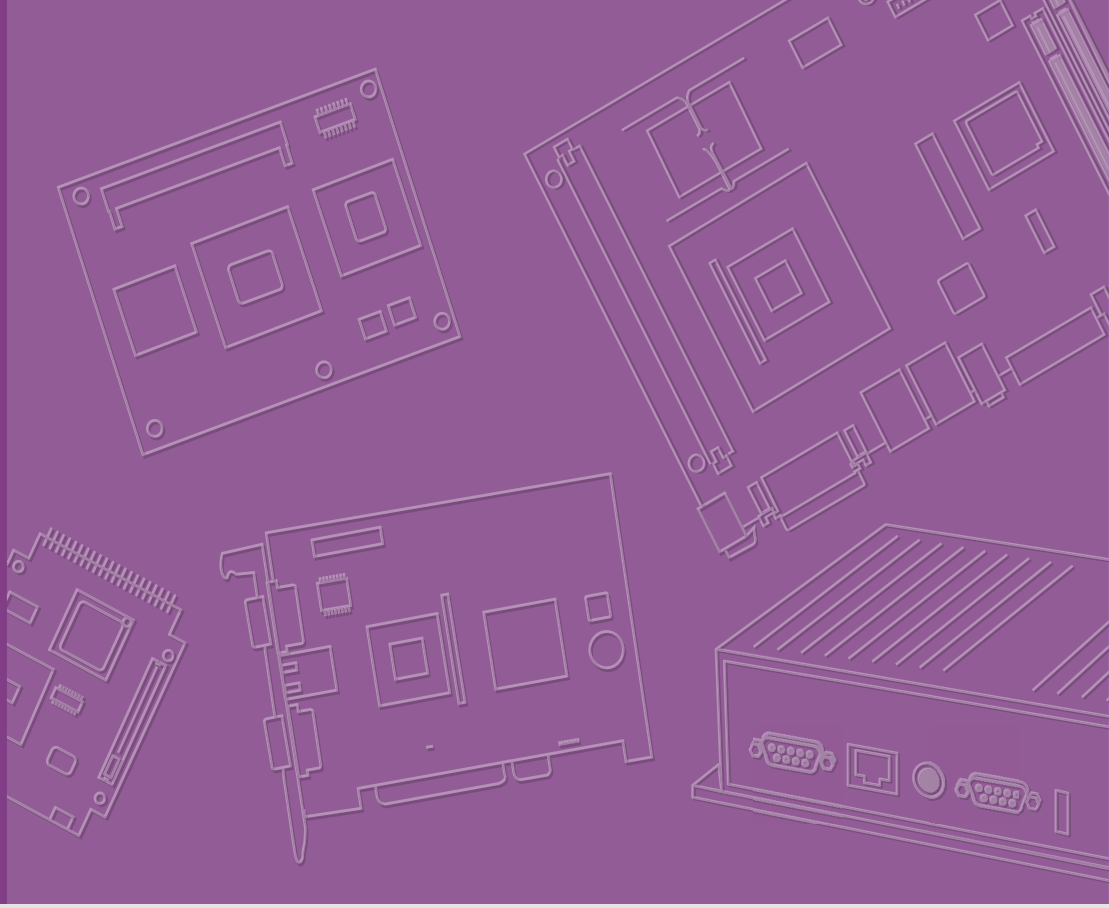


User Manual

ASR-A702

ADVANTECH

Enabling an Intelligent Planet

Attention!

This product contains a hard copy of the Chinese user manual for China CCC certification purposes. A PDF of the English user manual is included on the accompanying CD. Please disregard the hard copy Chinese user manual if the product is not sold and/or installed in China.

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Product Warranty (2 years)

Advantech warrants the original purchaser that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products that have been repaired or altered by persons other than repair personnel authorized by Advantech, or products that have been subject to misuse, abuse, accident, or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced free of charge during the warranty period. For out-of-warranty repairs, customers will be billed according to the cost of replacement materials, service time, and freight. Please consult your dealer for more details.

If you believe your product to be defective, follow the steps outlined below.

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages displayed when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain a return merchandize authorization (RMA) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a completed Repair and Replacement Order Card, and a proof of purchase date (such as a photocopy of your sales receipt) into a shippable container. Products returned without a proof of purchase date are not eligible for warranty service.
5. Write the RMA number clearly on the outside of the package and ship the package prepaid to your dealer.

Declaration of Conformity

FCC Class B

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for assistance.

Technical Support and Assistance

1. Visit the Advantech website at www.advantech.com/support to obtain the latest product information.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before calling:
   - 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

Warnings, Cautions and Notes

Warning! Warnings indicate conditions that if not observed can cause personal injury!



Caution! *Cautions are included to help prevent hardware damage and data losses. For example,*



"Batteries are at risk of exploding if incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions."

Note! *Notes provide additional optional information.*



Avertissements, Mises en garde et Remarques

Avertissement! *Les avertissements indiquent des conditions pouvant entra?ner des blessures corporelles si elles ne sont pas respectées.*



Attention! *Les mises en garde sont fournies pour aider à prévenir les dommages matériels et la perte de données.*



Par exemple:

"Les piles présentent un risque d'explosion si elles sont mal installées. N'essayez pas de les recharger, de les forcer ou de les exposer à la chaleur. Remplacez les piles uniquement par un modèle identique ou équivalent recommandé par le fabricant. Jetez les piles usagées con-formément aux instructions du fabricant."

Packing List

Before system installation, check that the items listed below are included and in good condition. If any item does not accord with the list, contact your dealer immediately.

- 1 x ASR-A702 unit
- 1 x NVIDIA Jetson Thor module
- 1 x Cooler for NVIDIA Jetson Thor module
- 1 x 512GB NVME SSD
- 1 x Heatsink for PCIe Switch
- 1 x China RoHS
- 1 x Simplified Chinese Startup Manual
- 1 x Terminal block*

*Wiring must be installed by a qualified professional.

Ordering Information

Part Number	Description
ASR-A702-X1A1U	NVIDIA Jetson T5000 inference system with 128GB LPDDR5X memory + 512 GB NVME

Optional Accessories

Optional Items for the Default SKU

Part Number	Description
96PSA-A330W24P4-3*	AC to DC adapter, DC 24V 330W, -20 ~ 60° C
1700035844-01	COM Cable D-SUB 9P(M)/2x5P-2.0 25cm
MIOE-PSE-DPA1**	MIOe-PSE PoE Module (dual 15.4W) w/ Heatsink
AFE-RM04-8PA1	MAX96712, 8ports GMSL board

* The equipment power supply cord shall be connected to a socket-outlet with earthing connection.

1. For power supply connection use wires suitable for at least 75-degree C.
2. The terminal block is suitable for 14-12 AWG. Torque value 7lb-in User copper conductors only.
3. Must be installed by skilled person.
4. The terminal block uses two sets of interfaces to make it split to meet the maximum current limit, and a single pin will be limited below 6A.

** The EUT is to be connected only to PoE networks without routing to the outside plant.

Safety Instructions

1. Read these safety instructions carefully.
2. Retain this user manual for future reference.
3. Disconnect the equipment from all power outlets before cleaning. Use only a damp cloth for cleaning. Do not use liquid or spray detergents.
4. For pluggable equipment, the power outlet socket must be located near the equipment and easily accessible.
5. Protect the equipment from humidity.
6. Place the equipment on a reliable surface during installation. Dropping or letting the equipment fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. Do not cover the openings.
8. Ensure that the voltage of the power source is correct before connecting the equipment to a power outlet.
9. Position the power cord away from high-traffic areas. 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 avoid damage from transient overvoltage.
12. Never pour 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.
14. If any of the following occurs, have the equipment checked by service personnel:
    - The power cord or plug is damaged.
    - Liquid has penetrated the equipment.
    - The equipment has been exposed to moisture.
    - The equipment is malfunctioning, or does not operate according to the user manual.
    - The equipment has been dropped and damaged.
    - The equipment shows obvious signs of breakage.
15. Do not leave the equipment in an environment with a storage temperature of below -40 °C (-40 °F) or above 85 °C (185 °F) as this may damage the components. The equipment should be kept in a controlled environment.
16. Any unverified component may cause unexpected damage. To ensure correct installation, always use the components (e.g., screws) provided in the accessory box.
17. CAUTION: Batteries are at risk of exploding if incorrectly replaced. Replace only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.
18. Always disconnect the power cord from the chassis before manually handling the hardware. Do not implement connections or configuration changes while the device is powered on. Sudden power surges may damage sensitive electronic components.
19. In accordance with IEC 704-1:1982 specifications, the sound pressure level at the operator's position does not exceed 70 dB (A).
20. DISCLAIMER: These instructions are provided according to IEC 704-1 standards. Advantech disclaims all responsibility for the accuracy of any statements contained herein.
21. This product is intended to be supplied by a UL-Listed power Adapter, or DC power source rated: 20-28 Vdc, 12.03-8.64A min, Tma= 50°C min. (for AGX

Thor); 55°C min. Altitude: 2000 m maximum. If you need further assistance, please contact Advantech for further information

22. 22.RESTRICTED ACCESS AREA: The equipment should only be installed in a Restricted Access Area.

Consignes de Sécurité

1. Veuillez lire attentivement ces instructions de sécurité.
2. Veuillez conserver ce manuel de l'utilisateur pour référence ultérieure.
3. Veuillez débrancher cet équipement de la prise secteur avant le nettoyage. Utilisez un chiffon humide. Ne pas utiliser de détergent liquide ou pulvérisé pour le nettoyage. Utilisez une feuille ou un chiffon humide pour le nettoyage.
4. Pour les équipements enfichables, la prise de courant doit être à proximité de l'équipement et doit être facilement accessible.
5. S'il vous plaît garder cet équipement de l'humidité.
6. Posez cet équipement sur une surface fiable lors de l'installation. Une chute ou une chute pourrait causer des blessures.
7. Les ouvertures sur le boîtier sont destinées à la convection d'air, protégeant. ainsi l'équipement de la surchauffe. NE COUVREZ PAS LES OUVERTURES.
8. Au moyen d'un cordon d'alimentation connecté à une prise de courant avec mise à la terre.
9. Placez le cordon d'alimentation de sorte que personne ne puisse marcher dessus. Ne placez rien sur le cordon d'alimentation.
10. Tous les avertissements et mises en garde sur l'équipement doivent être notés.
11. Si l'appareil n'est pas utilisé pendant une longue période, débranchez-le du secteur pour ne pas être endommagé par une surtension transitoire.
12. Ne jamais verser de liquide dans les ouvertures de ventilation; Cela pourrait provoquer un incendie ou un choc électrique.
13. N'ouvrez jamais l'équipement. Pour des raisons de sécurité, seul le personnel de maintenance qualifié doit ouvrir l'équipement.
14. Si l'une des situations suivantes se présente, faites vérifier le matériel par le personnel de service:
    - Le cordon d'alimentation ou la fiche est endommagé.
    - Un liquide a pénétré dans l'appareil.
    - L'équipement a été exposé à l'humidité.
    - L'équipement ne fonctionne pas bien ou vous ne pouvez pas le faire fonctionner conformément au manuel d'utilisation.
    - Equipment L'équipement est tombé et a été endommagé.
    - Equipment L'équipement présente des signes évidents de rupture.
15. Ne laissez pas cet équipement dans un environnement où la température de stockage peut être inférieure à -40°C (-40°F) ou supérieure à 85°C (185°F). Cela pourrait endommager l'équipement. L'équipement doit être dans un environnement contrôlé.
16. Tout composant non vérifié peut causer des dommages inattendus. Pour garantir une installation correcte, veuillez toujours utiliser les composants (ex. Vis) fournis avec la boîte d'accessoires.
17. ATTENTION: L'ordinateur est équipé d'un circuit d'horloge temps réel alimenté par batterie. Il y a un risque d'explosion si la batterie est remplacée de manière incorrecte. Remplacez uniquement avec le même type ou un type équivalent recommandé par le fabricant. Jetez les piles usagées conformément aux instructions du fabricant.

18. Débranchez toujours complètement le cordon d'alimentation de votre châssis lorsque vous utilisez du matériel. Ne faites pas de connexion quand l'appareil est sous tension. Les composants électroniques sensibles peuvent être endommagés par des surtensions soudaines.
19. Niveau de pression acoustique au poste de l'opérateur selon la norme CEI 704-1: 1982 n'est pas supérieur à 70 dB (A).
20. AVERTISSEMENT: Cet ensemble d'instructions est donné conformément à la norme CEI 704-1. Advantech décline toute responsabilité quant à l'exactitude des déclarations contenues dans ce.
21. Ce produit est destiné à être alimenté par un adaptateur secteur répertorié UL ou une source d'alimentation CC, évalué: 20-28 Vdc, 12.03-8.64A, Tma = 50 degrés C, si besoin d'assistance supplémentaire, veuillez contacter Advantech pour plus d'informations
22. ZONE D'ACCES RESTREINTE: L'équipement ne doit être installé que dans une zone d'accès restreint.

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Chapter 1

General Introduction

1.1 Introduction

Advantech's ASR-A702 is a high-end robotic controller series powered by NVIDIA Jetson Thor, featuring compact dimensions: single board system 170 x 170 mm. The ASR-A702 delivers up to 2070 TOPS of AI computing performance for AMR AI control and supports the Advantech Robotic Suite, offering a fast development plat-form for customers building robotic applications.

1.2 Specifications

1.2.1 General

Table 1.1: General

	ASR-A702-X1A1U
NVIDIA Jetson Series	Thor T5000
CPU	14-core Arm® Neoverse®-V3AE 64-bit CPU
GPU	2560-core NVIDIA Blackwell architecture GPU with 96 fifth-gen Tensor Cores, Maximum Operating Frequency: 1.57 GHz
Memory	128 GB 256-bits LPDDR5X
Storage	NA
Ethernet	6 x 2.5GbE (reserve 2 for PoE)
Serial Port	2 x RS-232/422/485
CANBus	2 x isolated CANFD
DIO	16 bit isolated DIO
USB Type A	6 x USB 3.2 Gen 2
USB Type C	1 x USB 3.2 Gen 2 (for system recovery only)
Expansion	1 x M.2 2280 B Key, 1 x M.2 2230 E Key, 1 x M.2 2280 M key, GMSL 8 x FAKRA

1.2.2 Display

- **Resolution:** 1 x HDMI 2.0 (Max. resolution 3840 x 2160 @ 24Hz)

1.2.3 Ethernet

- **Chipset:** Intel® i226
- **Speed:** 10/100/1000/2500 Mbps
- **Interface:** 6 x RJ-45, 1 x SFP28

1.2.4 I/O Ports and Expansion

- 1 x HDMI 2.0 max. 3840 x 2160 @ 24Hz
- 6 x USB 3.2 Gen 2 Type A
- 1 x 16-bit DI/DO (DB25 connector)
- 2 x RS-232/RS-422/RS-485
- 2 x CAN bus (isolated CANFD)
- 1 x OTG Type C USB (Recovery Only)
- 1 x M.2 2230 E-Key

- 1 x M.2 2280 B-Key
- 1 x M.2 2280 M-Key
- 6 x LAN (4 for RJ45, 2 for PoE)

1.2.5 CPU

- **ASR-A702-X1A1U:** 14-core Arm® Neoverse®-V3AE 64-bit CPU

1.2.6 GPU

- **ASR-A702-X1A1U:** 2560-core NVIDIA Blackwell architecture GPU with 96 fifth-gen Tensor Cores

1.3 Mechanical Specifications

1.3.1 System Dimensions (AGX Thor)

- ASR-A702 (AGX Thor), 170 x 170 mm
- ASR-A702-X1A1U

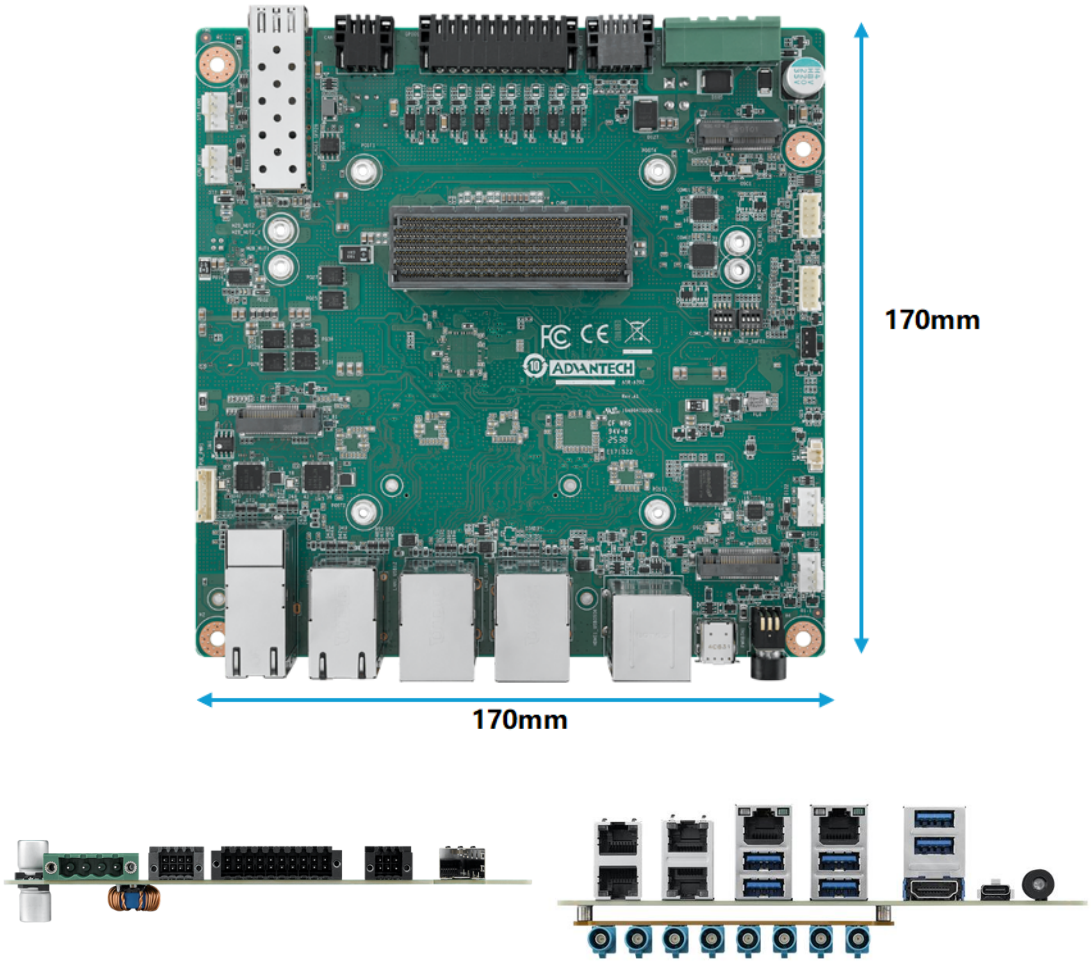


Figure 1.1 System Dimensions

1.3.2 Weight of the System

Table 1.2: Weight of the System		
Part Number	**Module**	**Weight (System Only)**
ASR-A702-X1A1U	Thor T5000	655 g

1.4 Power Requirements

1.4.1 System Power

- **Power supply voltage:** 20 ~ 28 V
- **Power type:** ATX/AT mode, ATX default

1.5 Environmental Specifications

1.5.1 Operating Temperature Range

- **ASR-A702-X1A1U:** -10 ~ 55° C with 0.7 m/s airflow

1.5.2 Relative Humidity

- 95% @ 40° C (104° F) (non-condensing)

1.5.3 Storage Temperature

- -40 ~ 60° C

1.5.4 Vibration Tolerance

- When the system is equipped with an M.2 SSD: 3 Grms, IEC 60068-2-64, random, 5 ~ 500 Hz, 1 hr/axis, (x, y, z) 3 axes

1.5.5 Shock Tolerance

- When the system is equipped with an M.2 SSD: 30 G, IEC 60068-2-27, half-sine, 11 ms duration

1.5.6 EMC Certification

- CE, FCC Class B

Chapter 2

Hardware Installation

This chapter details instructions for installing hardware and external I/O on the board for the ASR-A702.

2.1 Introduction

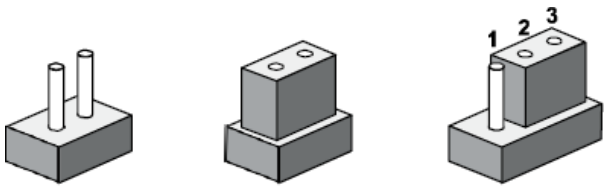
The ASR-A702 is the control system and works with the ASR-A702 control board.

The following sections demonstrate the internal jumper settings and the external connector pin assignments on the ASR-A702 board.

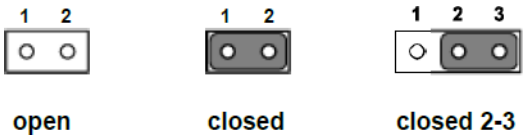
2.2 Jumpers

2.2.1 Jumper Description

The ASR-A702 can be configured to satisfy specific application requirements by setting jumpers. A jumper is a metal bridge used to close an electric circuit. 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, connect the pins with the clip. To open a jumper, remove the clip. Sometimes a jumper will have three pins, labeled 1, 2, and 3. For these jumpers, connect either pins 1 and 2, or 2 and 3.



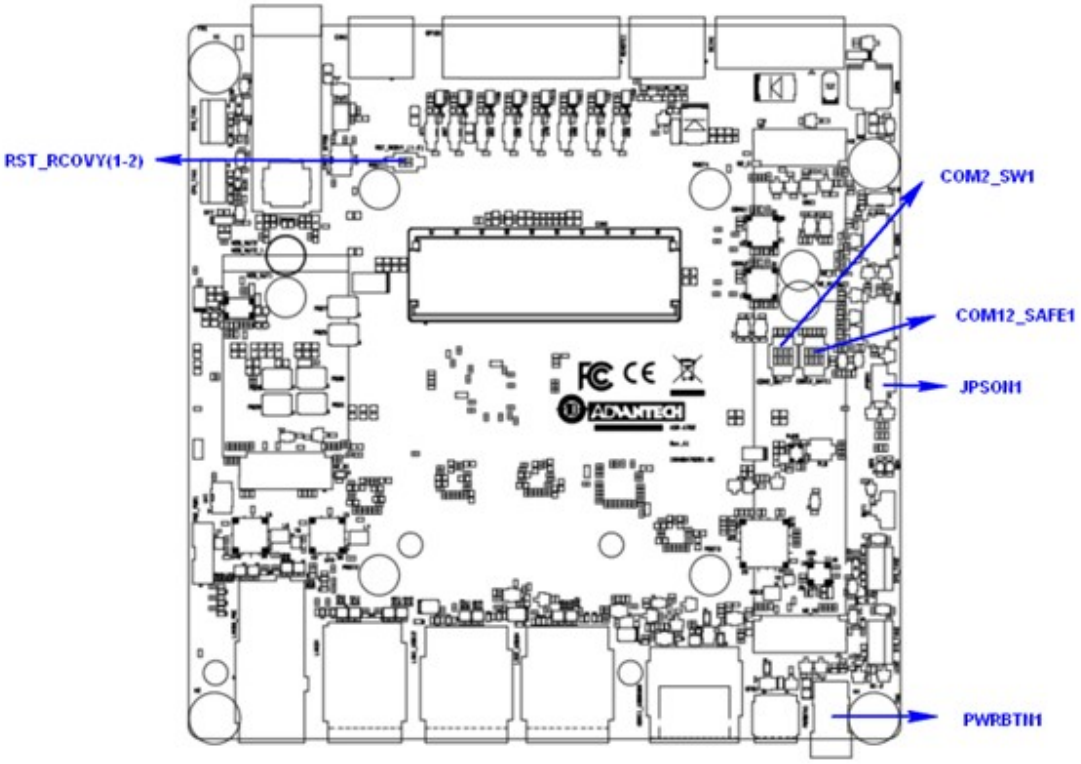
The jumper settings are schematically diagrammed in this manual as follows:



A pair of needle-nose pliers may be necessary when working with jumpers. Users with concerns regarding the ideal hardware configuration for your application should contact your local distributor or sales representative before making any changes. Usually, only a standard cable is required to make most connections.

2.2.2 Jumper List

- TOP SIDE of the ASR-A702



- BOTTOM SIDE of the ASR-A702

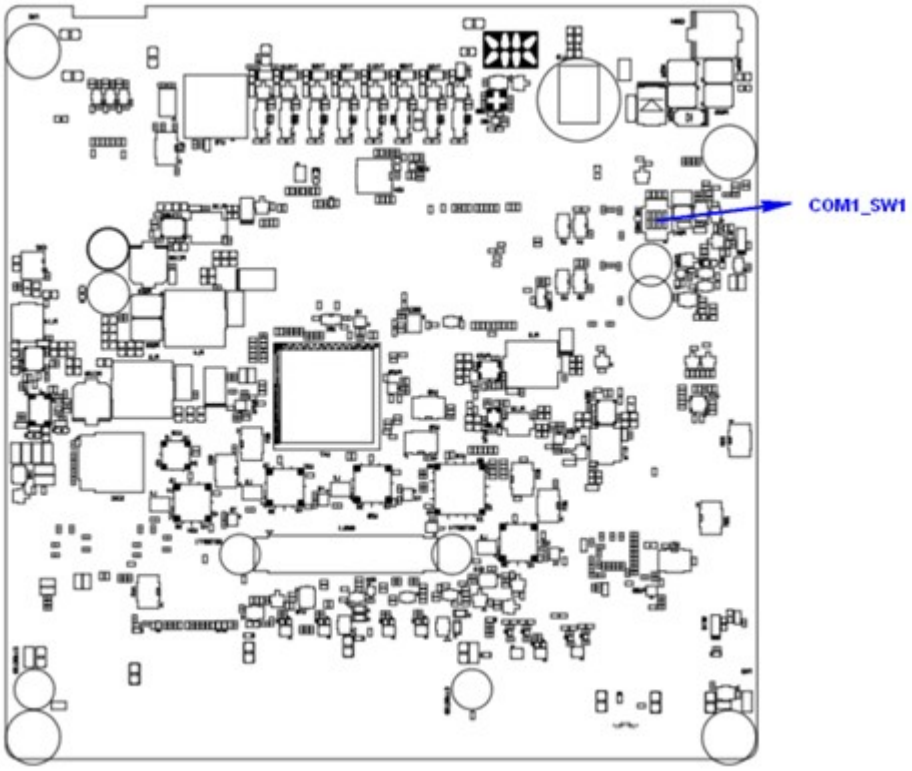


Table 2.1: Jumper Settings	
Location	**Function**
RST_RCOVY_(1_2)	System reset and system image recovery
COM12_SAFE1	COM Port Failsafe Function Selection
COM1_SW1	COM1 SW RS232/422/485 mode selection
COM2_SW1	COM2 SW RS232/422/485 mode selection
PWRBTN1	System power button
JPSON1	AT/ATX mode switch

2.2.3 Jumper and Connector Locations



Table 2.2: Reset and Recovery Switch			
	Mode/Description	**Pin1**	**Pin2**
RST_RCOVY_(1_2) Setting	Reset Device	ON: Enable OFF: Disable (Default)	
	Recovery Device	-	ON: Enable OFF: Disable (Default)



Table 2.3: Table 2.3: COM Port Failsafe Function Selection					
	Mode/Description	**Pin1**	**Pin2**	**Pin1**	**Pin2**
COM12_SAFE1 Setting	Default	OFF	OFF	OFF	OFF
	COM2 RS485_TX/RX external pull	-	-	ON	ON
	COM2 RS485_TX/RX external pull high /RS422_TX/RX external GND	ON	ON	-	-

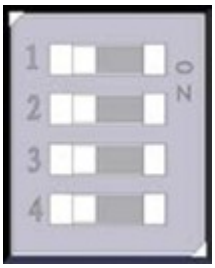


Table 2.4: COM1 Port Mode Selection

	Mode/Description	Pin1	Pin2	Pin3	Pin4
COM1_SW1 (COM1) Setting	RS-232 (Default)	OFF	OFF	OFF	OFF
	RS-422	ON	OFF	OFF	OFF
	RS-422 (Enable Termination Resistor)	ON	OFF	ON	OFF
	RS-485 (Software flow control)	ON	ON	OFF	ON
	RS-485	ON	ON	ON	OFF
	RS-485 (Enable Termination Resistor)	ON	ON	ON	ON
	Loopback (Enable Termination Resistor)	OFF	ON	OFF	OFF



Table 2.5: COM2 Port Mode Selection

	Mode/Description	Pin1	Pin2	Pin3	Pin4
COM2_SW1 (COM2) Setting	RS-232 (Default)	OFF	OFF	OFF	OFF
	RS-422	ON	OFF	OFF	OFF
	RS-422 (Enable Termination Resistor)	ON	OFF	ON	OFF
	RS-485 (Software flow control)	ON	ON	OFF	ON
	RS-485	ON	ON	ON	OFF
	RS-485 (Enable Termination Resistor)	ON	ON	ON	ON
	Loopback (Enable Termination Resistor)	OFF	ON	OFF	OFF

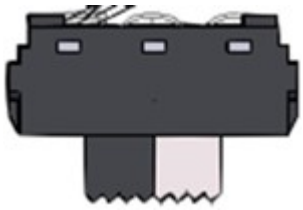


Table 2.6: JPSON1			
Item	**Mode selection**	**Pin1**	**Pin2**
1	ATX mode (Default)	Left	
2	AT mode		Right

2.3 Connectors

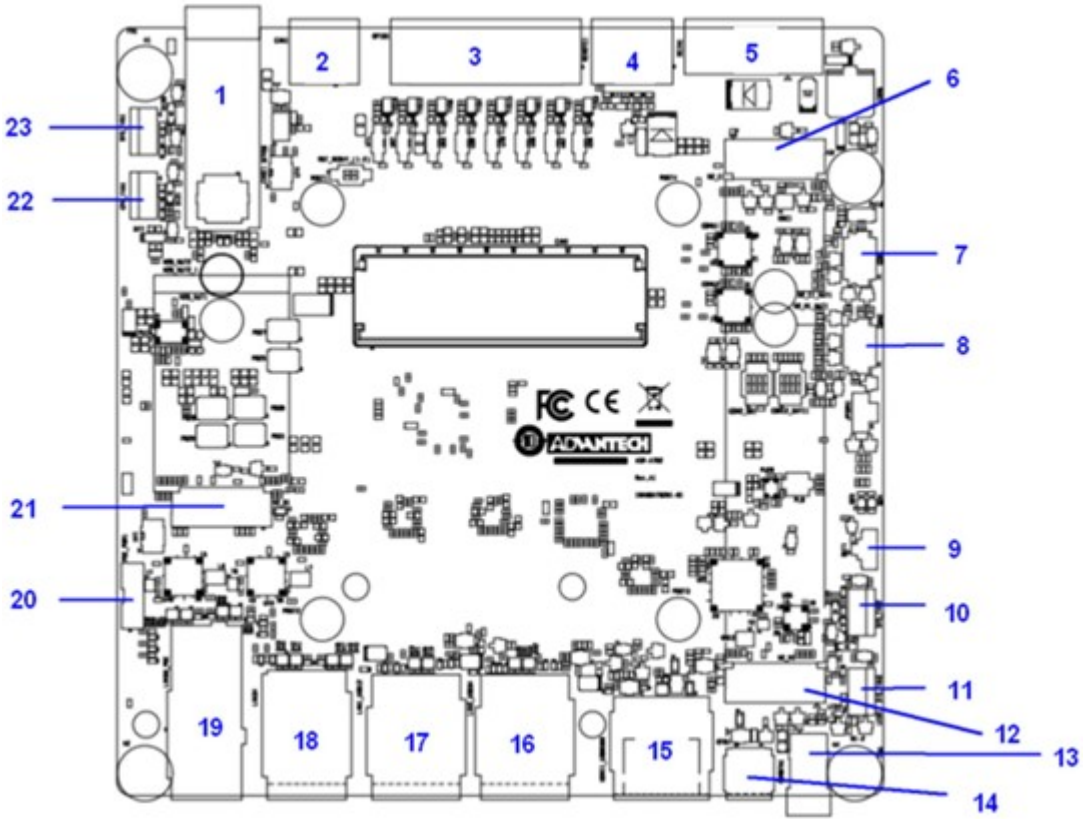


Figure 2.1 Top Layer Overview

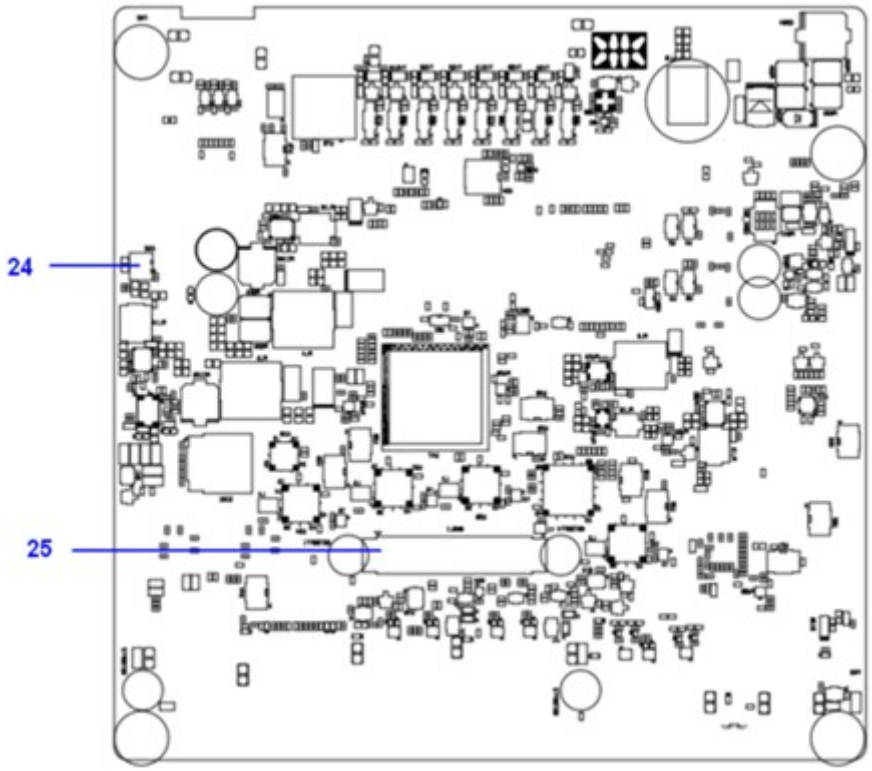


Figure 2.2 Bottom Layer Overview

Table 2.7: Connector

Item	Description	Part Reference
1	SFP28 connector	SFP28(CAGE1_SFP28)
2	CAN BUS	CAN1
3	GPIO 16-bit isolation CONN I/O	GPIO1
4	Remote conn	REMOTE1
5	DC IN power connector	DCIN1
6	M.2 E-KEY Connector	M2_E1
7	COM port 1	COM1
8	COM port 2	COM2
9	Battery connector	BAT1
10	System fan	SYS_FAN2
11	System fan	SYS_FAN3
12	M.2 M-KEY Connector	M2_M1
13	Power button	PWRBTN1
14	TYPE-C (flash image Recovery mode)	OTG1
15	HDMI + USB3.2 Gen2 stack connector	HDMI1_USB0506
16	RJ-45 + USB 3.2 Gen2 stack connector	LAN2_USB34
17	RJ-45 + USB 3.2 Gen2 stack connector	LAN1_USB12
18	RJ45 stack connector	LAN34
19	RJ45 stack connector+POE	LAN56_POE
20	POE power connector	POE_PWR1
21	M.2 B-KEY Connector	M2_B1
22	CPU fan connector	CPU_FAN1
23	System fan	SYS_FAN1

Table 2.7: Connector		
24	GMSL power connector	CN2
25	GMSL MIPI-120PIN Connector	GMSL1

2.3.1 SFP28 Connector (SFP28)

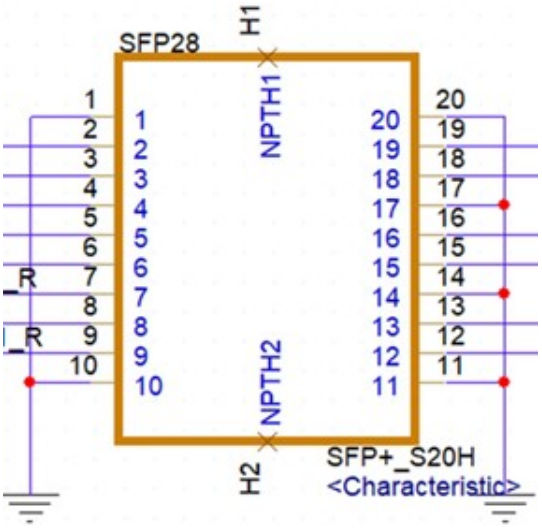


Table 2.8: SFP28 connector (SFP28)	
Pin	**Signal**
1	GND
2	TX fault
3	TX disable
4	I2C data
5	I2C CLK
6	MOD ABS
7	RS0
8	RX Loss
9	RS1
10	GND
11	GND
12	RXN
13	RXP
14	GND
15	RX 3.3V power
16	TX 3.3V power
17	GND
18	TXP
19	TXN
20	GND

2.3.2 CAN Bus (CAN1)

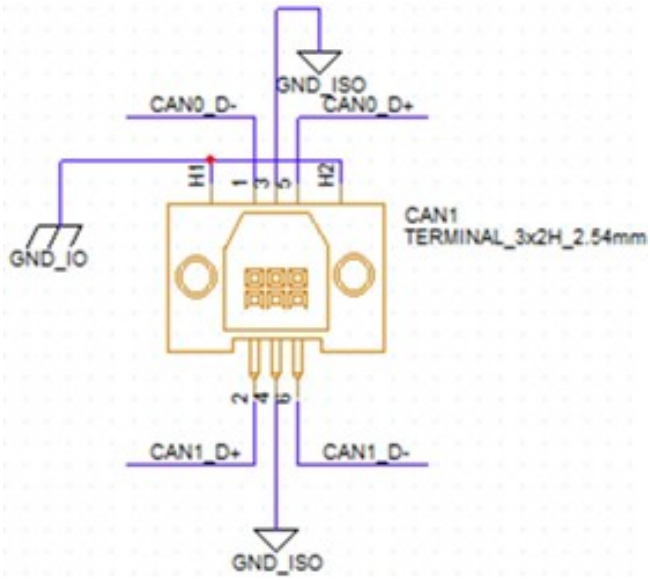


Table 2.9: CAN Bus (CAN1)

Pi	Signal
1	CAN0_D-
2	CAN1_D+
3	GND
4	GND
5	CAN0_D+
6	CAN1_D-

2.3.3 GPIO 16-Bit Isolation CONN I/O (GPIO1)

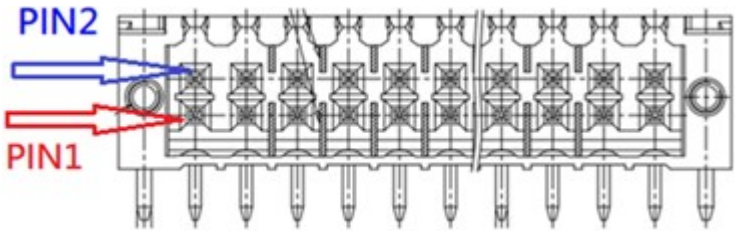


Table 2.10: GPIO 16-Bit Isolation CONN I/O (GPIO1)

Pin	Signal	Pin	Signal
1	GND_ISO	11	GND_ISO
2	GND_ISO	12	GND_ISO
3	DI1	13	DI5
4	DO1	14	DO5
5	DI2	15	DI6
6	DO2	16	DO6
7	DI3	17	DI7
8	DO3	18	DO7
9	DI4	19	DI8
10	DO4	20	DO8

2.3.4 REMOTE CONN (REMOTE1)

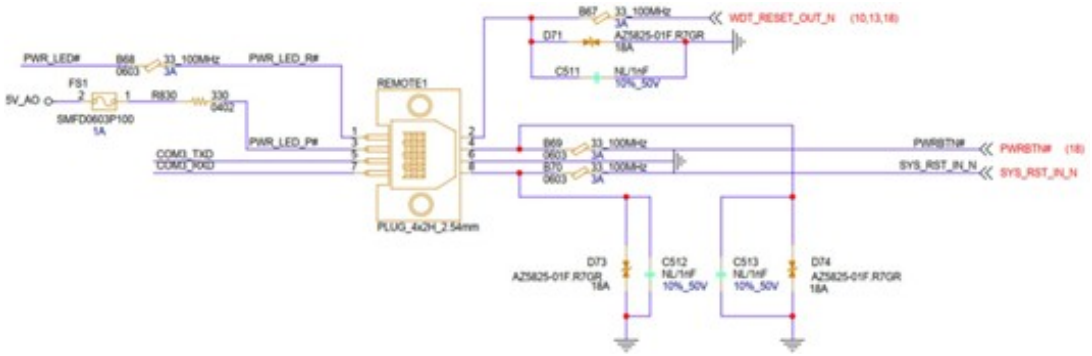


Table 2.11: REMOTE CONN (REMOTE1)

Pin	Signal
1	Power LED
2	WDT
3	PWR_LED_P#
4	Power Button
5	COM3_TXD
6	GND
7	COM3_RXD
8	Reset

2.3.5 DC IN Power Connector (DCIN1)

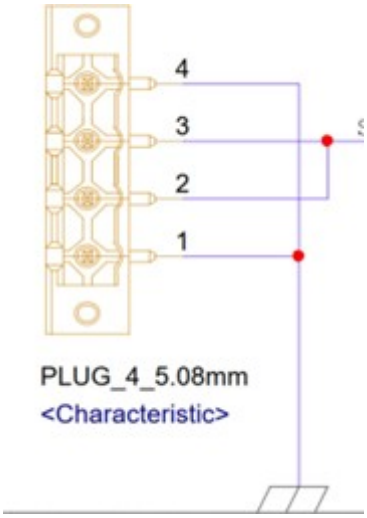


Table 2.12: DC IN Power Connector (DCIN1)

Pin	Signal
1	GND
2	ADAPTER VOLTAGE
3	ADAPTER VOLTAGE
4	GND

2.3.6 M.2 E-Key Connector (M2_E1)

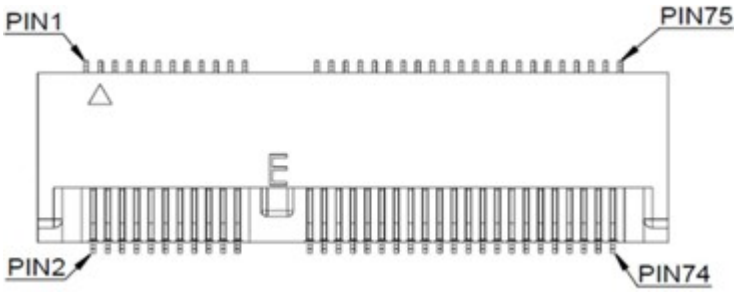


Table 2.13: M.2 E-Key Connector (M2_E1)

Pin	Signal	Pin	Signal
1	GND	2	+V3.3_MKE
3	USB_M2E_AP_P	4	+V3.3_MKE
5	USB_M2E_AP_N	6	N/C
7	GND	8	I2S1_SCLK
9	N/C-	10	I2S1_FS
11	N/C-	12	I2S1_DIN
13	N/C-	14	I2S1_DOUT
15	N/C-	16	N/C
17	N/C-	18	GND
19	N/C-	20	BT_M2E_WAKE_AP

Table 2.13: M.2 E-Key Connector (M2_E1)			
21	N/C-	22	N/C
23	N/C-	24	Connector Key
25	Connector Key	26	Connector Key
27	Connector Key	28	Connector Key
29	Connector Key	30	Connector Key
31	Connector Key	32	N/C-
33	GND	34	N/C-
35	UPHY_TX3_P	36	N/C-
37	UPHY_TX3_N	38	N/C-
39	GND	40	N/C-
41	UPHY_RX3_P	42	N/C-
43	UPHY_RX3_N	44	N/C-
45	GND	46	N/C-
47	PEX_CLK6_P	48	N/C-
49	PEX_CLK6_N	50	M2E_SUSCLK
51	GND	52	PCIE1_RST
53	PCIE1_M2E_CLKREQ_N	54	W_DISABLE2
55	PCIE_M2E_WAKE	56	W_DISABLE1
57	GND	58	I2C5_M2E_SDA
59	N/C-	60	I2C5_M2E_SCL
61	N/C-	62	M2E_ALERT*
63	GND	64	N/C-
65	N/C-	66	N/C-
67	N/C-	68	N/C-
69	GND	70	N/C-
71	N/C-	72	+V3.3_MKE
73	N/C-	74	+V3.3_MKE
75	GND		

2.3.7 COM PORT (COM1)

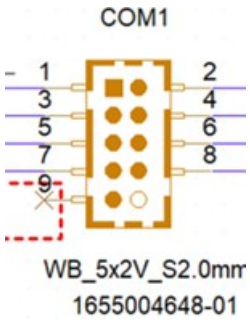


Table 2.14: COM PORT (COM1)

Pin	RS-232	RS-422	RS-485
1	DCD	Tx-	Tx-
2	TxD	Tx+	Tx+
3	RxD	Rx+	NC
4	DTR	Rx-	NC
5	GND	GND	GND
6	DSR	NC	NC
7	RTS	NC	NC
8	CTS	NC	NC
9	NC	NC	NC
NC represents “No Connection”.			

2.3.8 COM PORT (COM2)

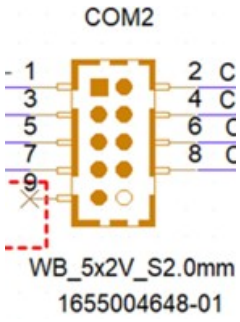


Table 2.15: COM PORT (COM2)

Pin	RS-232	RS-422	RS-485
1	DCD	Tx-	Tx-
2	TxD	Tx+	Tx+
3	RxD	Rx+	NC
4	DTR	Rx-	NC
5	GND	GND	GND
6	DSR	NC	NC
7	RTS	NC	NC
8	CTS	NC	NC
9	NC	NC	NC
NC represents “No Connection”.			

2.3.9 Battery Connector (BAT1)

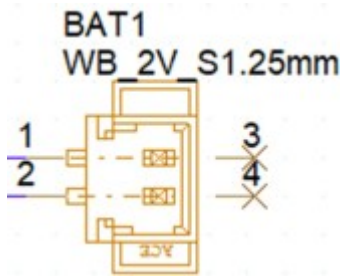


Table 2.16: Battery Connector(BAT1)	
Pi	**Signal**
1	3.3V power
2	GND
3	NC
4	NC

2.3.10 System Fan Connector (SYS_FAN2)

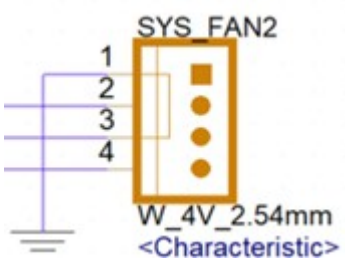


Table 2.17: System Fan Connector (SYS_FAN2)	
Pin	**Signal**
1	GND
2	12V
3	FAN_TACH_A5
4	FAN_PWM_D4

2.3.11 System Fan Connector (SYS_FAN3)

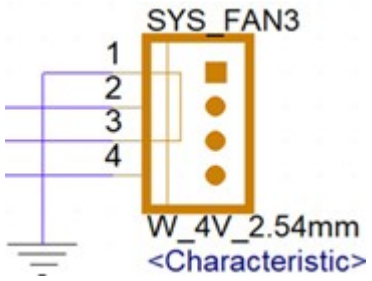


Table 2.18: System Fan Connector (SYS_FAN3)

Pin	Signal
1	GND
2	12V
3	FAN_TACH_A6
4	FAN_PWM_D5

2.3.12 M.2 E-Key Connector (M2_M1)

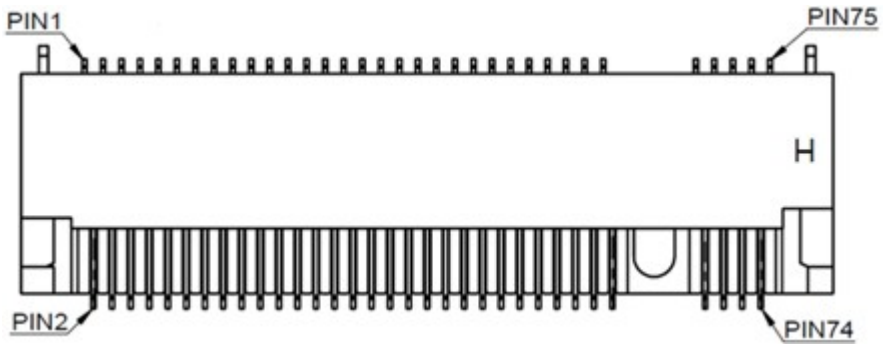


Table 2.19: M.2 E-Key Connector (M2_M1)

Pin	Signal	Pin	Signal
1	GND	2	+V3.3
3	GND	4	+V3.3
5	UPHY_RX11_N	6	N/C
7	UPHY_RX11_P	8	N/C
9	GND	10	N/C
11	UPHY_TX11_N	12	+V3.3
13	UPHY_TX11_P	14	+V3.3
15	GND	16	+V3.3
17	UPHY_RX10_N	18	+V3.3
19	UPHY_RX10_P	20	N/C
21	GND	22	N/C
23	UPHY_TX10_N	24	N/C
25	UPHY_TX10_P	26	N/C
27	GND	28	N/C
29	UPHY_RX9_N	30	N/C

Table 2.19: M.2 E-Key Connector (M2_M1)			
31	UPHY_RX9_P	32	N/C
33	GND	34	N/C
35	UPHY_TX9_N	36	N/C
37	UPHY_TX9_P	38	N/C
39	GND	40	I2C2_M2M_SCL
41	UPHY_RX8_N	42	I2C2_M2M_SDA
43	UPHY_RX8_P	44	M2M_ALERT*
45	GND	46	N/C
47	UPHY_TX8_N	48	N/C
49	UPHY_TX8_P	50	PCIE_M2M_RST
51	GND	52	PCIE_M2M_CLKREQ
53	PCIE_CLK3_N	54	PCIE_M2M_WAKE
55	PCIE_CLK3_P	56	N/C
57	GND	58	N/C
59	Connector Key	60	Connector Key
61	Connector Key	62	Connector Key
63	Connector Key	64	Connector Key
65	Connector Key	66	Connector Key
67	N/C	68	M2M_SUSCLK_32KHZ
69	N/C	70	+V3.3
71	GND	72	+V3.3
73	GND	74	+V3.3
75	GND		

2.3.13 TYPE-C (Recovery Mode Only) (OTG1)

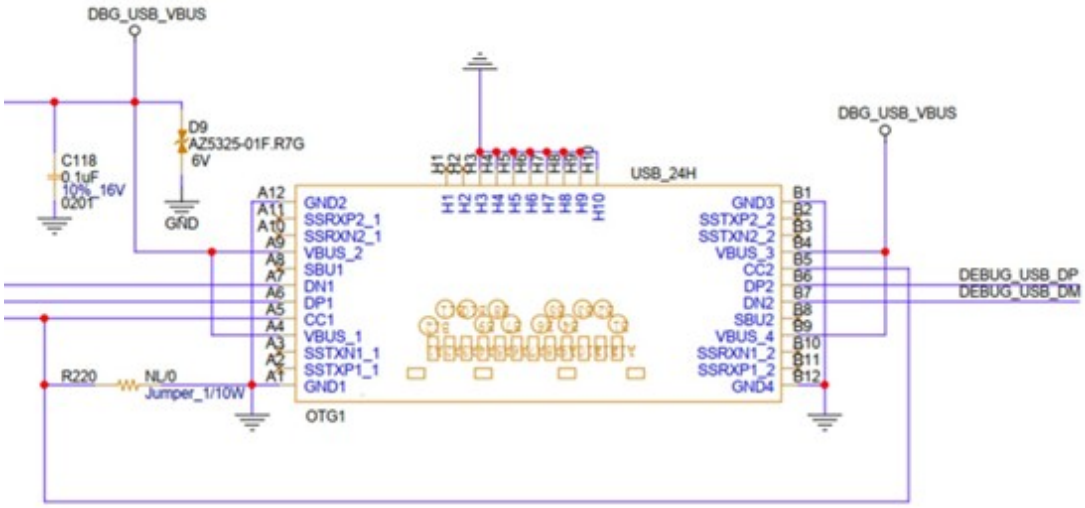


Table 2.20: Type-C Receptacle A Pin Layout		
Pin	**Signal**	**Description**
A1	GND	Ground return
A2	SSTXp1	N/A
A3	SSTXn1	N/A
A4	VBUS	Bus power
A5	CC1	OTG_ID (none used)
A6	Dp1	DEBUG_USB_DP
A7	Dn1	DEBUG_USB_DM
A8	SBU1	Sideband use (SBU)
A9	VBUS	Bus power
A10	SSRXn2	N/A
A11	SSRXp2	N/A
A12	GND	Ground return
Type-C Receptacle B Pin Layout		
Pin	Signal	Description
B12	GND	Ground return
B11	SSTXp1	N/A
B10	SSTXn1	N/A
B9	VBUS	Bus power
B8	SBU2	Sideband use (SBU)
B7	Dn2	DEBUG_USB_DM
B6	Dp2	DEBUG_USB_DP
B5	CC2	Configuration channel
B4	VBUS	Bus power
B3	SSRXn2	N/A
B2	SSRXp2	N/A
B1	GND	Ground return

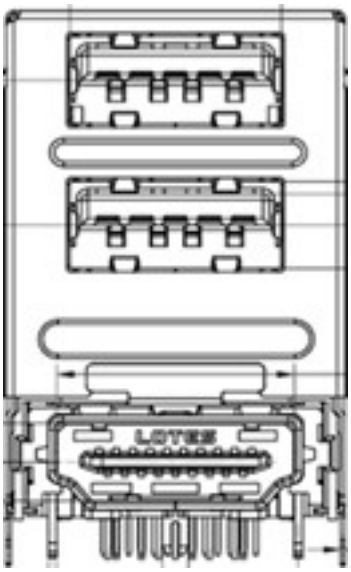


Table 2.21: HDMI +USB3.2 Gen2 Stack Connector (HDMI1+USB0506)	
HDMI	
Pin	**Signal**
A1	DATA2+
A2	GND
A3	DATA2-
A4	DATA1+
A5	GND
A6	DATA1-
A7	DATA0+
A8	GND
A9	DATA0-
A10	CLK+
A11	GND
A12	CLK-
A13	CEC
A14	NC
A15	SCL
A16	SDA
A17	GND
A18	+V5 power
A19	HPD
USB3.2	
Pin	**Signal**
B11	VBUS1
B12	D1-
B13	D1+
B14	GND
B15	SSRX1-
B16	SSRX1+

Table 2.21: HDMI +USB3.2 Gen2 Stack Connector (HDMI1+USB0506)	
B17	GND
B18	SSTX1-
B19	SSTX1+
B21	VBUS2
B22	D2-
B23	D2+
B24	GND
B25	SSRX2-
B26	SSRX2+
B27	GND
B28	SSTX2-
B29	SSTX2+

2.3.14 RJ-45 + USB 3.2 Gen2 Stack Connector (LAN2_USB34)

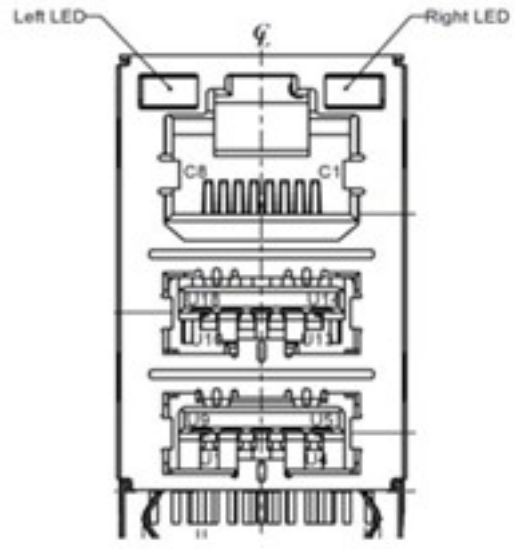


Table 2.22: RJ-45 + USB 3.2 Gen2 Stack Connector (LAN2_USB34)			
Pin	**Signal**	**Pin**	**Signal**
U1	+V5_BUS34	U10	+V5_BUS34
U2	HUB1_DN_P3	U11	HUB1_DN_P4
U3	HUB1_DN_P3	U12	HUB1_DN_P4
U4	GND	U13	GND
U5	HUB1_SSRX_N_P3	U14	HUB1_SSRX_N_P4
U6	HUB1_SSRX_P_P3	U15	HUB1_SSRX_P_P4
U7	GND	U16	GND
U8	HUB1_SSTX_N_P3	U17	HUB1_SSTX_N_P4
U9	HUB1_SSTX_P_P3	U18	HUB1_SSTX_P_P4
Pin	Signal	Pin	Signal
R2	LAN2_MDI_P0	R6	LAN2_MDI_P2
R3	LAN2_MDI_N0	R7	LAN2_MDI_N2
R4	LAN2_MDI_P1	R8	LAN2_MDI_P3
R5	LAN2_MDI_N1	R9	LAN2_MDI_N3

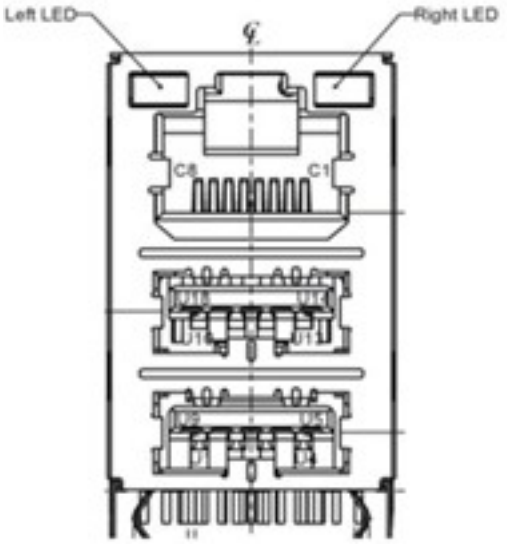


Table 2.23: RJ-45 + USB 3.2 Gen2 Stack Connector (LAN1_USB12)			
Pin	Signal	Pin	Signal
U1	+V5_BUS12	U10	+V5_BUS12
U2	HUB1_DN_P1	U11	HUB1_DN_P2
U3	HUB1_DN_P1	U12	HUB1_DN_P2
U4	GND	U13	GND
U5	HUB1_SSRX_N_P1	U14	HUB1_SSRX_N_P2
U6	HUB1_SSRX_P_P1	U15	HUB1_SSRX_P_P2
U7	GND	U16	GND
U8	HUB1_SSTX_N_P1	U17	HUB1_SSTX_N_P2
U9	HUB1_SSTX_P_P1	U18	HUB1_SSTX_P_P2
Pin	Signal	Pin	Signal
R2	LAN1_MDI_P0	R6	LAN1_MDI_P2
R3	LAN1_MDI_N0	R7	LAN1_MDI_N2
R4	LAN1_MDI_P1	R8	LAN1_MDI_P3
R5	LAN1_MDI_N1	R9	LAN1_MDI_N3

2.3.15 RJ-45 Stack Connector (LAN34)

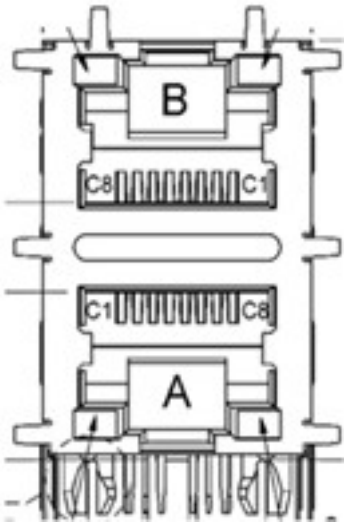


Table 2.24: RJ-45 Stack Connector (LAN34)

Pin	Signal	Pin	Signal
RA1	LAN3_MDI_P0	RA5	LAN3_MDI_P2
RA2	LAN3_MDI_N0	RA6	LAN3_MDI_N2
RA3	LAN3_MDI_P1	RA7	LAN3_MDI_P3
RA4	LAN3_MDI_N1	RA8	LAN3_MDI_N3
RB1	LAN4_MDI_P0	RB5	LAN4_MDI_P2
RB2	LAN4_MDI_N0	RB6	LAN4_MDI_N2
RB3	LAN4_MDI_P1	RB7	LAN4_MDI_P3
RB4	LAN4_MDI_N1	RB8	LAN4_MDI_N3

LAN	LED	Position	Color	LED State	Display
				On	Active Connection

2.3.16 HDMI Display (HDMI1)

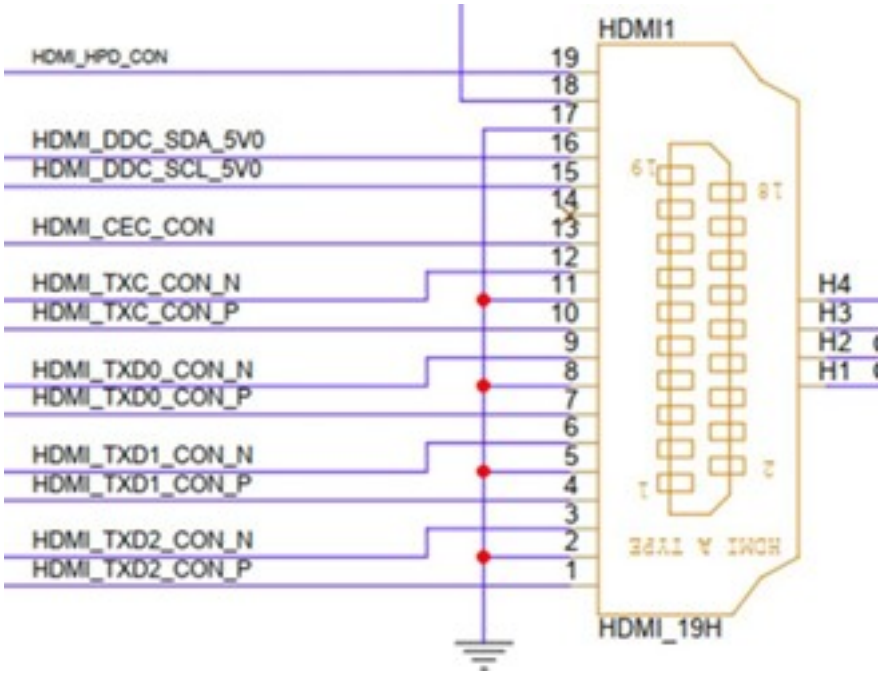


Table 2.25: HDMI Display (HDMI1)

Pin	Signal
1	HDMI_TXD2_CON_P
2	GND
3	HDMI_TXD2_CON_N
4	HDMI_TXD1_CON_P
5	GND
6	HDMI_TXD1_CON_N
7	HDMI_TXD0_CON_P
8	GND
9	HDMI_TXD0_CON_N
10	HDMI_TXC_CON_P
11	GND
12	HDMI_TXC_CON_N
13	HDMI_CEC_CON
14	NC
15	HDMI_DDC_SCL_5V0
16	HDMI_DDC_SDA_5V0
17	GND
18	VDD_5V0_HDMI_CON
19	HDMI_HPD_CON
NC represents “No Connection”.	

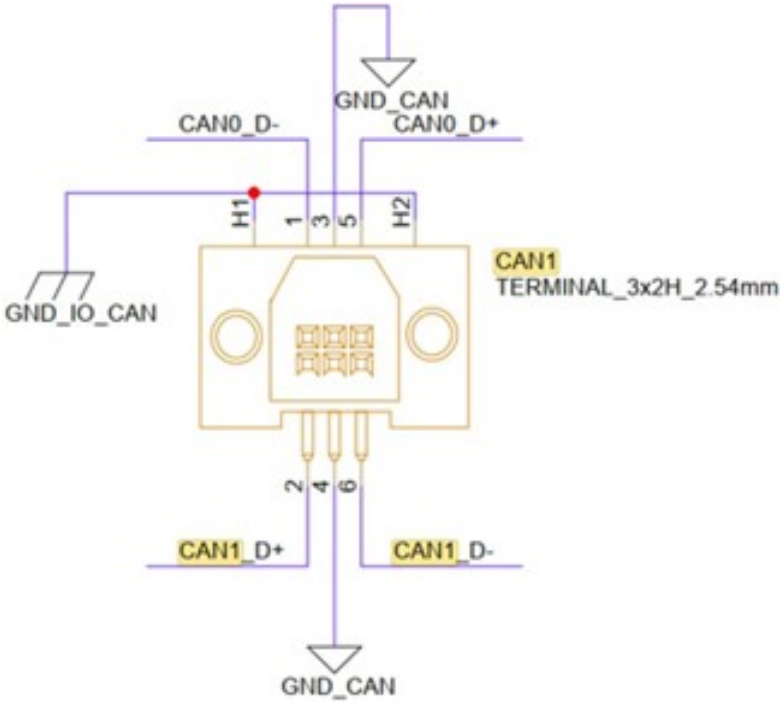


Table 2.26: CAN Bus (CAN1)	
Pin	**Signal**
1	CAN0_D-
2	CAN1_D+
3	GND
4	GND
5	CAN0_D+
6	CAN1_D-

2.3.17 FAN CONN I/O (SYS_FAN1)

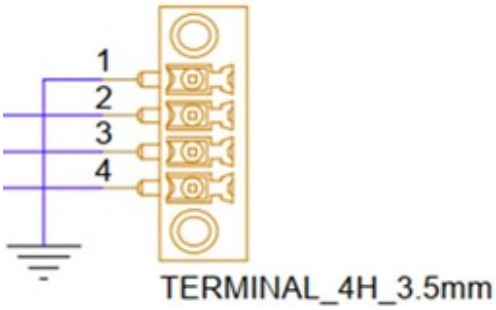


Table 2.27: FAN CONN I/O (SYS_FAN1)	
Pin	Signal
1	GND
2	12V
3	SYS_FAN_TACH
4	FAN_PWM_D1

2.3.18 FAN CONN Internal (CPU_FAN1)

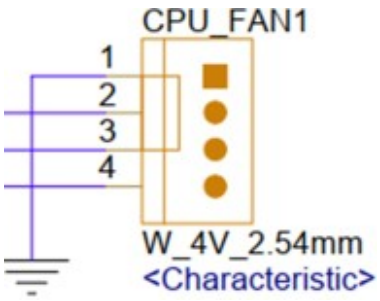


Table 2.28: FAN CONN Internal (CPU_FAN1)

Pin	Signal
1	GND
2	12V
3	CPU_ FAN_TACH
4	FAN_PWM_D2

2.3.19 M.2 M-Key Connector (NVME1)

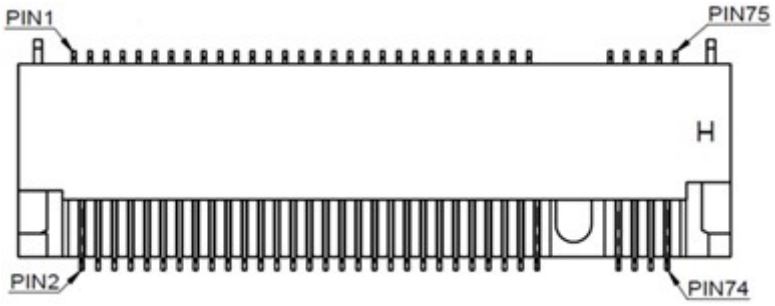


Table 2.29: M.2 M-Key Connector (NVME1)

Pin	Signal	Pin	Signal
1	GND	2	VDD_3V3
3	GND	4	VDD_3V3
5	PCIE_M2M_RX3_N	6	N/C
7	PCIE_M2M_RX3_P	8	N/C
9	GND	10	N/C
11	PCIE_M2M_TX3_N	12	VDD_3V3
13	PCIE_M2M_TX3_P	14	VDD_3V3
15	GND	16	VDD_3V3
17	PCIE_M2M_RX2_N	18	VDD_3V3
19	PCIE_M2M_RX2_P	20	N/C
21	GND	22	N/C
23	PCIE_M2M_TX2_N	24	N/C
25	PCIE_M2M_TX2_P	26	N/C
27	GND	28	N/C
29	PCIE_M2M_RX1_N	30	N/C

Table 2.29: M.2 M-Key Connector (NVME1)			
31	PCIE_M2M_RX1_P	32	N/C
33	GND	34	N/C
35	PCIE_M2M_TX1_N	36	N/C
37	PCIE_M2M_TX1_P	38	N/C
39	GND	40	I2C2_M2M_SCL
41	PCIE_M2M_RX0_N	42	I2C2_M2M_SDA
43	PCIE_M2M_RX0_P	44	M2M_ALERT*
45	GND	46	N/C
47	PCIE_M2M_TX0_N	48	N/C
49	PCIE_M2M_TX0_P	50	PCIE_M2M_RST
51	GND	52	PCIE_M2M_CLKREQ
53	PCIE_M2M_CLK_N	54	PCIE_M2M_WAKE
55	PCIE_M2M_CLK_P	56	N/C
57	GND	58	N/C
59	Connector Key	60	Connector Key
61	Connector Key	62	Connector Key
63	Connector Key	64	Connector Key
65	Connector Key	66	Connector Key
67	N/C	68	M2M_SUSCLK_32KHZ
69	N/C	70	VDD_3V3
71	GND	72	VDD_3V3
73	GND	74	VDD_3V3
75	GND		

2.3.20 LAN CONN (LAN1/2)

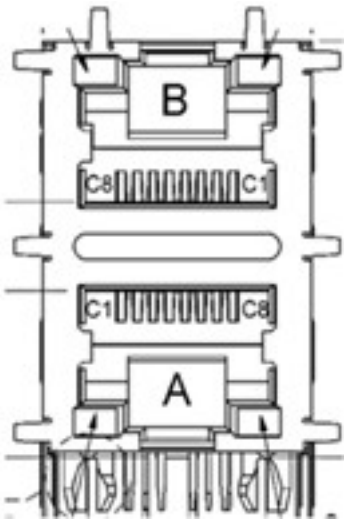


Table 2.30: LAN CONN (LAN1/2)

Pin	Signal		Pin	Signal	
RA1	LAN3_MDI_P0		RA5	LAN3_MDI_P2	
RA2	LAN3_MDI_N0		RA6	LAN3_MDI_N2	
RA3	LAN3_MDI_P1		RA7	LAN3_MDI_P3	
RA4	LAN3_MDI_N1		RA8	LAN3_MDI_N3	
Pin	**Signal**		**Pin**	**Signal**	
RB1	LAN4_MDI_P0		RB5	LAN4_MDI_P2	
RB2	LAN4_MDI_N0		RB6	LAN4_MDI_N2	
RB3	LAN4_MDI_P1		RB7	LAN4_MDI_P3	
RB4	LAN4_MDI_N1		RB8	LAN4_MDI_N3	
LAN	LED	Position	Color	LED State	Display
LAN1 LAN2	Link/Activity	To the right of the connector	Green	on	Active Connection
				Blinking	Transmit/Receive
				Off	LAN link is not established
LAN3 LAN4	Link Speed	To the left of the connector	Orange/ Green	Green	2500 Mbps
				Orange	1000 Mbps
				Off	10/100 Mbps
LAN5 LAN6	Link Speed	To the left of the connector	Orange/ Green	Green	1000 Mbps
				Orange	100 Mbps
				Off	10Mbps

Note! **The LAN56 and LAN34 LAN connector is upside down on the board, but it will follow the same LED indication.*

2.3.21 RJ-45 + USB 3.2 Gen2 Stack Connector (LAN3_USB12)

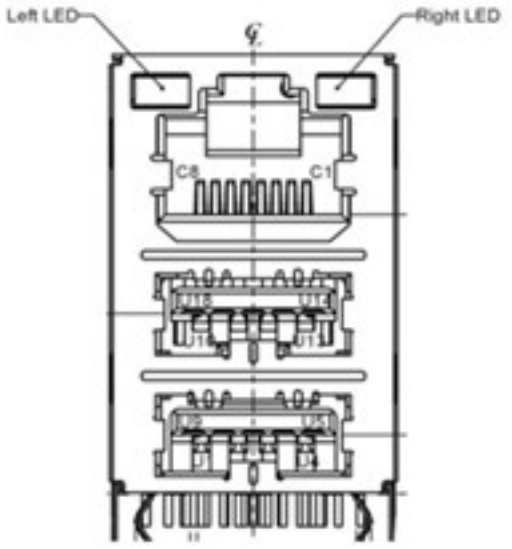


Table 2.31: RJ-45 + USB 3.2 Gen2 Stack Connector (LAN3_USB12)

Pin	Signal	Pin	Signal
U1	VDD_5V_BUS12	U10	VDD_5V_BUS12
U2	HUB1_DN_P3	U11	HUB1_DN_P4
U3	HUB1_DN_P3	U12	HUB1_DN_P4
U4	GND	U13	GND
U5	HUB1_SSRX_N_P3	U14	HUB1_SSRX_N_P4
U6	HUB1_SSRX_P_P3	U15	HUB1_SSRX_P_P4
U7	GND	U16	GND
U8	HUB1_SSTX_N_P3	U17	HUB1_SSTX_N_P4
U9	HUB1_SSTX_P_P3	U18	HUB1_SSTX_P_P4
Pin	**Signal**	**Pin**	**Signal**
R2	LAN1_MDI0+	R6	LAN1_MDI2+
R3	LAN1_MDI0-	R7	LAN1_MDI2-
R4	LAN1_MDI1+	R8	LAN1_MDI3+
R5	LAN1_MDI2-	R9	LAN1_MDI3-

2.3.22 RJ-45 + USB 3.2 Gen2 Stack Connector (LAN4_USB34)

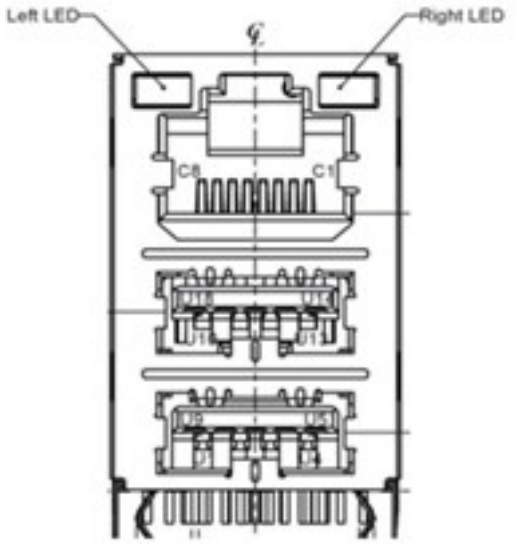


Table 2.32: RJ-45 + USB 3.2 Gen2 Stack Connector (LAN4_USB34)

Pin	Signal	Pin	Signal
U1	VDD_5V_BUS34	U10	VDD_5V_BUS34
U2	HUB1_DN_P1	U11	HUB1_DN_P2
U3	HUB1_DN_P1	U12	HUB1_DN_P2
U4	GND	U13	GND
U5	HUB1_SSRX_N_P1	U14	HUB1_SSRX_N_P2
U6	HUB1_SSRX_P_P1	U15	HUB1_SSRX_P_P2
U7	GND	U16	GND
U8	HUB1_SSTX_N_P1	U17	HUB1_SSTX_N_P2
U9	HUB1_SSTX_P_P1	U18	HUB1_SSTX_P_P2
Pin	**Signal**	**Pin**	**Signal**
R2	LAN2_MDI_P0	R6	LAN2_MDI_P2
R3	LAN2_MDI_N0	R7	LAN2_MDI_N2
R4	LAN2_MDI_P1	R8	LAN2_MDI_P3
R5	LAN2_MDI_N1	R9	LAN2_MDI_N3

Note! *Under the system OS, it will show a different network interface name for each Ethernet port.*

LAN1: enP9p3s0 LAN2: enP9p6s0 LAN3: enP9p4s0 LAN4: enP9p5s0.

2.3.23 M.2 E-Key Connector (M2E1)

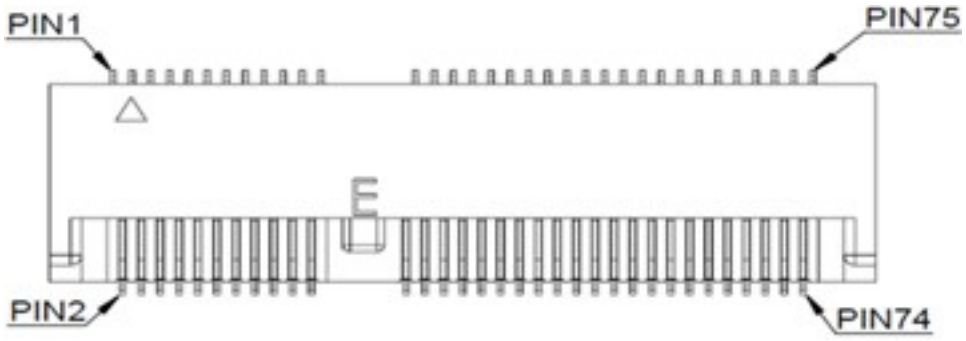


Table 2.33: M.2 E-Key Connector (M2E1)

Pin	Signal	Pin	Signal
1	GND	2	VDD_3V3_MKE
3	USB_M2E_AP_P	4	VDD_3V3_MKE
5	USB_M2E_AP_N	6	N/C
7	GND	8	M2E_I2S1_SCLK
9	M2_SDIO_CLK	10	M2E_I2S1_LRCK
11	M2_SDIO_CMD	12	M2E_I2S1_SDIN
13	M2_SDIO_D0	14	M2E_I2S1_SDOUT
15	M2_SDIO_D1	16	N/C
17	M2_SDIO_D2	18	GND
19	M2_SDIO_D3	20	BT_M2E_WAKE_AP
21	N/C	22	N/C
23	SDIO_RESET#	24	Connector Key
25	Connector Key	26	Connector Key
27	Connector Key	28	Connector Key
29	Connector Key	30	Connector Key
31	Connector Key	32	N/C-
33	GND	34	N/C-
35	PCIE1_M2E_TX0_P	36	N/C-
37	PCIE1_M2E_TX0_N	38	N/C-
39	GND	40	N/C-
41	PCIE1_M2E_RX0_P	42	N/C-
43	PCIE1_M2E_RX0_N	44	N/C-
45	GND	46	N/C-
47	PCIE1_M2E_CLK_P	48	N/C-
49	PCIE1_M2E_CLK_N	50	M2E_SUSCLK
51	GND	52	PCIE1_RST
53	PCIE1_M2E_CLKREQ_N	54	W_DISABLE2
55	PCIE_M2E_WAKE	56	W_DISABLE1
57	GND	58	I2C5_M2E_SDA
59	N/C-	60	I2C5_M2E_SCL
61	N/C-	62	M2E_ALERT*
63	GND	64	N/C-
65	N/C-	66	N/C-

Table 2.33: M.2 E-Key Connector (M2E1)			
67	N/C-	68	N/C-
69	GND	70	N/C-
71	N/C-	72	VDD_3V3_MKE
73	N/C-	74	VDD_3V3_MKE
75	GND		

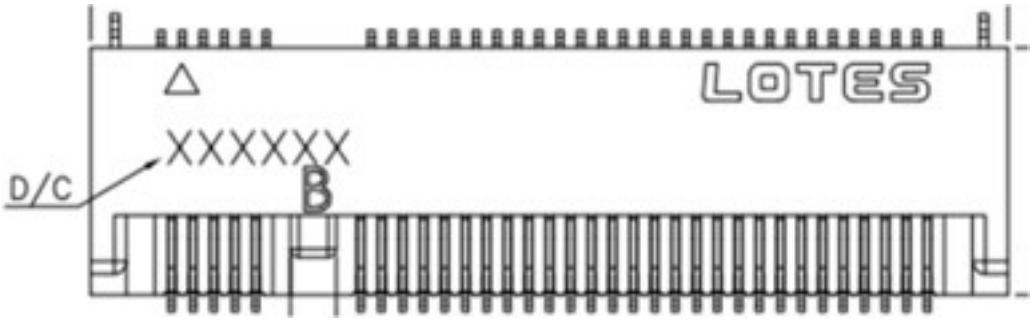
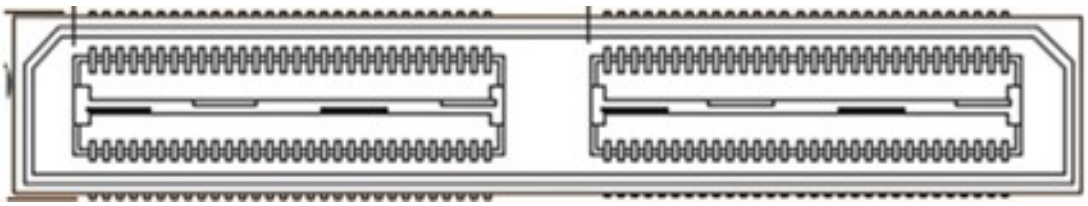


Table 2.34: M.2 B-Key Connector (M2B1)			
Pin	**Signal**	**Pin**	**Signal**
1	MKB_CONFIG3	2	VDD_3V3_MKB
3	GND	4	VDD_3V3_MKB
5	GND	6	M2B1_POWER_OFF#_R
7	USB2_2_P_KB	8	M2B1_W_DISABLE#_R
9	USB2_2_N_KB	10	GNSS_PPS
11	Connector Key	12	Connector Key
13	Connector Key	14	Connector Key
15	Connector Key	16	Connector Key
17	Connector Key	18	Connector Key
19	Connector Key	20	I2S2_SCLK
21	MKB_CONFIG0	22	I2S2_DOUT
23	M2B_WAKE_WWAN#	24	I2S2_DIN
25	M2B_SAR_N	26	M2B1_GNSS_DISABLE#_R
27	GND	28	I2S2_FS
29	M2B_USBSS_RX_N	30	UIM_RESET
31	M2B_USBSS_RX_P	32	UIM_CLK
33	GND	34	UIM_DATA
35	M2B_USBSS_TX_N	36	UIM_PWR
37	M2B_USBSS_TX_P	38	N/C
39	GND	40	I2C5_SCL_1V8_KB
41	M2B_PCIe0_RX_N0	42	I2C5_SDA_1V8_KB
43	M2B_PCIe0_RX_P0	44	N/C
45	GND	46	N/C
47	M2B_PCIe0_TX_N0	48	N/C
49	M2B_PCIe0_TX_P0	50	M2B_PLTRST#
51	GND	52	MKB_CLKREQ#
53	M2B_CLK_N0	54	M2B_PCIE_WAKE#
55	M2B_CLK_P0	56	N/C

Table 2.34: M.2 B-Key Connector (M2B1)			
57	GND	58	N/C
59	LAA_TX_EN (N/C)	60	(N/C) WLAN_TX_EN
61	N/C	62	N/C
63	N/C	64	N/C
65	N/C	66	N/C
67	M2B_MODULE_RESET#_R	68	SUSCLK_32KHZ_M2B
69	MKB_CONFIG1	70	VDD_3V3_MKB
71	GND	72	VDD_3V3_MKB
73	GND	74	VDD_3V3_MKB
75	MKB_CONFIG2		

2.3.24 MIPI-120PIN Connector for GMSL Board (CN1)



2.4 I/O Introduction



Figure 2.3 Front View

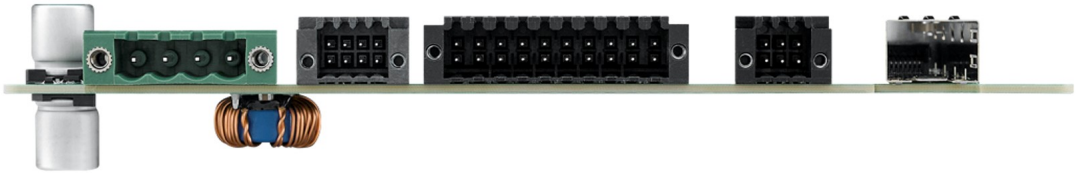


Figure 2.4 Rear View

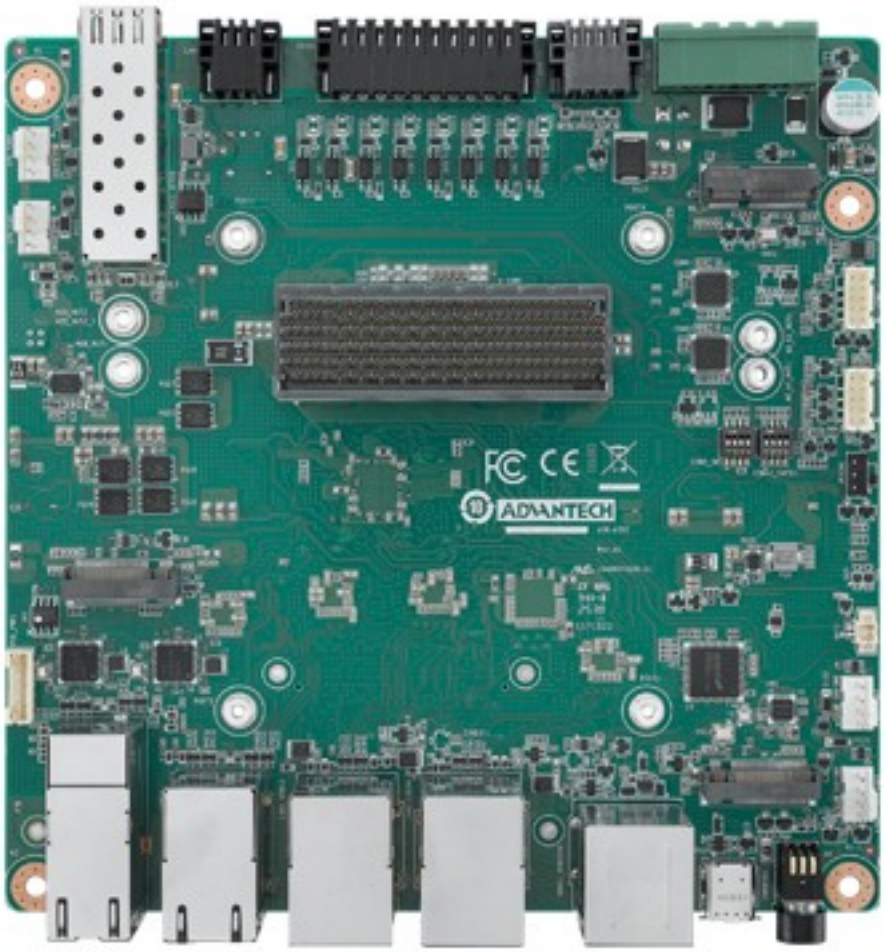


Figure 2.5 Top View

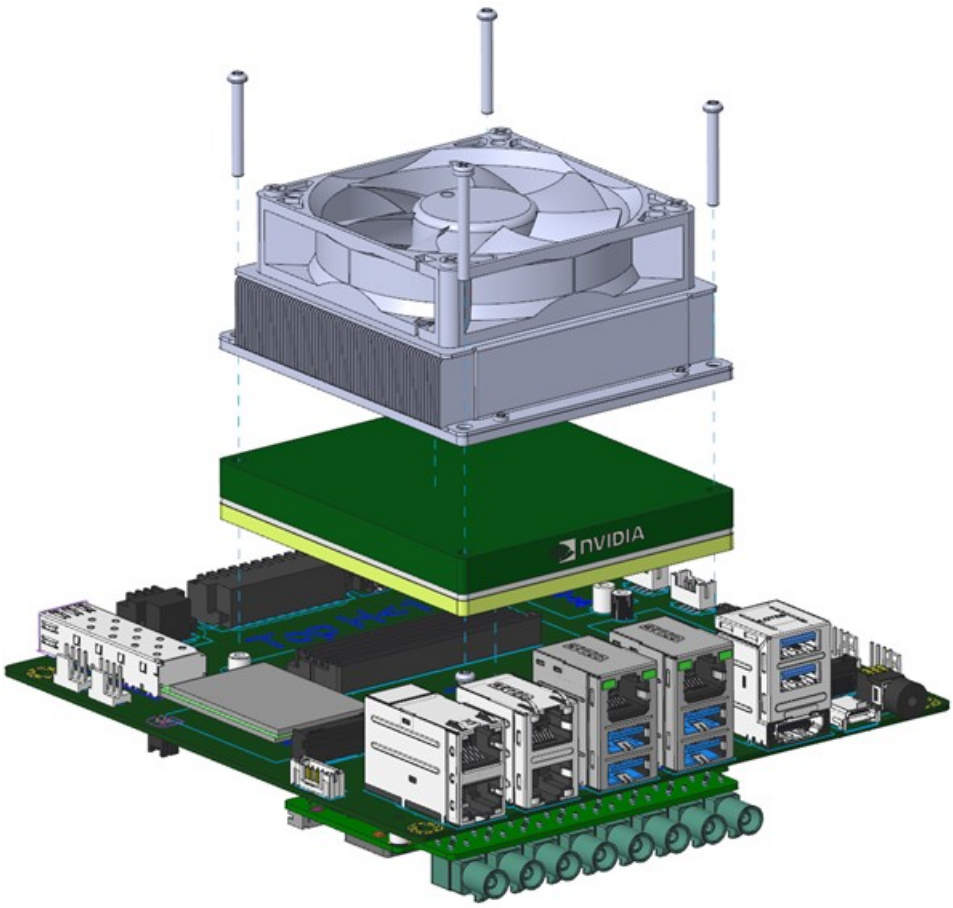


Figure 2.6 Exploded Assembly Drawing

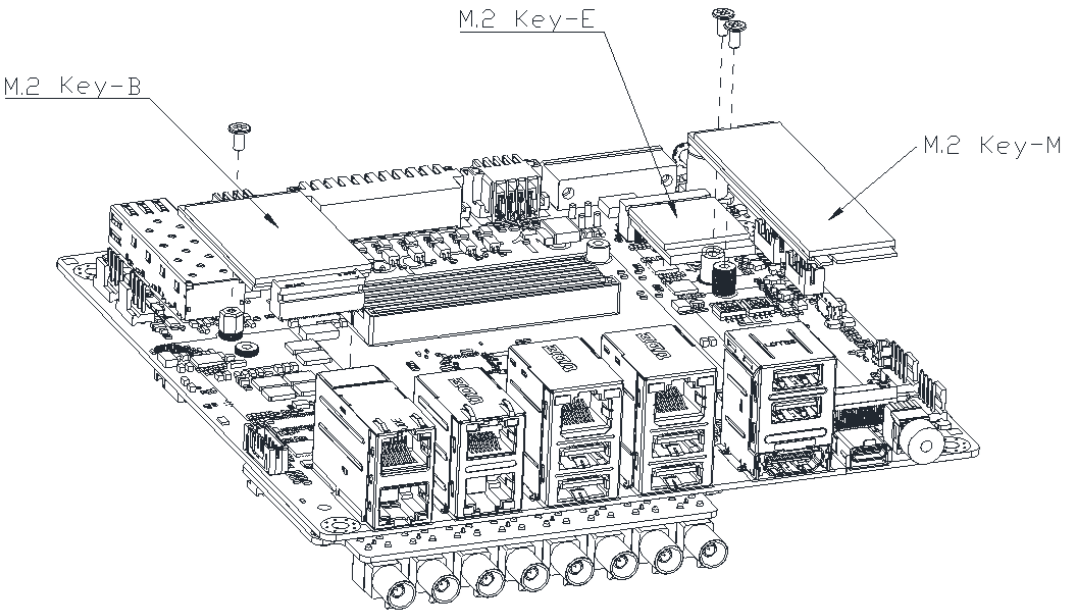
2.5 Installation

2.5.1 M.2 B-Key/E-Key/M-Key Installation

Follow these steps to install the M.2 modules:

Install M.2 Modules (Key-B/Key-E/Key-M)

– Installation: Insert the module into its corresponding slot at a 30-degree angle. Press the module down and secure it using the mounting screw (Part No: 193B030400/M3*1).

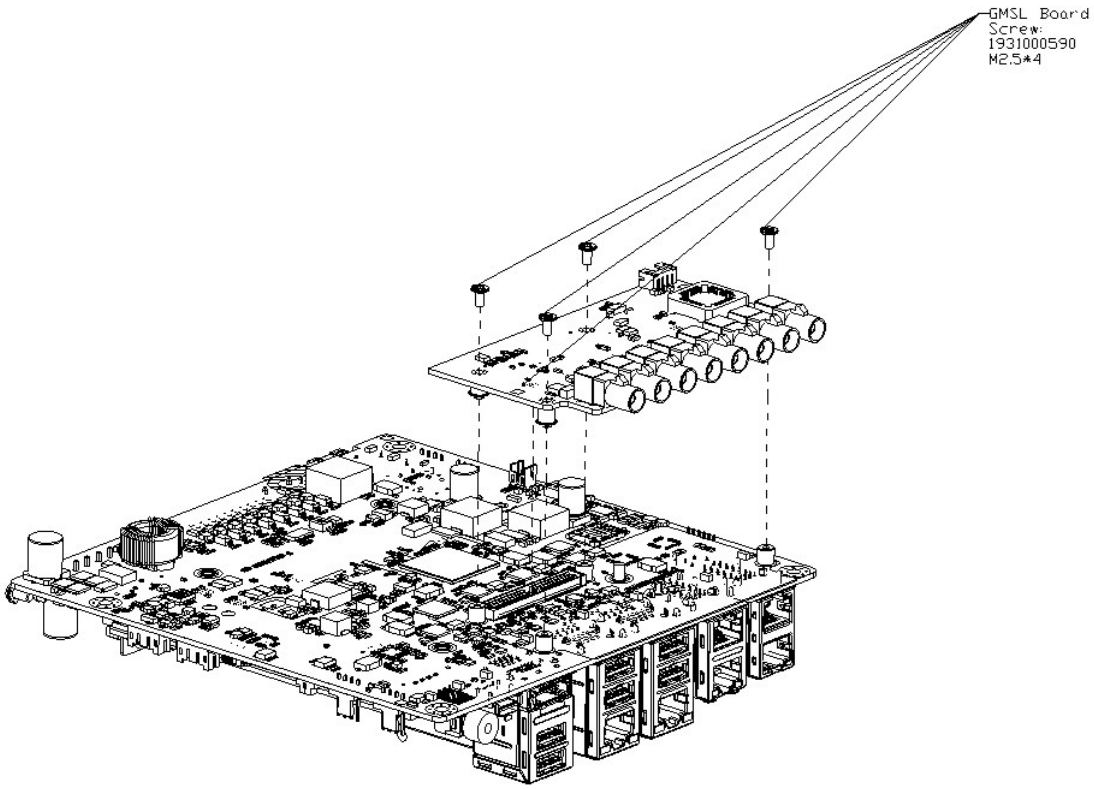


2.5.2 GMSL Board Installation

Follow these steps to install the expansion modules onto the motherboard:

Install the GMSL Board

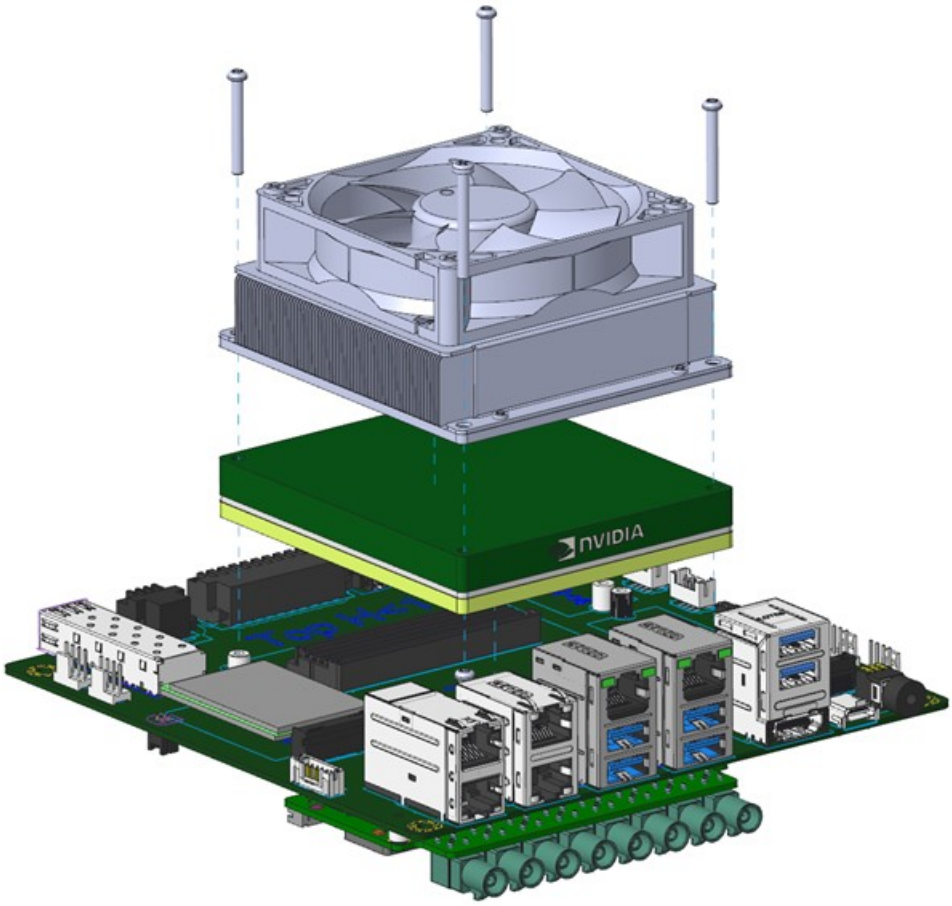
- Positioning: Align the GMSL board with the connection headers on the mainboard.
- Securing: Fasten the GMSL board using 4 screws (Part No: 1931000590, Spec: M2.5*5). Ensure the board is leveled and firmly attached to the standoffs.



2.5.3 Thor Module and Cooler Installation

Follow these steps to install the expansion modules onto the motherboard:

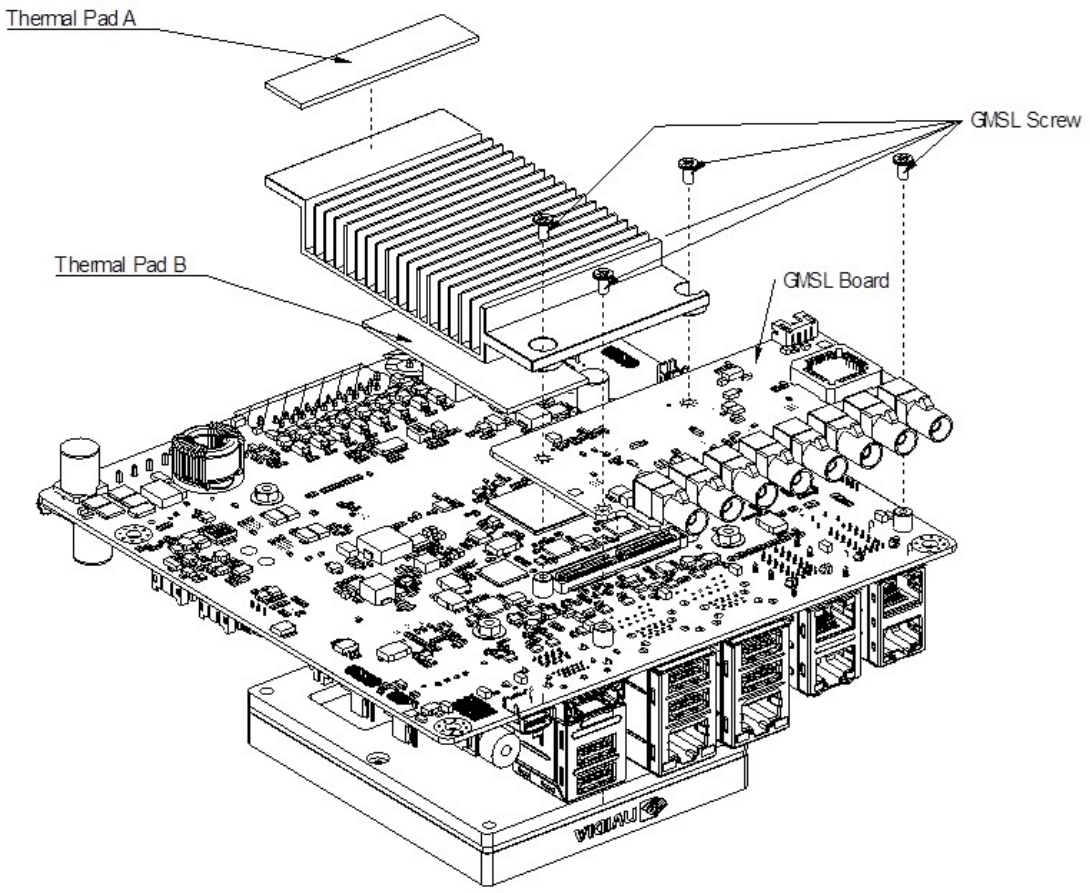
1. Install the Thor module.
   - Positioning: Align the Thor module connector with the connector on the mainboard.
   - Note: 1) Connectors should be parallel with respect to each other during mating. 2) Use a smooth motion during mating (no mechanical shock, knocking, hammering).
2. Install the Cooler.
   - Positioning: Align the Cooler with the connection headers on the Thor module
   - Securing: Fasten the module using 4 screws (Part No: 1930000684-01, Spec: M3*28). Ensure the board is leveled and firmly attached to the standoffs.



2.5.4 Heatsink Installation

Follow these steps to install the Heatsink onto the backside of motherboard:

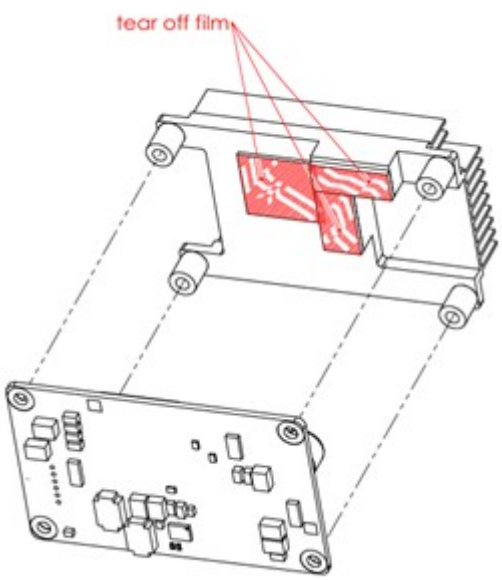
1. When GMSL Board is installed
   - Positioning: Tear off film of thermal pad and align the two mounting points of heatsink with the two mounting points on the rear of GMSL board, and ensure that the heatsink is firmly seated against the bottom of your chassis.
   - Securing: Fasten the heatsink using 2 screws (Part No: 1931000590, Spec: M2.5*5). Ensure the heatsink is leveled and firmly attached to the standoffs.
2. When GMSL Board is not installed
   - Positioning: Align the two washers (Part No: 1920001677-01) mounting points of heatsink with the two mounting points on the backside of motherboard, and align the two mounting points of the heatsink with the two washers. (Place the heatsink on top of two washers)
   - Securing: Fasten the heatsink using 2 screws (Part No: 1931000590, Spec: M2.5*5). Ensure the heatsink is leveled and firmly attached to the standoffs.

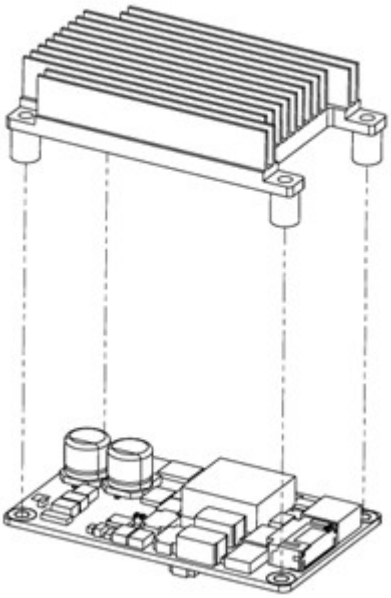


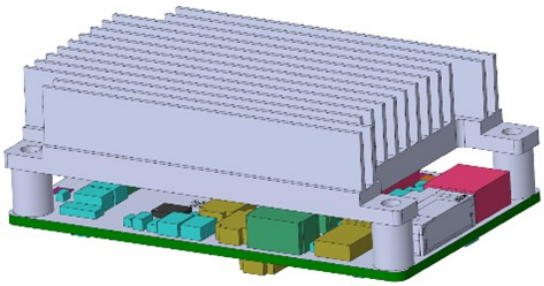
2.5.5 PoE Board Installation

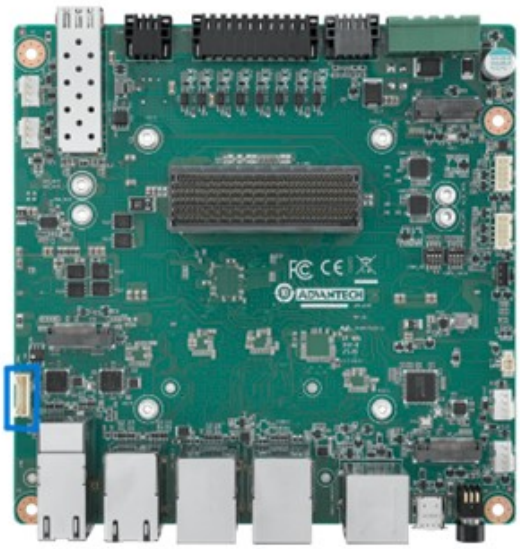
Follow these steps to install the PoE Module onto the motherboard:

1. Install the Heatsink of PoE Board.
   - Positioning: Tear off film of thermal pad of heatsink, align the four mounting points of the heatsink with the four mounting points on the PoE module.
   - Securing: Fasten the heatsink using 4 brass standoffs in the box of PoE module.
2. Connect the PoE Board to motherboard.
   - Securing: Connect the PoE Board to POE_PWR1 connector on the motherboard with the power cable. (Please find a secure location on your system/ chassis to fix the PoE board.)









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