aetina

Jetson Platform

AIB-MX13/23

USER MANUAL

www.aetina.com

Document Change History

Version	Date	Description
V1.0	2023/02/04	Initial Release.
V1.1	2023/03/01	Modify the software and initial setup
V1.2	2023/03/24	Updated support information, Specifications

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Version 1.0

Acknowledgements

Customer Support Overview

Contact your distributor, sales representative, or Aetina's customer service center for technical support if you need additional assistance. Please have the 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

Visit the Aetina website at https://www.Aetina.com/support-warranty-policy.php where you can find the latest information about the product.

Contact Information

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Product Warranty (2 years)

Aetina warrants to you, 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 which have been repaired or altered by persons other than repair personnel authorized by Aetina, or which have been subject to misuse, abuse, accident or improper installation. Aetina assumes no liability under the terms of this warranty as a consequence of such events.

Because of Aetina's high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If an Aetina product is defective, it will be repaired or replaced at no charge during the warranty period. For out of warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

If you think you have a defective product, follow these steps:

1. Collect all the information about the problem encountered. (For example, CPU speed, Aetina products used other hardware and software used, etc.) Note anything abnormal and list any onscreen messages you get 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 an RMA (return merchandise authorization) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy of the proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

ESD Warning

This product, like all electronic products, uses the product that can be damaged by electrostatic discharge (ESD). When handling, care must be taken so that the devices are not damaged. Damage due to inappropriate handling is not covered by the warranty. The following precautions must be taken:

- Do not open the protective conductive packaging until you have read the following and are at an approved anti-static workstation.
- If working on a prototyping board, use a soldering iron or station that is marked as ESD-safe.
- Always disconnect the product from the prototyping board when it is being worked on.
- Always discharge yourself by touching a grounded bare metal surface or approved anti-static mat before picking up an ESD - sensitive electronic component.
- Use an approved anti-static mat to cover your work surface.

Safety Precautions

Please read the following safety instructions carefully. It is advised that you keep this manual for future references:

1. All cautions and warnings on the equipment should be noted.
2. Make sure the power source matches the power rating of the device.
3. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
6. Always completely disconnect the power before working on the system's hardware.
7. Keep this equipment away from humidity.
8. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
9. The openings on the enclosure are for air convection. Protect the equipment from overheating. DO NOT COVER THE OPENINGS.
10. Be sure that the room in which you choose to operate your system has adequate air circulation. Ensure that the chassis cover is secure.
11. The chassis design allows cooling air to circulate effectively. An open chassis permits air leaks, which may interrupt and redirect the flow of cooling air from internal components.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
14. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
15. If any of the following situations arises, please the contact our service personnel:
    - Damaged power cord or plug
    - Liquid intrusion to the device
    - Exposure to moisture
    - Device is not working as expected or in a manner as described in this manual
    - The device is dropped or damaged
    - vi. Any obvious signs of damage displayed on the device

Contents

1. Introduction

AIB-MX13/23 series supports NVIDIA Jetson AGX Orin series modules, and you can quickly emulate the functionality of your desired end product for software development and hardware verification.

To build a functional prototype of your target system you will need:

- NVIDIA Jetson AGX Orin 32/64GB module
- Carrier board
- Power adaptor

1.1 Features

- Supports NVIDIA Jetson AGX Orin 32/64GB module
- 1 x B-Key/1 x E-Key/1 x M-Key slot
- 1 x GbE/1 x 10GbE port
- Wide Power Input Range 9 to 36 VDC
- Operating Temperature -25° C ~ 80° C
- Supports OOB (out-of-band) powered by Innodisk (optional)

1.2 Specifications

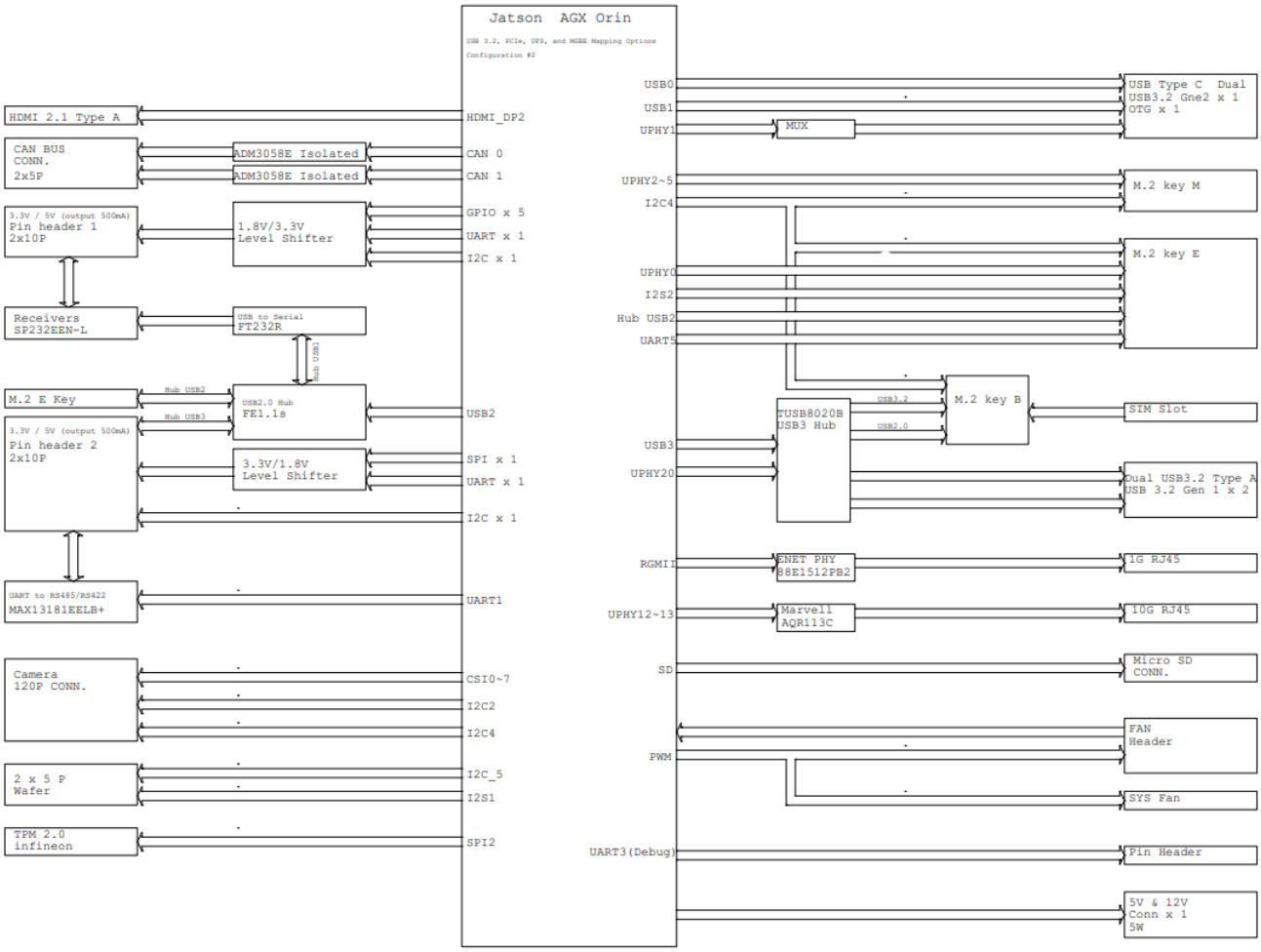
Carrier board specifications

Specification	AIB-MX13	AIB-MX23
Module Compatibility	NVIDIA Jetson AGX Orin 32GB	NVIDIA Jetson AGX Orin 64GB
AI Performance	200 TOPs	275 TOPs
GPU	1792-core NVIDIA Ampere GPU with 56 Tensor Cores	2048-core NVIDIA Ampere GPU with 64 Tensor Cores
CPU	8-core Arm® Cortex®-A78AE v8.2 64-bit CPU 2MB L2 + 4MB L3	12-core Arm® Cortex®-A78AE v8.2 64-bit CPU 3MB L2 + 6MB L3
Memory	32 GB 256-bit LPDDR5 204.8 GB/s	64GB 256-bit LPDDR5 204.8 GB/s
Storage	64GB eMMC 5.1	
Display	1x HDMI 2.0 Type A	
Audio	LINE IN/OUT, Microphone (optional with daughter board)	
Camera Input	1x 16-Lane MIPI Expansion Connector	
LAN	1 x RJ-45 GbE port, 1 x RJ-45 10GbE port	
USB	2 x USB 3.2 Gen1 Type-A 1 x USB 3.2 Gen2 Type-C 1 x OTG Type-C	
I/O Interfaces	2 x I2C, 1 x I2S, 1 x SPI, 5 x GPIO, 1 x 3.3VDC/0.5A, 2 x 5VDC/0.5A, 1 x 12VDC/0.5A, 1 x USB 2.0	
Expansion	1 x M.2 B-Key 3042/3052 (support USB 3.2 Gen1, USB 2.0) 1 x M.2 E-Key 2230 (support PCIe x1 Gen4, USB 2.0) 1 x M.2 M-Key 2280 (support NVMe, PCIe x2 Gen4) 1 x MicroSD Slot	
MISC. Function	1 x Power/Recovery/Reset Button 2 x UART, 1 x UART (Debug only) 1 x RS-2321 x RS-422 or RS-485 (Either one) 2 x CAN 2.0b with isolation	
Power Consumption	Idle: 6.65 W Full Loading: 49.2 W	Idle: 7.2 W Full Loading: 69.5 W

	Idle configuration: Connect with Keyboard, Mouse and HDMI Display Full Loading configuration: Connect with Keyboard, Mouse and HDMI Display with CPU and GPU 100% Loading
Power Input / Connector	DC-in 9 to 36 VDC / 4-Pin DC Jack Power Connector
Dimension (W x D x H)	131 x 120 x 62.9 mm (5.16 x 4.72 x 2.47 in)
Net Weight	0.701 kg (1.54 lb) w/ Fansink
Vibration	1 Grms, IEC 60068-2-64, random, 5 ~ 500 Hz, 1 hr/axis
Shock	10 G, IEC 60068-2-27, half sine, 11 ms duration
Temperature	Operating Temp.: -25° C ~ 80° C (-13° F ~ 176° F) Storage Temp.: -40° C ~ 85° C (-40° F ~ 185° F)
Humidity	95% @ 40°C Related Humidity, Non-condensing
Certification	CE/FCC Class A, IEC 62368

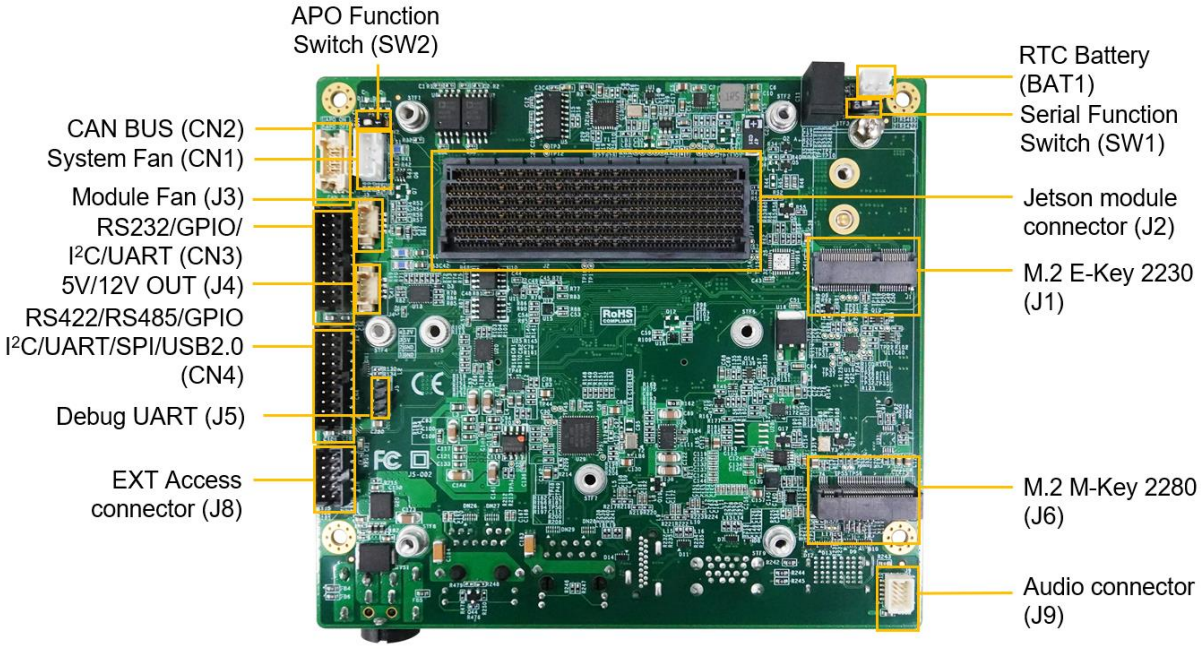
2. Hardware Information

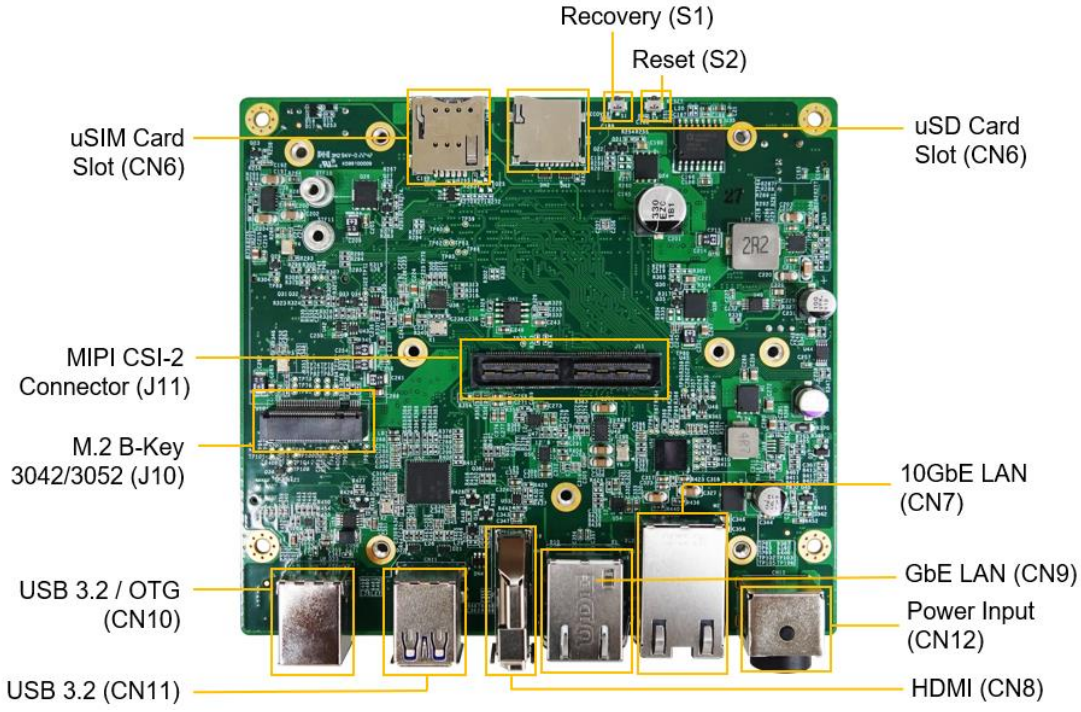
2.1 Block Diagram



AIB-MX13/AIB-MX23 Block diagram

2.2 Connectors, LEDs, and Switches Locations





2.3 Connectors and Switches Description

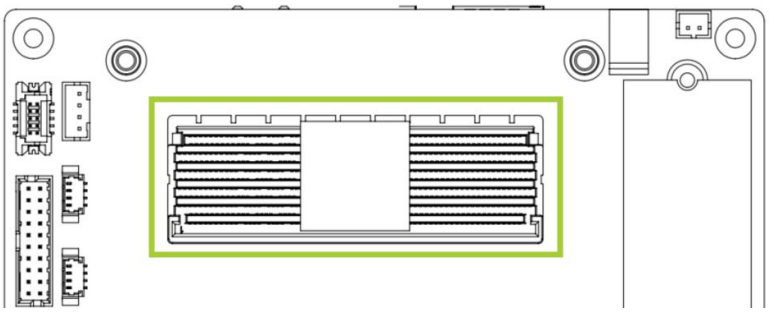
Label	Description
J2	Jetson AGX Orin module connector
CN8	HDMI 2.0 Type-A connector
J6	M.2 M-Key 2280 connector (support NVMe, PCIe x2 Gen4)
J1	M.2 E-Key 2230 connector (support PCIe x1 Gen4, USB 2.0)
J10	M.2 B-Key 3042/3052 connector (support USB 3.2 Gen1, USB 2.0)
CN11	2 x USB 3.2 Gen1 Type-A
J11	120-Pin board to board connector for MIPI CSI-2
CN10	USB 3.2 Gen2 Type-C / OTG Type-C
CN9	RJ45 connector, support GbE Ethernet
CN7	RJ45 connector, support 10GbE Ethernet
CN3	2 x 10P P:2.0 support RS232/GPIO/I2C/UART
CN4	2 x 10P P:2.0 support RS422/RS485/GPIO/I2C/UART/SPI/USB 2.0
CN2	2 x 5P P:1.25 support CAN BUS function
J3	1 x 4P P:1.25 Module Fan
J4	1 x 4P P:1.25 DC output 5V/12V
J8	2 x 5P P:1.25 Front Panel
CN12	DC Power input connector
J5	Debug UART
S1	Recovery Button
S2	Reset Button
J9	2 x 5P P”1.0 Audio connector (optional with daughter board)
SW1	To select RS-422 or RS-485 function by switch
SW2	To enable APO function by switch
BAT1	1 x 2P P:2.0 RTC Connector (optional with battery)
CN1	1 x 4P P:2.0 System Fan

CN5	Micro SD card holder
CN6	Micro SIM card holder

2.4 Connectors and Pinout

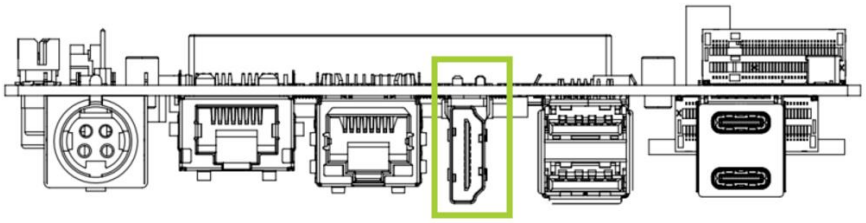
Here are the connectors and Pinout information of AIB-MX13/23 carrier board below.

■ Jetson AGX Orin Module Connector



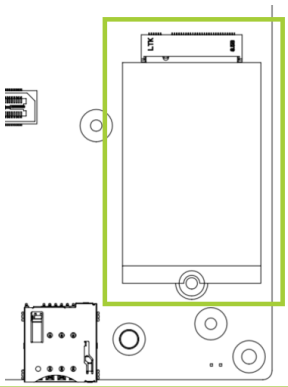
Item	Description
Location	J11
Type	AGX Xavier connector
Pinout	Please refer to NVIDIA Jetson AGX Xavier System-on-Module datasheet

■ HDMI Type-A Connector



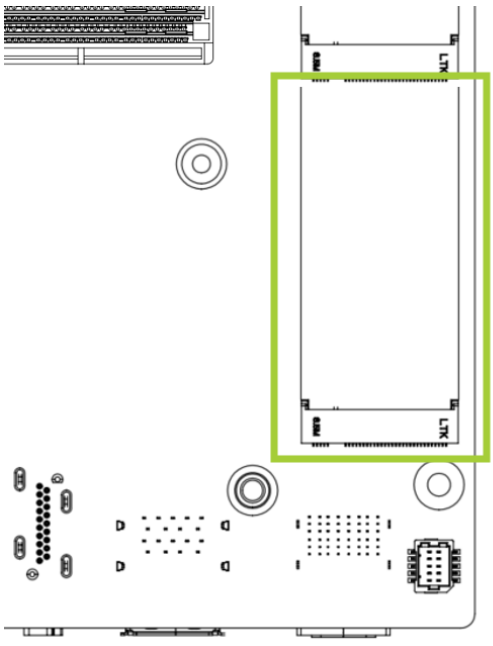
Item	Description
Location	CN8
Type	HDMI Type-A female connector
Pinout	Please refer to HDMI Type-A Standard

M.2 B-Key Connector



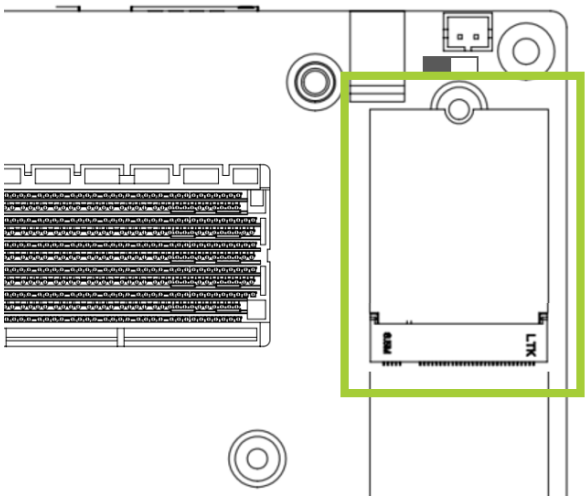
Item	Description
Location	J10
Type	M.2 B-Key 3042/3052
Pinout	Please refer to M.2 B-Key Standard
Notes	Support USB 3.2 Gen1, USB 2.0

M.2 M-Key Connector



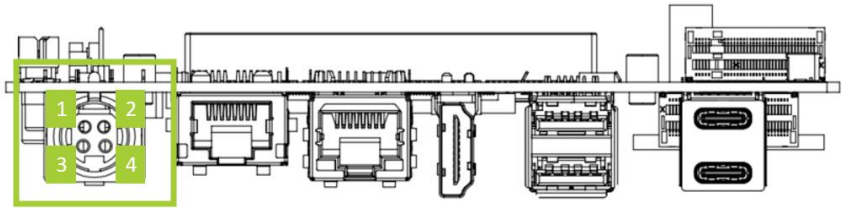
Item	Description
Location	J6
Type	M.2 M-Key 2280
Pinout	Please refer to M.2 M-Key Standard
Notes	Support NVMe, PCIe x2 Gen4

M.2 E-Key Connector



Item	Description
Location	J1
Type	M.2 E-Key 2230
Pinout	Refer to M.2 E-Key Standard
Notes	Support PCIe x1 Gen4, USB 2.0

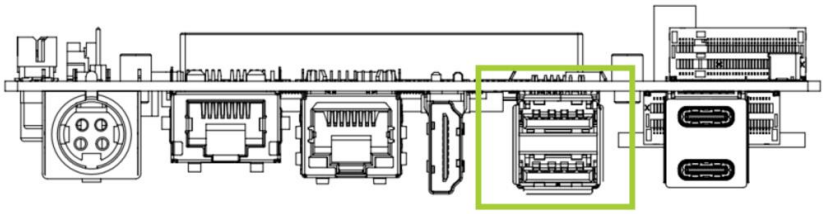
DC Power Input Connector



Item	Description
Location	CN12
Type	4-Pin Male DC Power Connector
Pinout	Please refer to DC Jack Standard

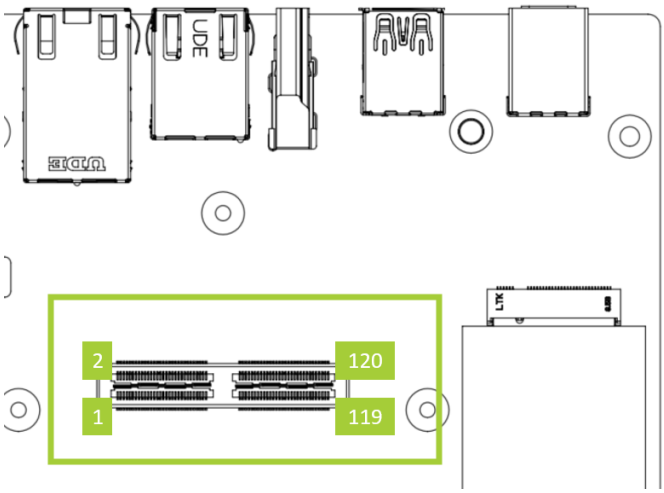
Pin #	Definition	Pin #	Definition
1	VIN	2	GND
3	VIN	4	GND

Dual USB 3.2 Gen1 Type-A Connector



Item	Description
Location	CN11
Type	Type-A USB connector
Pinout	Please refer to USB Standard

120-Pin Board-to-Board Connector for MIPI CSI-2



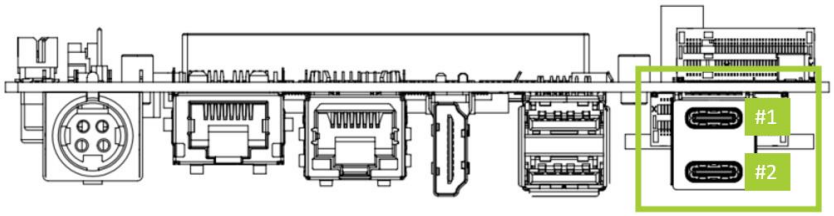
Item	Description
Location	J11
Type	QSH 120-Pin connector

Pin #	Definition	Pin #	Definition
1	CSI_0_D0_P	2	CSI_1_D0_P
3	CSI_0_D0_N	4	CSI_1_D0_N
5	GND	6	GND
7	CSI_0_CLK_P	8	CSI_1_CLK_P
9	CSI_0_CLK_N	10	CSI_1_CLK_N
11	GND	12	GND

13	CSI_0_D1_P	14	CSI_1_D1_P
15	CSI_0_D1_N	16	CSI_1_D1_N
17	GND	18	GND
19	CSI_2_D0_P	20	CSI_3_D0_P
21	CSI_2_D0_N	22	CSI_3_D0_N
23	GND	24	GND
25	CSI_2_CLK_P	26	CSI_3_CLK_P
27	CSI_2_CLK_N	28	CSI_3_CLK_N
29	GND	30	GND
31	CSI_2_D1_P	32	CSI_3_D1_P
33	CSI_2_D1_N	34	CSI_3_D1_N
35	GND	36	GND
37	CSI_4_D0_P	38	CSI_6_D0_P
39	CSI_4_D0_N	40	CSI_6_D0_N
41	GND	42	GND
43	CSI_4_CLK_P	44	CSI_6_CLK_P
45	CSI_4_CLK_N	46	CSI_6_CLK_N
47	GND	48	GND
49	CSI_4_D1_P	50	CSI-6_D1_P
51	CSI_4_D1_N	52	CSI_6_D1_N
53	GND	54	GND
55	NC	56	NC
57	NC	58	NC
59	CSI_5_D0_P	60	CSI_7_D0_P
61	CSI_5_D0_N	62	CSI_7_D0_N
63	GND	64	GND
65	CSI_5_CLK_P	66	CSI_7_CLK_P
67	CSI_5_CLK_N	68	CSI_7_CLK_N

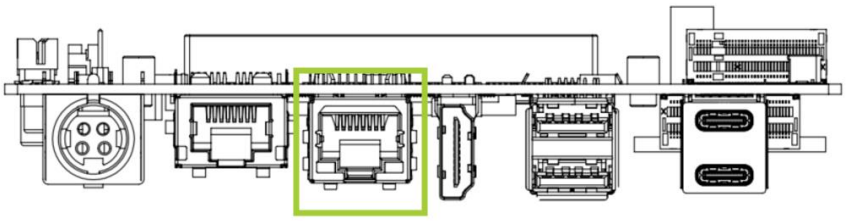
69	GND	70	GND
71	CSI_5_D1_P	72	CSI_7_D1_P
73	CSI_5_D1_N	74	CSI_7_D1_N
75	I2C_GP3_CLK	76	NC
77	I2C_GP3_DAT	78	NC
79	GND	80	GND
81	AVDD_CAM_2V8	82	AVDD_CAM_ 2V8
83	AVDD_CAM_2V8	84	NC
85	NC	86	NC
87	I2C_GP2_CLK	88	CAM1_MCLK03
89	I2C_GP2_DAT	90	GPIO15_CAM1_ PWDN
91	CAM0_MCLK02	92	GPIO16_CAM1_RST
93	CAM0_PWDN	94	CAM2_MCLK04
95	CAM0_RST	96	NC
97	NC	98	NC
99	GND	100	GND
101	NC	102	VDD_1V8
103	NC	104	NC
105	I2C_GP4_CLK	106	NC
107	I2C_GP4_DAT	108	VDD_3V3
109	NC	110	VDD_3V3
111	NC	112	NC
113	NC	114	NC
115	GND	116	GND
117	NC	118	VDD_3V3
119	GPIO25_VDD_ SYS_EN	120	VDD_3V3

OTG Type-C / USB 3.2 Gen2 Type-C



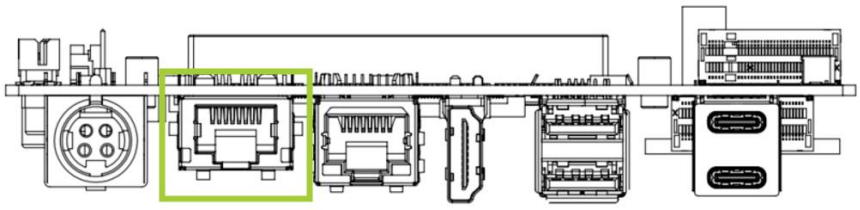
Item	Description
Location	CN10
Type	Dual USB TYPE-C connector
Pinout	Please refer to USB standard
Notes	#1 OTG Type-C Port #2 USB 3.2 Gen2 Type-C

Gigabit Ethernet Connector



Item	Description
Location	CN9
Type	RJ-45 connector
Pinout	Please refer to Ethernet standard
Notes	LED Static ON: LAN Link is active. LED Blinking: Data is being transmitted. LED Static OFF: LAN Link is inactive.

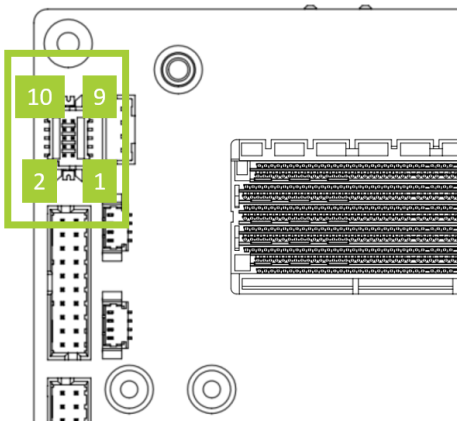
10 Gigabit Ethernet Connector



Item	Description
Location	CN7

Type	RJ-45 connector
Pinout	Please refer to Ethernet standard
Notes	LED Static ON: LAN Link is active. LED Blinking: Data is being transmitted. LED Static OFF: LAN Link is inactive.

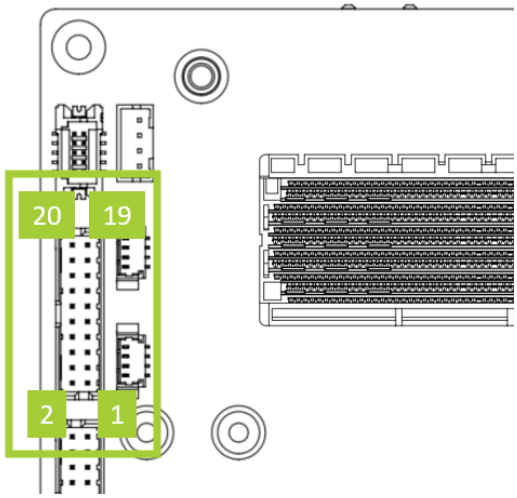
CAN BUS Connector



Item	Description
Location	CN2
Type	2*5P 1 P:1.25mm H:4.8mm Wafer connector

Pin #	Definition	Pin #	Definition
1	CAN0H	2	CAN1H
3	CAN0L	4	CAN1L
5	NC	6	NC
7	CAN_5V	8	CAN_5V
9	GND	10	GND

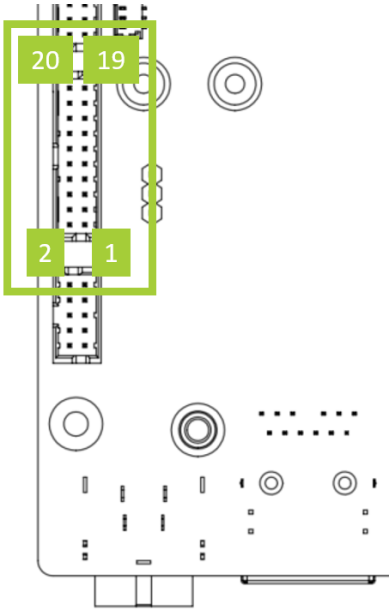
MISC I/O Connector (RS232/GPIO/I2C/UART)



Item	Description
Location	CN3
Type	2*10P P:2.0mm H:7mm Pin header

Pin #	Definition	Notes	Pin #	Definition
1	VDD_3V3		2	VDD_5V
3	GPIO_1 (GPIO17 / PP.04 444)	IN/OUT	4	UART_TXD
5	GPIO_2 (GPIO11 / PAC.05 491)	IN/OUT	6	UART_RXD
7	GPIO_3 (PWM01 / PR.00 456)	IN/OUT	8	UART_CTS
9	GPIO_4 (GPIO27 / PN.01 433)	IN/OUT	10	UART_RTS
11	GPIO_5 (GPIO35 / PH.00 391)	IN/OUT	12	RS232_RX
13	I2C_CLK		14	RS232_RTS
15	I2C_DAT		16	RS232_TX
17	GND		18	RS232_CTS
19	GND		20	GND

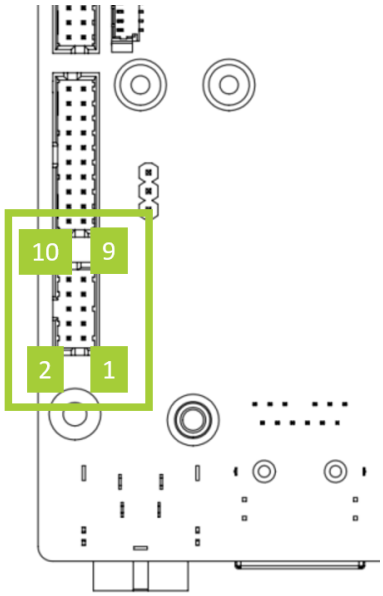
MISC I/O Connector (RS422/RS485/GPIO/I2C/UART/SPI/USB2.0)



Item	Description
Location	CN4
Type	2*10P P:2.0mm H:7mm Pin header

Pin #	Definition	Pin #	Definition
1	VDD_3V3	2	VDD_5V
3	I2C_CLK	4	USB_D-
5	I2C_DAT	6	USB_D+
7	UART_TX	8	SPI_MOSI
9	UART_RX	10	SPI_SCK
11	RS422_A (RX+)	12	SPI_MISO
13	RS422_B (RX-)	14	SPI_CS1
15	RS422_Z (TX-) / RS485-	16	SPI_CS0
17	RS422_Y (TX+) / RS485+	18	NC
19	GND	20	GND

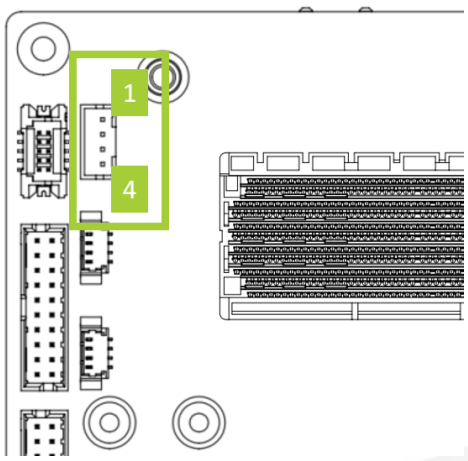
Front Panel Connector



Item	Description
Location	J8
Type	2*5P P:2.0mm H:7mm Wafer connector

Pin #	Definition	Pin #	Definition
1	Power On	2	GND
3	Reset	4	GND
5	Recovery	6	GND
7	Sleep	8	GND
9	LED+	10	LED-

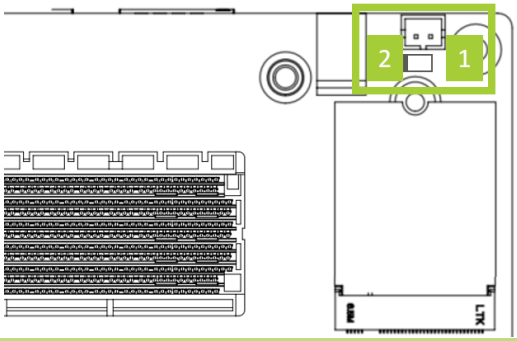
System Fan Connector



Item	Description
Location	CN1
Type	1*4P P:2.0mm Wafer connector

Pin #	Definition	Pin #	Definition
1	GND	2	VCC_12V
3	NC	4	PWM

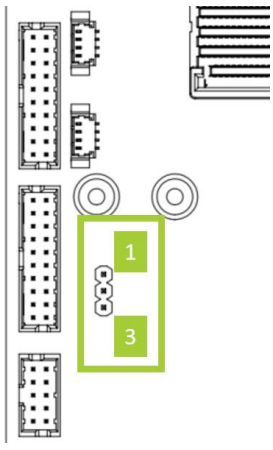
RTC Battery Connector



Item	Description
Location	BAT1
Type	1*2P P:2.0mm connector

Pin #	Definition
1	–
2	+

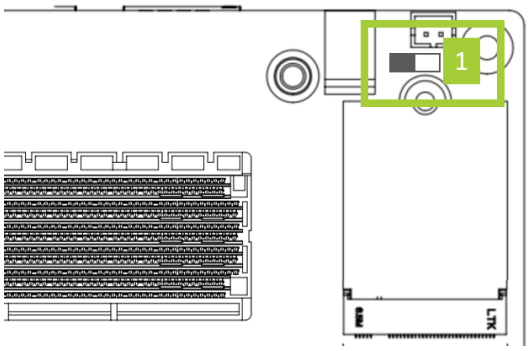
Debug UART



Item	Description
Location	J5
Type	1*3P P:2.54mm Pin connector

Pin #	Definition
1	Debug_UART_TX
2	Debug_UART_RX
3	GND

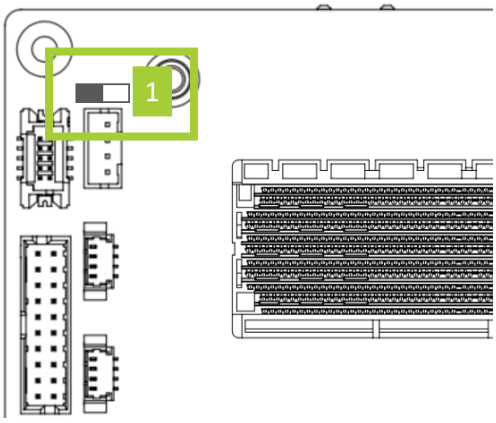
RS422 / RS485 Function Switch



Item	Description
Location	SW1
Type	DIP Switch
Notes	To select RS-485 or RS-422 function by Switch

Position	Function
ON	RS-422
1 (Default)	RS-485

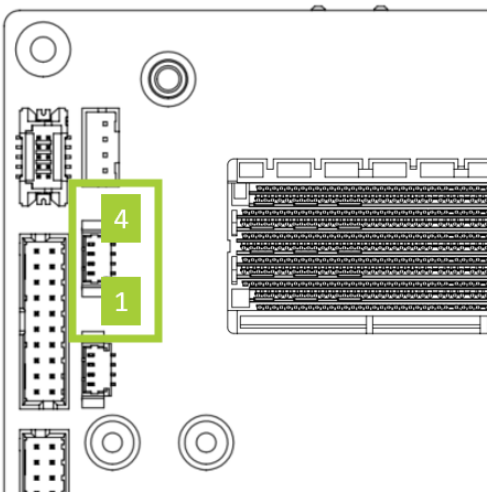
Auto Power ON (APO) Switch



Item	Description
Location	SW2
Type	DIP Switch
Notes	To enable APO function by Switch

Position	Function
ON	Disable APO
1 (Default)	Enable APO

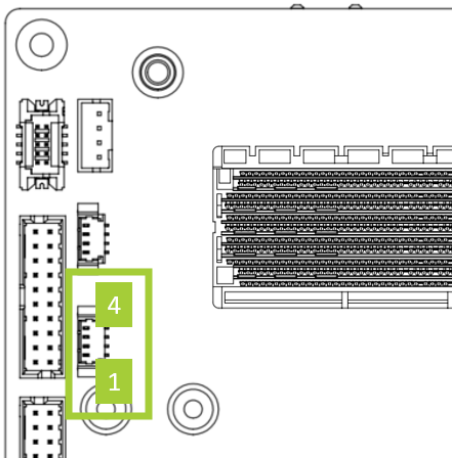
5V Fan Connector



Item	Description
Location	J3
Type	1*4P 1.25mm Wafer connector

Pin #	Definition	Pin #	Definition
1	GND	2	VDD_5V
3	TACH	4	PWM

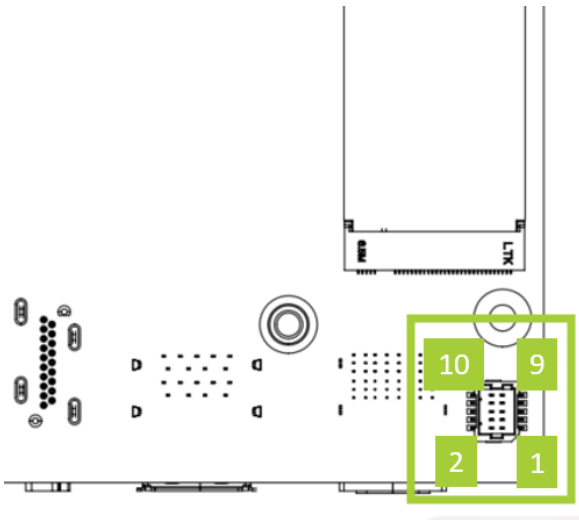
5/12V Connector



Item	Description
Location	J4
Type	1*4P 1.25mm Wafer connector
Notes	Output: 0.5A @5V, 0.5A @12V

Pin #	Definition	Pin #	Definition
1	GND	2	GND
3	5V	4	12V

Audio Board-to-Board Connector

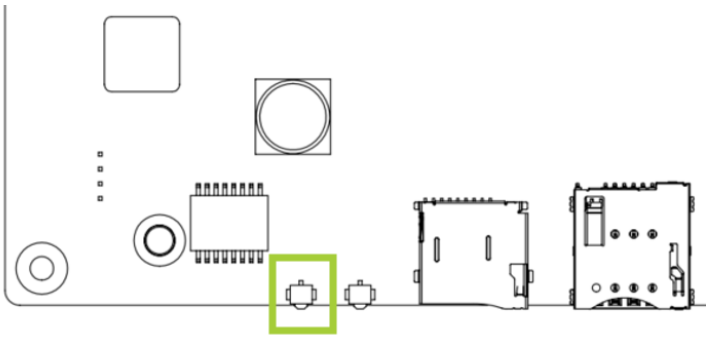


Item	Description
Location	J9
Type	2*5P P:1.0mm Wafer connector

Pin #	Definition	Pin #	Definition
1	I2S_SCLK	2	VDD_3V3
3	I2S_OUT	4	I2C_DAT
5	I2S_IN	6	I2C_CLK
7	I2S_FS	8	GND
9	I2S_MCLK	10	GND

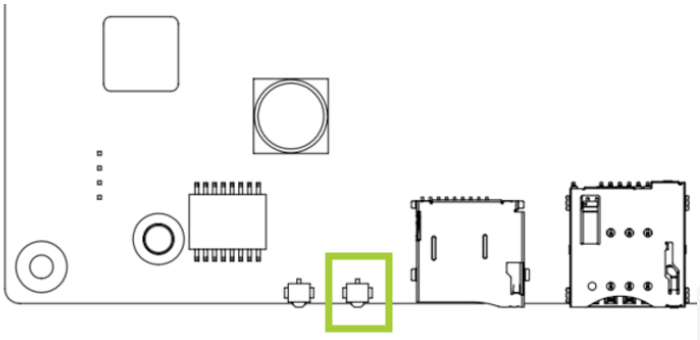
Note: The voltage level of I2C & I2S is 1.8V

Reset Button



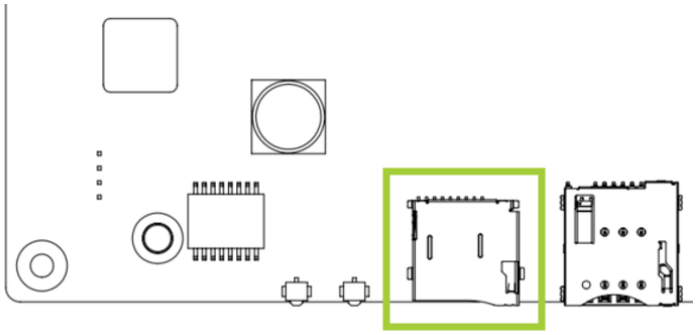
Item	Description
Location	S2
Type	Tact switch
Notes	To trigger system reset action

Recovery Button



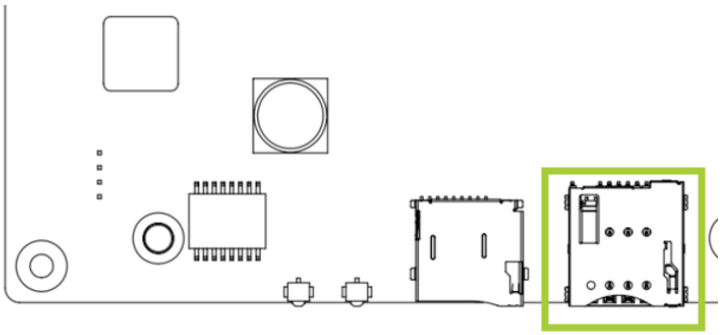
Item	Description
Location	S1
Type	Tact switch
Notes	To trigger system recovery action

Micro SD Card Slot



Item	Description
Location	CN5
Type	Push-Push Micro SD card holder

Micro SIM Card Socket



Item	Description
Location	CN6
Type	Push-Push SIM card

2.5 Power Consumption

The power consumption shown as below is the theoretical value with AGX Orin module installed on AIB-MX13.

Type	Theoretical Maximum System power
Idle	6.655 W (Connect with Keyboard, Mouse and HDMI Display)
Full Loading	52.25 W (Connect with Keyboard, Mouse and HDMI Display with CPU And GPU 100% Loading)

The power consumption shown as below is the theoretical value with AGX Orin module installed on AIB-MX23.

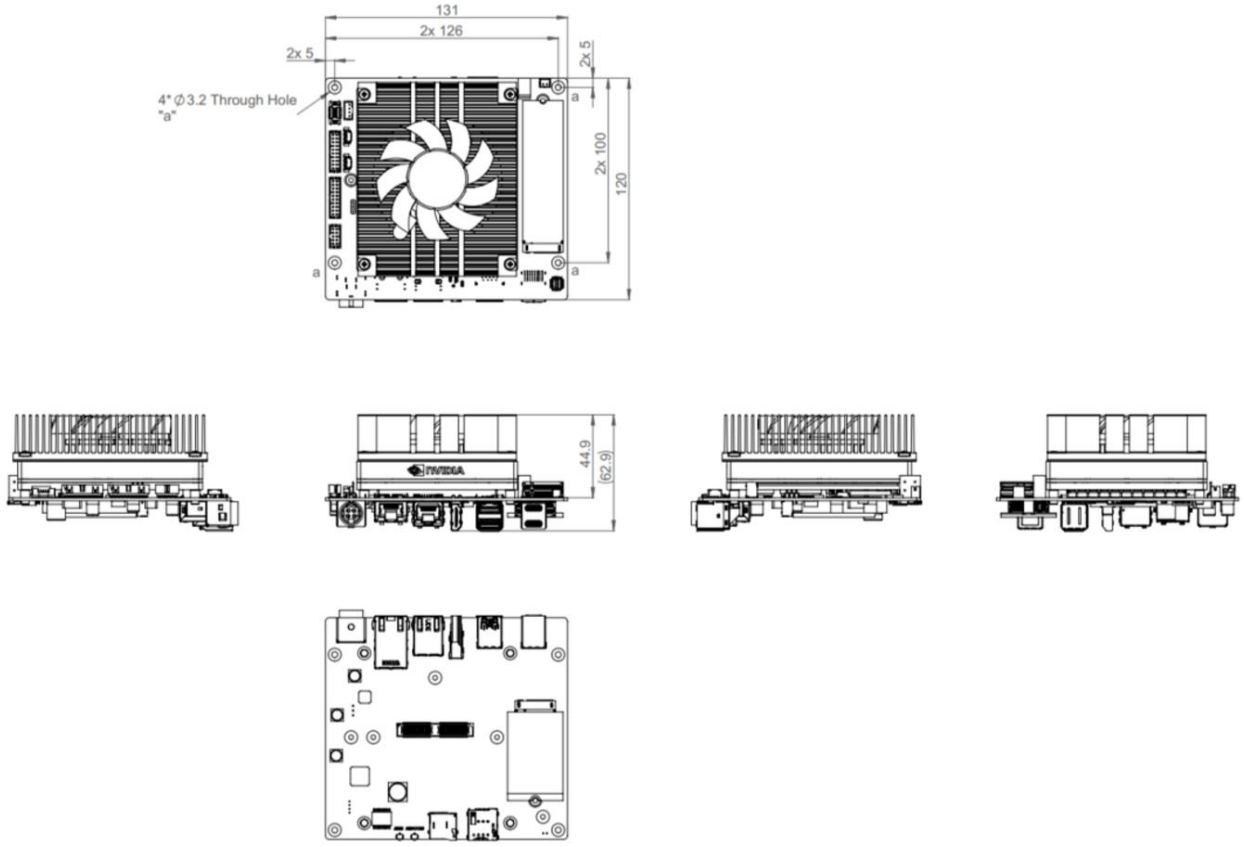
Type	Theoretical Maximum System power
Idle	6.9 W (Connect with Keyboard, Mouse and HDMI Display)
Full Loading	72.25 W (Connect with Keyboard, Mouse and HDMI Display with CPU And GPU 100% Loading)

Please refer to the following power consumption of individual I/O interface according to your use case.

Type	Theoretical Maximum System power
HDMI	0.25 W
M.2 M key	7 W
M.2 E key	2 W
USB 3.2 Gen1 (1 port)	4.5 W
120-Pin connector for MIPI CSI-2	12.6 W
USB 2.0	4.5 W
GbE LAN port	0.83 W
10GbE LAN Port	3.43 W
CAN Bus	1 W
Front Panel	0.05 W
Fan connector	3 W

2.6 Mechanical Dimensions

Integration assembly drawing for AIB-MX13/23 carrier board, AGX Orin module and Fansink.



3. Software/BSP Installation

Aetina NVIDIA Jetson products have built-in BSP so the users don't have to install it after getting the products. Since we develop our own BSP, the users may need to follow the BSP installation SOP to re-install/upgrade/downgrade the BSP. Please visit the Aetina website or contact with Aetina FAE at Tech_support@aetina.com for installation guides, BSPs and technical tips.

4. Recovery Mode

The OTG Type-C port of AIB-MX13/23 can be connected to another host device (Linux PC running NVIDIA Jetpack™) to run recovery process for re-flashing BSP.
Note: Please backup user personal files before flashing process

Connect the OTG Type-C port to another host device which supplying updated BSP file.
Press and hold the Reset button, then press and hold the Recovery button continually.
After one second (1 sec.) release the Reset button first, then release the Recovery button.
The AGX Orin will show up as a new NVIDIA device on USB list (Terminal console) at the host device.
Running re-flashing BSP process can be executed by the host device now.

5. Initial Setup

Before using AIB-MX13/23 series, please follow the steps below to have initial setup.

5.1 Prepare the materials

Please prepare the materials list below.

- A monitor with HDMI and respective cables
- USB keyboard and mouse
- Ethernet cable

5.2 Hardware connection

ATTENTION: Jetson Orin module is not hot-pluggable. Before installing or removing the module, the main power supply (to Power connector, CN12) must be disconnected and adequate time allowed for the various power rails to fully discharge.

For the initial setup, users will need to connect LAN port, keyboard and mouse via USB interface, HDMI interface, and power connector.

5.3 Setup details

Step 1: Connect to the monitor while powering off

Step 2: Power on and automatically enter the OS

Step 3: Log in to the Ubuntu OS via credentials below

- Username: nvidia
- Password: nvidia

For more information on how to use Ubuntu and NVIDIA Jetson modules, please visit Ubuntu and NVIDIA website.

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