

User Manual

**NVIDIA Jetson Series Carrier board
Aetina AX720 Series**

Document Change History

Version	Date	Description	Authors
V1.0	2020/07/7	Initial Release.	Eric Chu
V1.1	2020/09/29	Update U555 component description.	Stany Tsai
V1.2	2021/01/19	Correct CN22 image.	Stany Tsai
V2.0	2022/04/02	Add information	Rick Chiu
V2.1	2022/7/26	Correction for J509 Pin define (Pin7,9)	Jia Tsai

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1. Introduction

AX720 carrier supports NVIDIA® Jetson™ AGX Xavier 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 Xavier 32GB/64GB module
- Carrier board
- Power adaptor

1.1 Features

Here are the AX720 carrier board features below.

- Specifically designed for high performance and low-power envelope AI computing
Additional driver to support Embedded peripheral modules for multiple I/O expansion capability.
- On-board 2x HDMI, 1x M.2 M Key, 1x M.2 E Key and 3x RJ45 to support rich multimedia.
- Extended temperature range -40°C to 85°C.
- Suitable for general robotics, UAV, industrial inspection, medical imaging and deep learning.
- 1x 120pin board to board connector to support MIPI CSI-II adapter.

2. Ordering information

2.1 Model information

Here is the model information below.

Model Name	Description
AX720-STD-AN00	AX720 carrier board, standard temp -40°C to +85°C
AX720-X32-FN02	AX720 + 32G Xavier™ Module + FAN + Cable Kit + Power Adapter and US Power Cord -25°C to +80°C
AX720-X32-FN03	AX720 + 32G Xavier™ Module + FAN + Cable Kit + Power Adapter and EU Power Cord -25°C to +80°C
AX720-X32-BN70	AX720 + Chassis + 32G Xavier™ Module + FAN+ Power Adapter + Cable -20~70°C
AX720-X64-FN02	AX720 + 64G Xavier™ Module + FAN + Cable Kit + Power Adapter and US Power Cord -25°C to +80°C
AX720-X64-FN03	AX720 + 64G Xavier™ Module + FAN + Cable Kit + Power Adapter and EU Power Cord -25°C to +80°C
AX720-X64-BN70	AX720 + Chassis + 64G Xavier™ Module + FAN+ Power Adapter + Cable -20~70°C

2.2 Packing list

Part No.	Description
31-080000-0002	AX720 Cable kit (CAN bus / UART / RS232 / Front panel / GPIO / I2C)
53-0F0000-0004	100-240V 120W Power Adapter
32-010000-0005 or 32-010000-0006	US or EU POWER CORD
53-0MSBTG-0000	Dual Isolated GbE LAN board with cable *AX720-X32/X64-BN70 is not supported

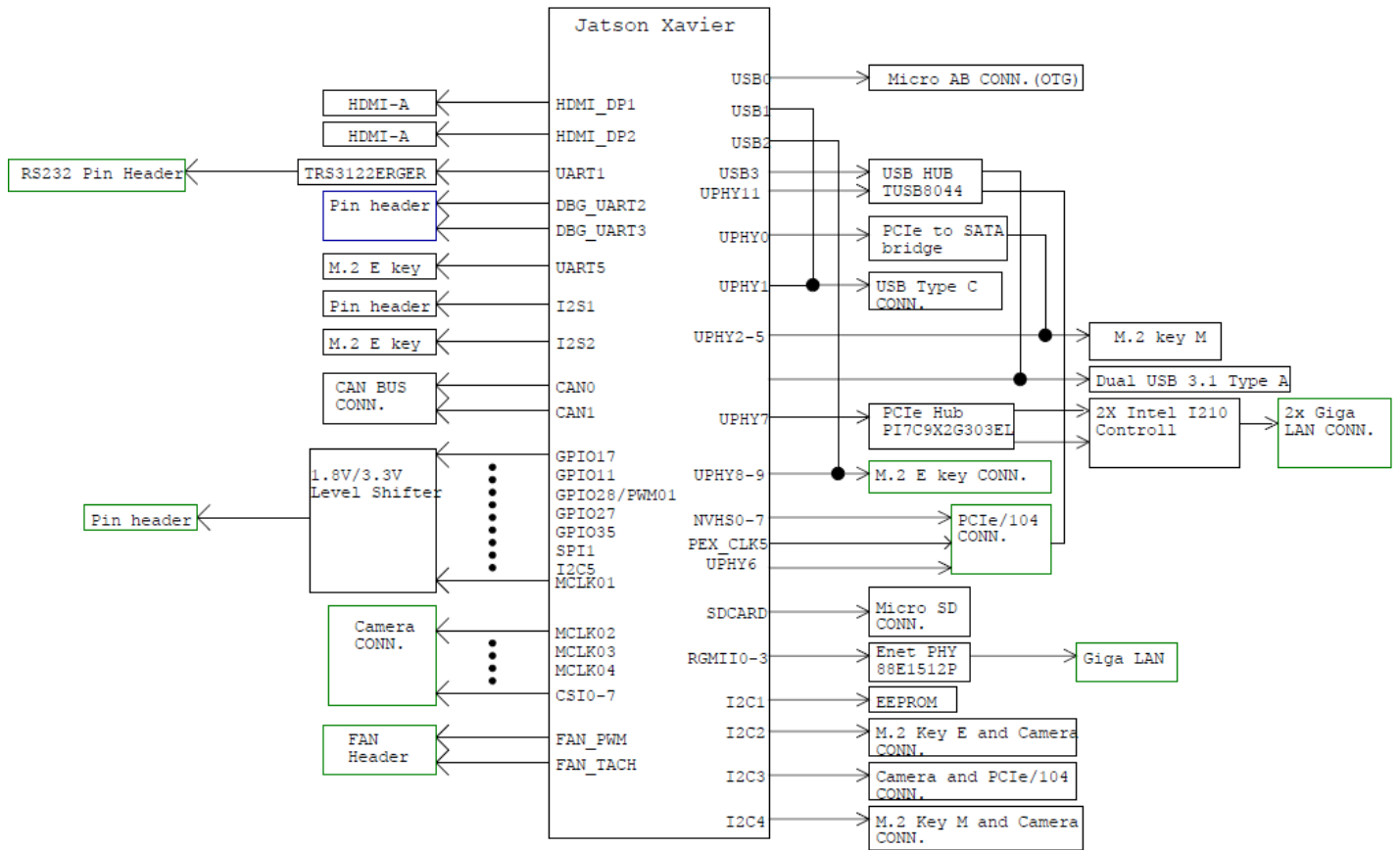
3. Board Specifications

Specifications	Description
Module Compatibility	Nvidia Jetson AGX Xavier 32GB / 64GB
GPU	Jetson AGX Xavier 32GB/64GB: - Nvidia Volta™, 512 CUDA cores/64 Tensor cores.
CPU	Jetson AGX Xavier 32GB/64GB: - HMP Quad ARM® V8.2 CPU/2MB L2/4MB L3
Memory	- 32GB/64GB 256-Bit LPDDR4x
Display	- 2x HDMI 2.0b Type A
Audio	- HDMI Integrated / I2S
LAN	- 3x Gigabit Ethernet(1x on board and 2x on extension board) *AX720-X32/X64- BN70 only support 1 Gigabit Ethernet
USB	- 2x USB3.2 Gen1 Type A - 1x USB3.2 Gen1 TypeC - 1x USB2.0 Micro AB OTG
Expansion	- 1x M.2 M-key 2280 (NVMe) - 1x M.2 E-key 2230 - 1x Micro SD
UART	- 3x UART
RS232	- 1x RS232
I2C/SPI	- 1x I2C - 1x SPI
GPIO	- 5x GPIO
CAN Bus	- 2x CAN Bus
Power Input	- 1x 6pin Power Connector DC-in 9V~20V
Dimension	- 131 x 120 x 30.5mm (WxDxH)
Net weight	- 140g
Vibration	-
Shock	-
Operating Temperature	- -40°C to + 85°C
Storage Temperature	- -40°C to + 85°C
Certification	- CE/FCC
OS Support	- Ubuntu 18.04

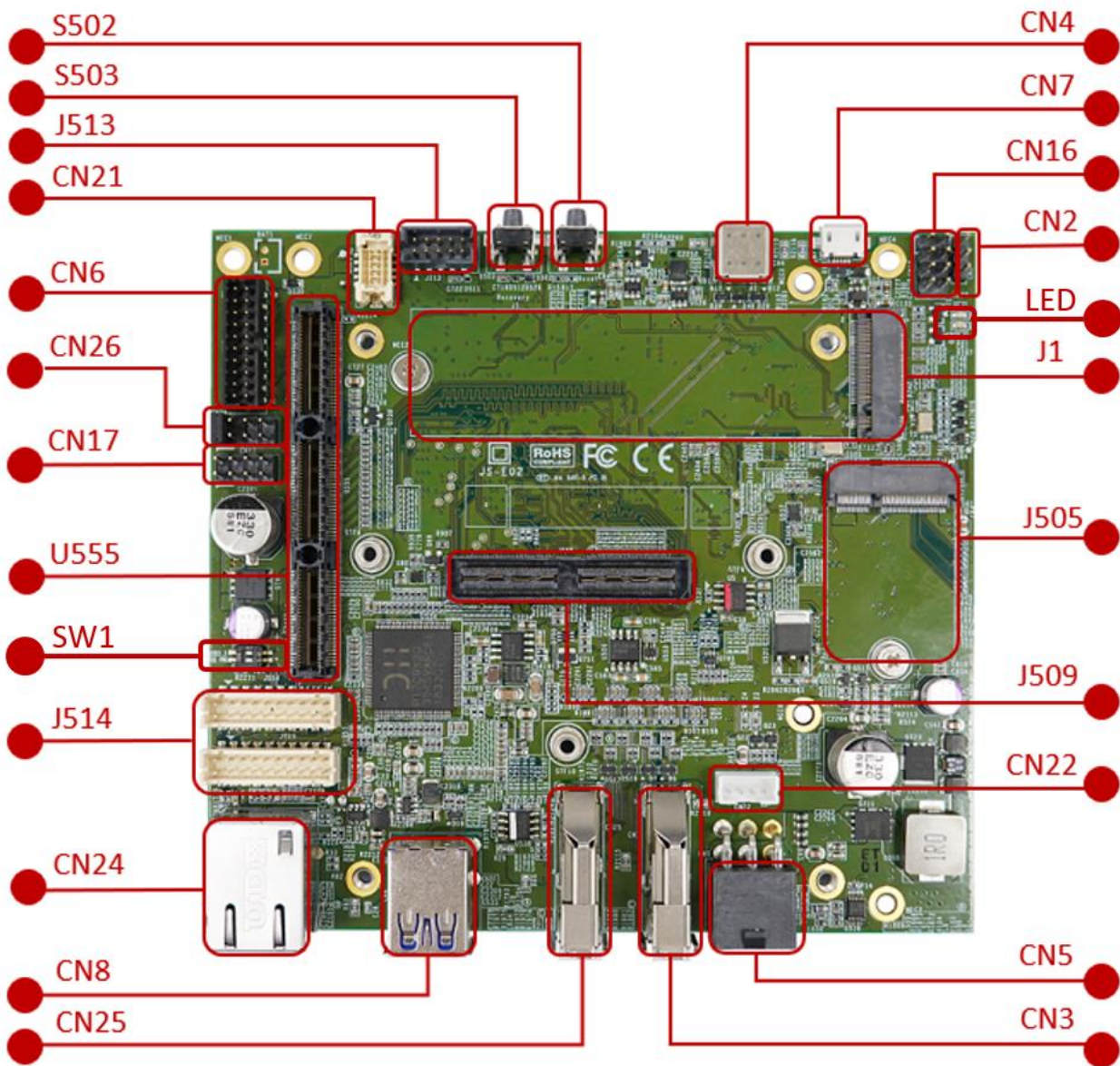
4. Product Overview

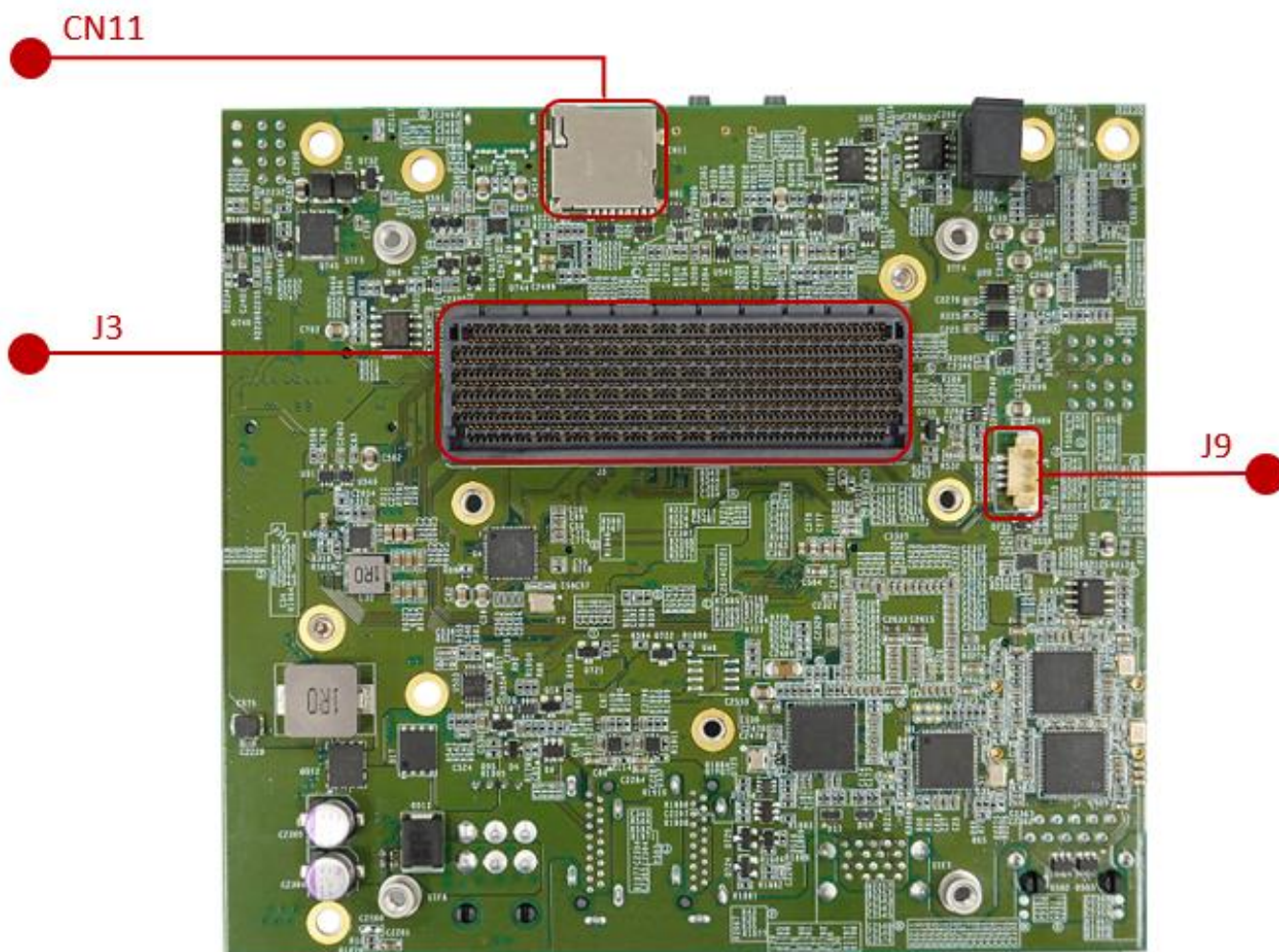
4.1 Block Diagram

Here is the block diagram below.



4.2 Connectors, LEDs, and Switches Locations





4.3 Connectors, LEDs, and Switches Description

J3	Jetson AGX Xavier™ module connector
CN3 / CN25	HDMI 2.0b Type-A connector
J1	M.2 M-Key 2280 connector, support PCIe/mSATA function device
J505	M.2 E-Key 2230 connector, support PCIe/USB2.0 function device
CN8	USB3.2 Gen1 Type-A x2
J509	120 pin board to board connector for MIPI CSI-2
CN7	USB2.0 Micro AB, support OTG function only
CN4	USB3.2 Gen1 Type-C

CN24	RJ45 connector, support 10/100/1000M Ethernet
J514	Dual RJ45 Extension board connectors
U555	Extension slot *(Pinout is not compatible with PCIe/104)
CN16	Support I2S function
CN17	Support SPI function
CN21	Support CAN BUS function
CN26	I2C / Auto Power On (pin 1-2)
CN6	UART x1 / GPIO x5 / RS232 x1
J513	Front Panel
CN22	DC output
CN5	6 pins Power input connector
CN2	Debug UART
S502	Reset Button
S503	Recovery Button
J9	5V Fan connector
SW1	To enable M.2 B key function by connecting ADM2B-720-NN05, please configure 1&2 to ON to supply 12V power to U555 *USB3.2 Gen1 Type A[CN8] will downgrade to USB2.0 speed
LED	Power Status LED

4.4 Connectors and Pin-outs

Here are the connectors and Pin-outs information of AX720 carrier board below.

- Jetson AGX Xavier™ module connector

Location	J3
Type	AGX Xavier™ connector
Pin definition	Refer to NVIDIA Jetson AGX Xavier™ System-on-Module datasheet



- HDMI 2.0b Type-A connector

Location	CN3,CN25
Type	HDMI vertical connector
Pin definition	Refer to HDMI Type-A Standard



- M.2 M-Key connector (NVME)

Location	J1
Type	M.2 M-Key 2280
Pin definition	Refer to M.2 M-Key Standard
Description	Support PCIe/mSATA function device



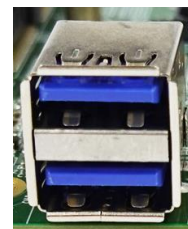
- M.2 E-Key connector

Location	J505
Type	M.2 E-Key 2230
Pin definition	Refer to M.2 E-Key Standard
Description	Support PCIe/USB2.0 function device



- Dual USB3.2 Gen1 Type-A connector

Location	CN8
Type	Type-A USB connector
Pin definition	Refer to USB Standard



- 120 pin board to board connector for MIPI CSI-2

Location	J509		
Type	QSH 120 pin connector		
Pin No.	Description		Pin No.
1	CSI_0_D0_P	CSI1_D0_P	2
3	CSI_0_D0_N	CSI1_D0_N	4
5	GND	GND	6
7	CSI_0_CLK_P	CSI1_CLK_P	8
9	CSI_0_CLK_N	CSI1_CLK_N	10
11	GND	GND	12
13	CSI0_D1_P	CSI1_D1_P	14
15	CSI0_D1_N	CSI1_D1_N	16
17	GND	GND	18
19	CSI2_D0_P	CSI3_D0_P	20
21	CSI2_D0_N	CSI3_D0_N	22
23	GND	GND	24
25	CSI2_CLK_P	CSI3_CLK_P	26
27	CSI2_CLK_N	CSI3_CLK_N	28
29	GND	GND	30
31	CSI2_D1_P	CSI3_D1_P	32
33	CSI2_D1_N	CSI3_D1_N	34
35	GND	GND	36
37	CSI4_D0_P	CSI6_D0_P	38
39	CSI4_D0_N	CSI6_D0_N	40
41	GND	GND	42
43	CSI4_CLK_P	CSI6_CLK_P	44
45	CSI4_CLK_N	CSI6_CLK_N	46
47	GND	GND	48
49	CSI4_D1_P	CSI6_D1_P	50
51	CSI4_D1_N	CSI6_D1_N	52
53	GND	GND	54
55	DVDD_CAM_LV	DVDD_CAM_LV	56
57			58
59	CSI5_D0_P	CSI7_D0_P	60
61	CSI5_D0_N	CSI7_D0_N	62
63	GND	GND	64
65	CSI5_CLK_P	CSI7_CLK_P	66



67	CSI5_CLK_N	CSI7_CLK_N	68
69	GND	GND	70
71	CSI5_D1_P	CSI7_D1_P	72
73	CSI5_D1_N	CSI7_D1_N	74
75	I2C_GP3_CLK	NC	76
77	I2C_GP3_DAT	NC	78
79	GND	GND	80
81	AVDD_CAM	AVDD_CAM_2V8	82
83		NC	84
85	NC	NC	86
87	I2C_GP2_CLK	CAM1_MCLK03	88
89	I2C_GP2_DAT	GPIO15_CAM1_PWDN	90
91	CAM0_MCLK02	GPIO16_CAM1_RST	92
93	CAM0_PWDN	CAM2_MCLK04	94
95	CAM0_RST	NC	96
97	NC	NC	98
99	GND	GND	100
101	DVDD_CAM_IO	VDD_1V8	102
103	NC	NC	104
105	I2C_GP4_CLK	NC	106
107	I2C_GP4_DAT	VDD_3V3	108
109	NC		110
111	NC	NC	112
113	NC	NC	114
115	GND	GND	116
117	NC	VDD_3V3	118
119	GPIO25_VDD_SYS_EN		120

- USB2.0 Micro USB (OTG only)

Location	CN7
Type	Micro AB USB connector
Pin definition	Refer to Micro USB standard



- USB3.2 Gen1 Type-C connector

Location	CN4
Type	Type-C USB connector
Pin definition	Refer to USB Type-C standard



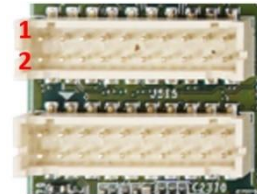
- 10/100/1000 Ethernet connector

Location	CN24
Type	RJ-45 connector
Pin definition	Refer to Ethernet standard

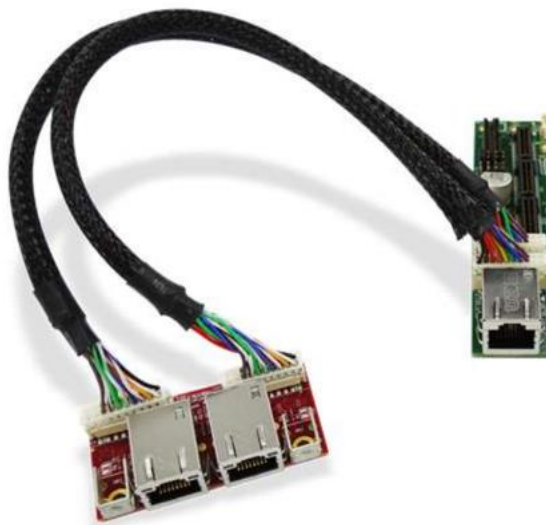


- Dual RJ45 Extension board connectors

Location	J514
Type	Wafer connector
Pin definition	N/A



To use the dual RJ45 Ethernet extension function, please connect Dual Isolated GbE LAN board as below.



to

- Extension slot

Location	U555
Type	PCIe /104 connector socket
Pin definition	N/A

Note: U555 only support Aetina dual 10G Ethernet extension board and the information link is listed below.

Link: <https://www.aetina.com/peripherals-detail.php?i=96>



- Pin header for I2S

Location	CN16		
Type	Pin header		
Pin No.	Description		Pin No.
1	MCLK01_1V8	I2S1_FS_1V8	2
3	I2S1_DOUT_1V8	I2S1_DIN_1V8	4
5	SYS_RST_IN#	AUDIO_CDC_IRQ	6
7	I2S1_SCLK_1V8	GND	8



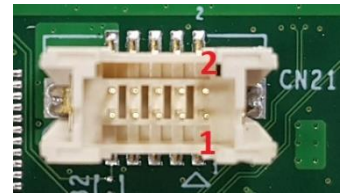
- Pin header for SPI

Location	CN17		
Type	Pin header		
Pin No.	Description		Pin No.
1	SPI1_SCK_3V3	N/A	2
3	SPI1_MISO_3V3	SPI1_MOSI_3V3	4
5	SPI1_CS0_3V3	SPI1_CS1_3V3	6
7	VDD_3V3	GND	8



- CAN Bus Connector

Location	CN21		
Type	Wafer connector		
Pin No.	Description		Pin No.
1	CAN0H	CAN1H	2
3	CAN0L	CAN1L	4
5	CAN1_STBY	CAN1_STBY	6
7	CAN0_EN	CAN1_EN	8
9	CAN_WAKE	GND	10



- Pin header for I2C / Auto Power On

Location	CN26		
Type	Pin header		
Pin No.	Description		Pin No.
1	AC OK	GND	2
3	SOC_LED+	GND	4
5	+3V3	I2C_GP1_DAT_3V3	6
7	GND	I2C_GP1_CLK_3V3	8



- MISC I/O Connector

Location	CN6		
Type	Wafer connector		
Pin No.	Description		Pin No.
1	UART0_RXD_HDR_3V3	RS232_RXD	2
3	UART0_TXD_HDR_3V3	RS232_TXD	4
5	UART0_RTS_HDR_3V3	RS232_RTS	6
7	UART0_CTS_HDR_3V3	RS232_CTS	8
9	GND0	GND1	10
11	GPIO0	GND2	12
13	GPIO1	GND3	14
15	GPIO2	GND4	16
17	GPIO3	GND5	18
19	GPIO4	GND6	20



- Front Panel

Location	J513		
Type	Wafer connector		
Pin No.	Description		Pin No.
1	Power On	GND0	2
3	Reset	GND1	4
5	Recovery	GND2	6
7	Sleep	GND3	8
9	LED+	LED-	10



Note: To power on the system, short-circuit Power ON (pin 1) and GND0 (Pin 2).

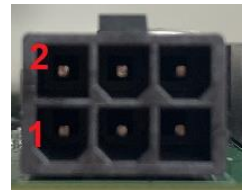
- DC output

Location	CN22		
Type	Wafer connector		
Pin No.	Description		Pin No.
1	VCC_SRC	VCC_SRC	2
3	GND	GND	4



- Power input connector

Location	CN5		
Type	6-pin male connector		
Pin No.	Description		Pin No.
1	VCC_SRC	GND	2
3	VCC_SRC	GND	4
5	VCC_SRC	GND	6



- Pin header for debug UART

Location	CN2	
Type	Pin header	
Pin No.	Description	
1	UART3_RXD_HDR3V3	
2	UART3_TXD_HDR3V3	
3	GND	



- Reset button

Location	S502
Type	Tact switch



- Recovery button

Location	S503
Type	Tact switch



- 5V Fan Connector

Location	J9
Type	Wafer connector
Pin No.	Description
1	GND
2	VDD_5V
3	FAN_TACH_CON
4	FAN_PWM_Q



- SW1

Location	SW1
Description	To enable M.2 B key function by connecting ADM2B-720-NN05, please configure 1&2 to ON to supply 12V power to U555 *USB3.2 Gen1 Type A[CN8] will downgrade to USB2.0 speed



-
- LED Indicator

Location	LED
Description	Power Status Power On: GREEN LED Power Off: Off



5. Power Consumption

The power consumption shown as below is the theoretical value with AGX Xavier module installed on the AX720 carrier board.

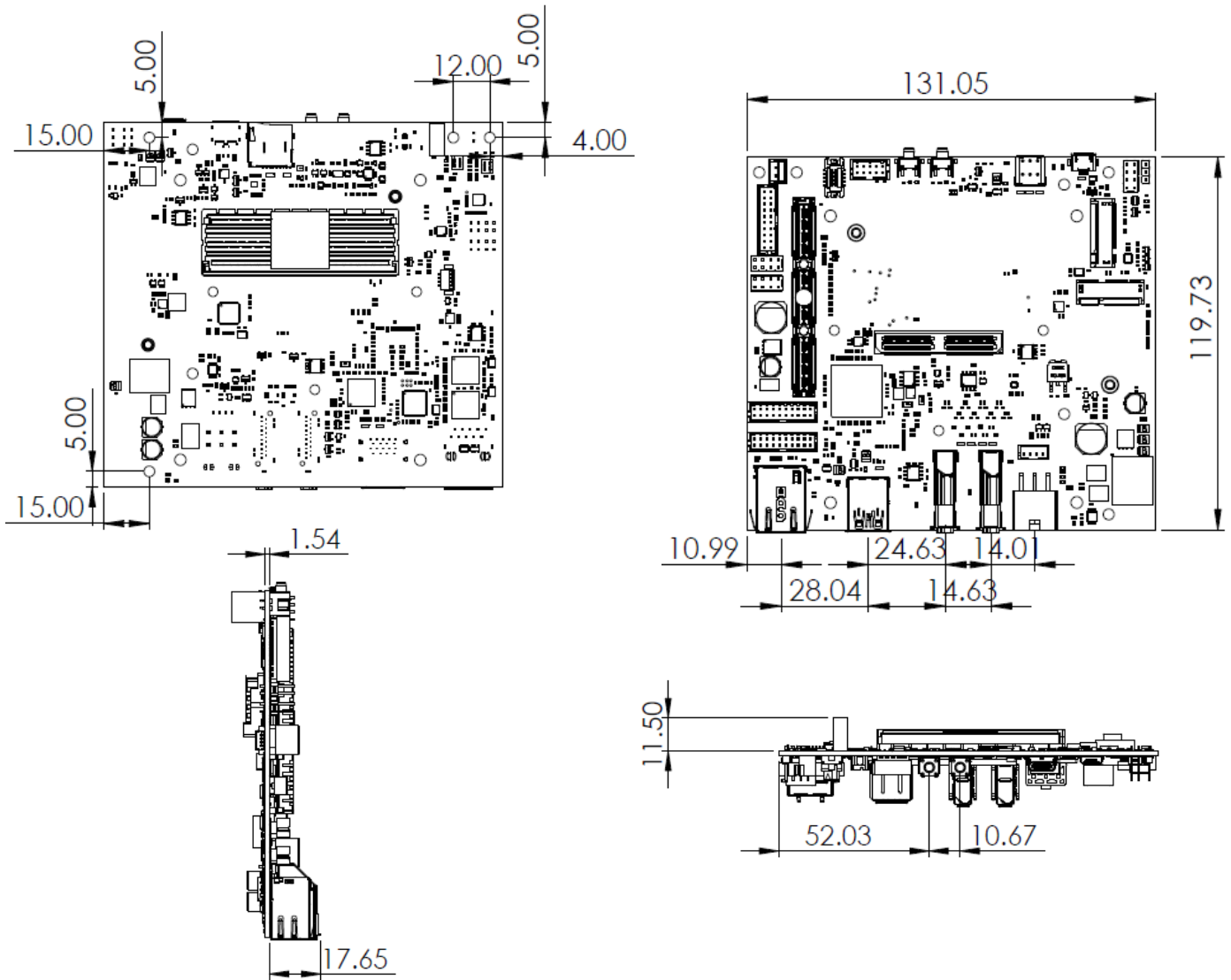
Type	Theoretical Maximum System power
Idle	7.9W (Connect with keyboard, mouse and HDMI display)
Full loading	24.9W (Connect with keyboard, mouse and HDMI display with CPU and GPU 100% loading)

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

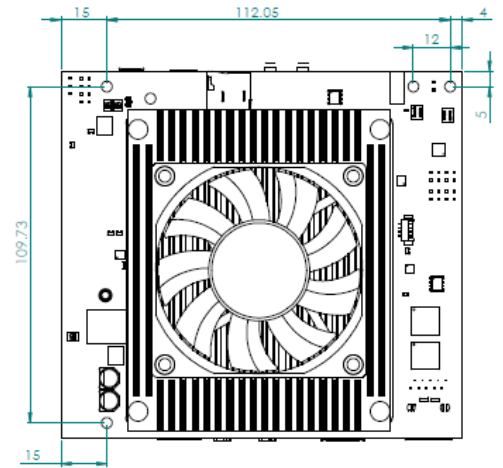
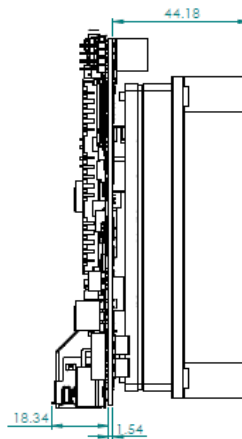
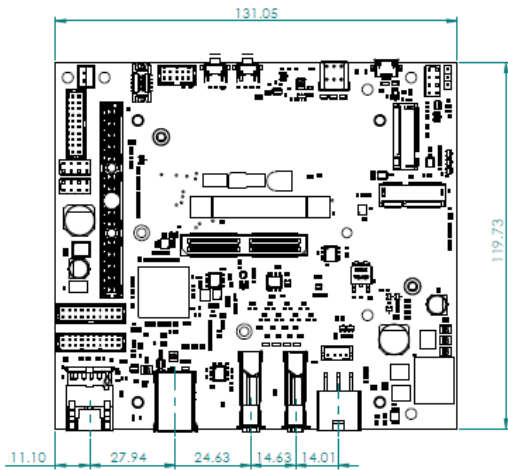
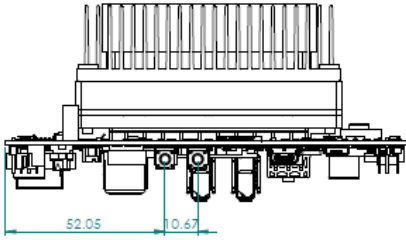
Type	Theoretical Maximum System power
HDMI	5W
M.2 M key	6.6W
M.2 E key	6.6W
USB 3.2 Gen1 (1 port)	4.5W
120pin connector for MIPI CSI-2	12.6W
USB 2.0	4.5W
LAN port	1.18W
Dual RJ45 Extension connectors	1.62W
Extension slot	26.88W
SPI bus	0.5W
CAN Bus	1W
I2C	0.5W
Misc. I/O	0.165
Front panel	0.05W
Fan connector	3W

6. Mechanical Dimensions

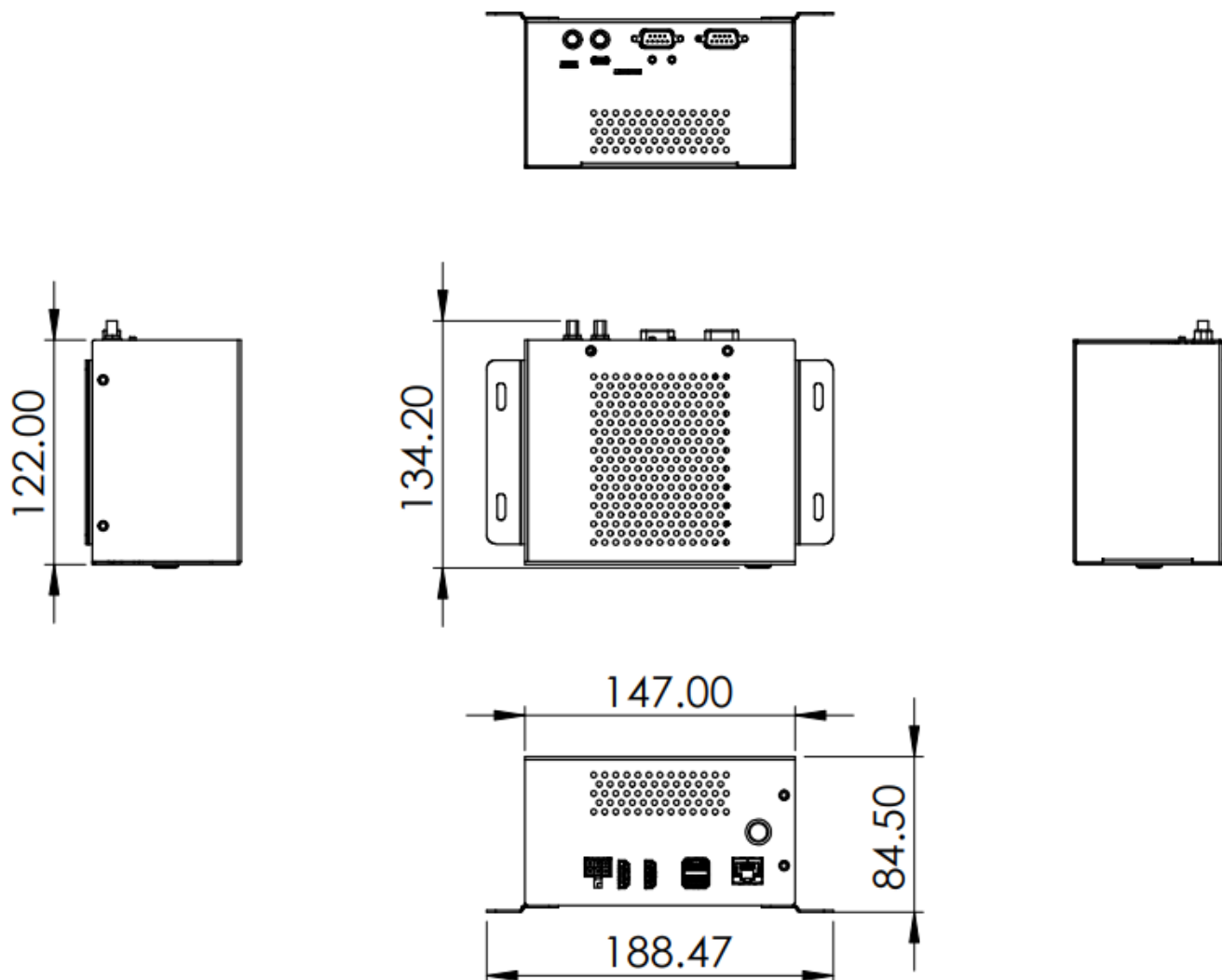
- AX720 carrier board dimension



- AX720 carrier board + AGX Xavier module + Fansink dimension



- AX720 carrier board + AGX Xavier module + Fan + Chassis dimension



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