

M2AI-2280-720

Dual Kneron KL720 NPU
M.2 2280 B-M key Module

User's Manual 1st Ed

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Packing List

Before setting up your product, please make sure the following items have been shipped:

Item	Quantity
● M2AI-2280-720 M.2 Module	1
● M3 screw	1

If any of these items are missing or damaged, please contact your distributor or sales representative immediately.

About this Document

This User's Manual contains all the essential information, such as detailed descriptions and explanations on the product's hardware and software features (if any), its specifications, dimensions, jumper/connector settings/definitions, and driver installation instructions (if any), to facilitate users in setting up their product.

Users may refer to the product page on AAEON.com for the latest version of this document.

Users may find more chip information and download SDK on the Kneron Document Center:

<https://www.kneron.com/tw/support/developers/>

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 device 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. Always completely disconnect the power before working on the system's hardware.
5. No connections should be made when the system is powered as a sudden rush of power may damage sensitive electronic components.
6. If the device is not to be used for a long time, disconnect it from the power supply to avoid damage by transient over-voltage.
7. Always disconnect this device from any power supply before cleaning.
8. While cleaning, use a damp cloth instead of liquid or spray detergents.
9. Make sure the device is installed near a power outlet and is easily accessible.
10. Keep this device away from humidity.
11. Place the device on a solid surface during installation to prevent falls.
12. Do not cover the openings on the device to ensure optimal heat dissipation.
13. Watch out for high temperatures when the system is running.
14. Do not touch the heat sink or heat spreader when the system is running
15. Never pour any liquid into the openings. This could cause fire or electric shock.
16. As most electronic components are sensitive to static electrical charge, be sure to ground yourself to prevent static charge when installing the internal components. Use a grounding wrist strap and contain all electronic components in any static-shielded containers.

17. If any of the following situations arises, please the contact our service personnel:
 - i. Damaged power cord or plug
 - ii. Liquid intrusion to the device
 - iii. Exposure to moisture
 - iv. Device is not working as expected or in a manner as described in this manual
 - v. The device is dropped or damaged
 - vi. Any obvious signs of damage displayed on the device
18. Do not leave this device in an uncontrolled environment with temperatures beyond the device's permitted storage temperatures (see chapter 1) to prevent damage.
19. Do NOT disassemble the motherboard so as not to damage the system or void your warranty.
20. If the thermal pad had been damaged, please contact AAEON's salesperson to purchase a new one. Do NOT use those of other brands.
21. The Hex Cylinder Coppers on the front panel are not removable.
22. Repeatedly assemble and disassemble the system may cause damages to the exterior paint and surface and screw holes.
23. Use the right size screwdriver.
24. Use the screwdriver correctly to remove screws from the system.

FCC Statement

Warning!



This device complies with Part 15 FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received including interference that may cause undesired operation.

Caution:

There is a danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions and your local government's recycling or disposal directives.

Attention:

Il y a un risque d'explosion si la batterie est remplacée de façon incorrecte. Ne la remplacer qu'avec le même modèle ou équivalent recommandé par le constructeur. Recycler les batteries usées en accord avec les instructions du fabricant et les directives gouvernementales de recyclage.

China RoHS Requirements (CN)

产品中有毒有害物质或元素名称及含量

AAEON 主板/子板/背板

QQ4-381 Rev.A2

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷电路板 及其电子组件	×	○	○	○	○	○
外部信号 连接器及线材	×	○	○	○	○	○
本表格依据 SJ/T 11364 的规定编制。 ○：表示该有毒有害物质在该部件所有均质材料中的含量均在GB/T 26572标准规定的限量要求以下。 ×：表示该有害物质的某一均质材料超出了GB/T 26572的限量要求，然而该部件仍符合欧盟指令2011/65/EU 的规范。 环保使用期限(EFUP (Environmental Friendly Use Period)) : 10年 备注：此产品所标示之环保使用期限，系指在一般正常使用状况下。						

China RoHS Requirement (EN)

Name and content of hazardous substances in product

AAEON Main Board/Daughter Board/Backplane

QO4-381 Rev.A2

Part Name	Hazardous Substances					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
PCB Assemblies	×	○	○	○	○	○
Connector and Cable	×	○	○	○	○	○
The table is prepared in accordance with the provisions of SJ/T 11364. ○: Indicates that said hazardous substance contained in all of the homogenous materials for this product is below the limit requirement of GB/T 26572. ×: Indicates that said hazardous substance contained in at least one of the homogenous materials used for this part is above the limit requirement of GB/T 26572. But this product still be compliance with 2011/65/EU Directive (allowed with 2011/65/EU Annex III of RoHS exemption with number 6(c),7(a),7(c)-1). EFUP (Environment Friendly Use Period) value: 10 years Notes: This product defined period of use is under normal condition.						

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Chapter 1

Product Specifications

1.1 M2AI-2280-720 Kneron NPU Module Specifications

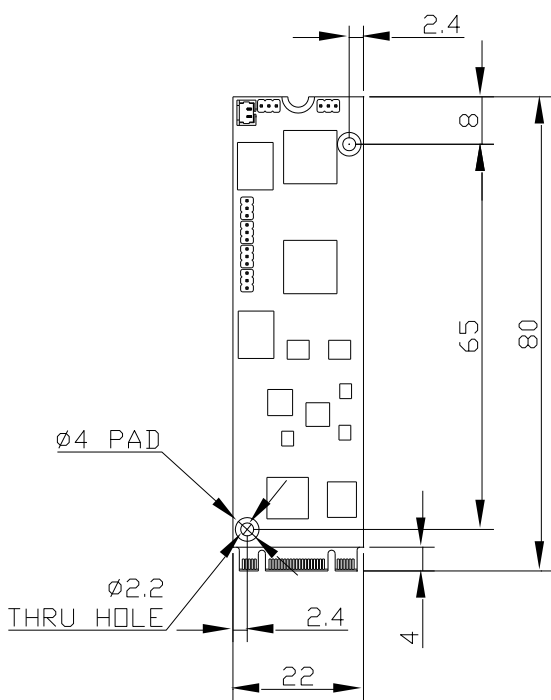
System	
IC	Kneron KL720
Type	ARM CM & DSP
Support Framework	Pytorch, ONNX, TensorFlow 1.6, Tensorflow lite, Keras, Caffe
Support Model	Resnet, GoogleNet, YOLO, Tiny YOLO, MobileNet-SSD, DenseNet, RNN, LSTM
Memory Type	128MB LPDDR3
NPU Performance	1.4 TOP/s x2
Overall Power Consumption	5W
Others	
Operating Temperature	32 °F~122 °F (0 °C ~ 50 °C with cooler 5m/s)
Storage Temperature	32 °F~158 °F (0 °C ~ 70 °C)
Operating Humidity	0% ~ 90% relative humidity, non-condensing
Certification	CE/FCC Class A

Chapter 2

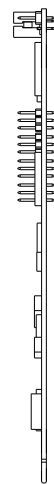
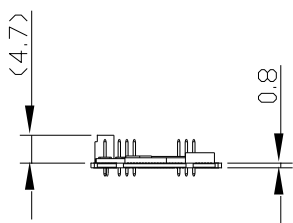
Hardware Information

2.1 Dimensions

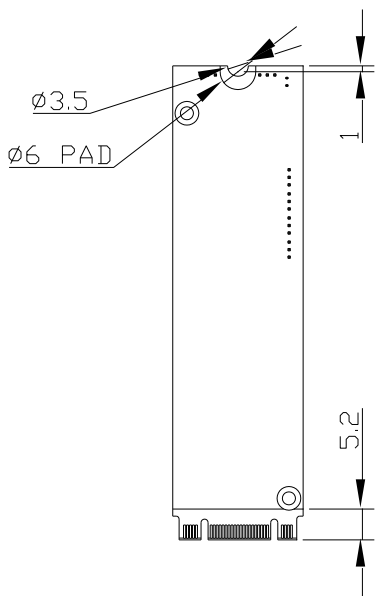
Component Side



Component Side

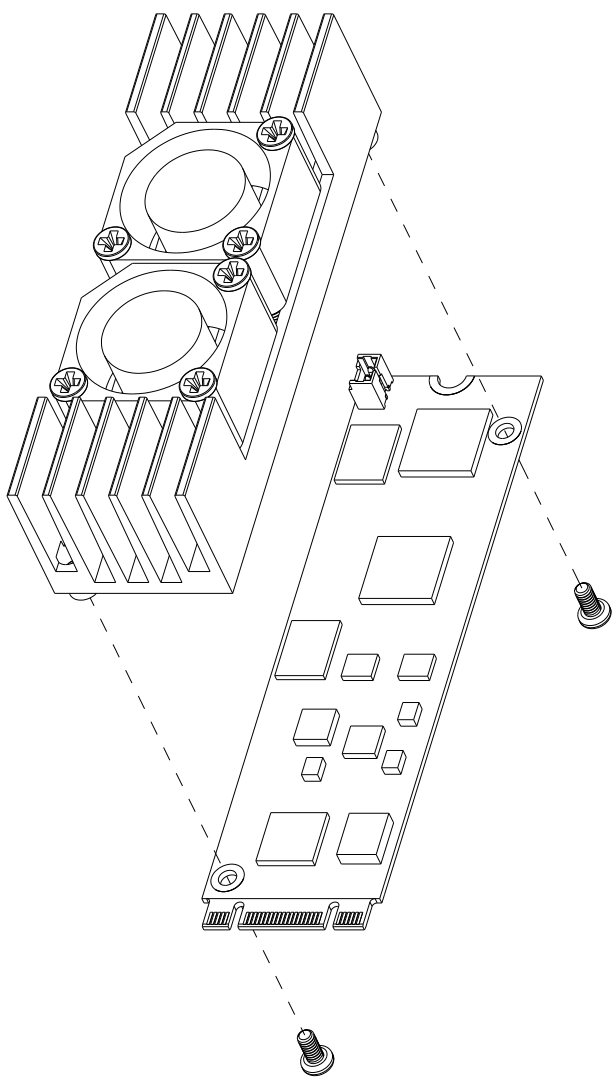


Solder Side

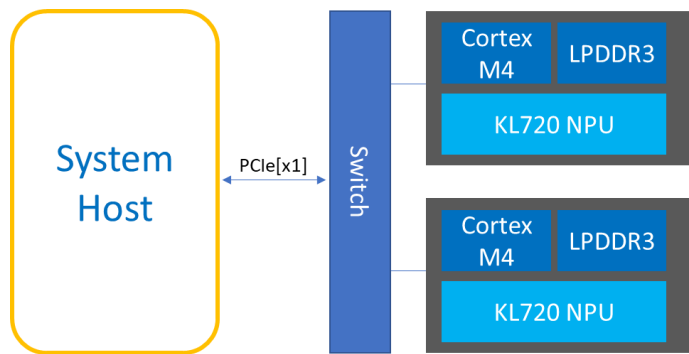


Solder Side

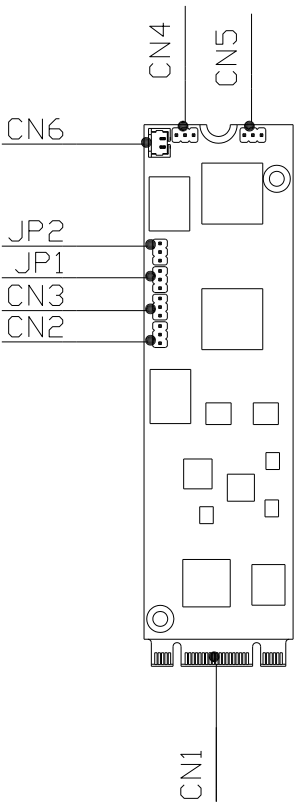
Cooler Assembly



2.2 Block Diagram



2.3 Board Design

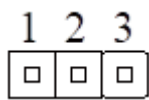


2.4 List of Jumpers

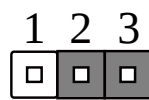
Please refer to the table below for all of the board’s jumpers that you can configure for your application.

Label	Function
JP1	Wake function Connector(Optional)
JP2	Reset function Connector(Optional)

2.4.1 Wake function Connector (Option) (JP1)

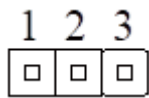


Normal Mode

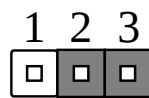


Wake function

2.4.2 Reset function Connector (Option) (JP2)



Normal Mode



Reset function

2.5 List of Connectors

This section details the connectors featured on the AI Core X module. This is a reference to help with setup and configuration for your application.

Label	Connector Type
CN1	M.2 2280 B+M key
CN2	KL720-1 UART0 connector(Optional)
CN3	KL720-1 UART1 connector(Optional)
CN4	KL720-2 UART0 connector(Optional)
CN5	KL720-2 UART1 connector(Optional)
CN6	FAN connector

2.5.1 M.2 228 B+M key (CN1)

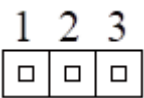
Pin	Signal Type	Description
1	Ground	Ground
2	3.3V	Supplypin, 3.3V
3	GND	Ground
4	3.3V	Supplypin, 3.3V
5	NC	
6	NC	
7	NC	
8	NC	
9	NC	
10	NC	
11	NC	

Pin	Signal Type	Description
20	NC	
21	GND	Ground
22	NC	
23	NC	
24	NC	
25	NC	
26	NC	
27	GND	Ground
28	NC	
29	NC	
30	NC	
31	NC	
32	NC	
33	GND	Ground
34	NC	
35	NC	
36	NC	
37	NC	
38	NC	
39	GND	Ground
40	NC	
41	PERn0	PCIe Lane 0 Rx
42	NC	
43	PERp0	PCIe Lane 0 Rx
44	NC	
45	GND	Ground

Pin	Signal Type	Description
46	NC	
47	PETn0	PCIe Lane 0 Tx
48	NC	
49	PETp0	PCIe Lane 0 Tx
50	PERST#	PCIe reset
51	GND	Ground
52	CLKREQ#	Reference clock request signal
53	REFCLKN	PCIe Reference Clock signals (100MHz)
54	PEWAKE#	PCIe WAKE# Open Drain with pull up on platform. Active Low.
55	REFCLKP	PCIe Reference Clock signals (100MHz)
56	NC	
57	GND	Ground
58	NC	
67	NC	
68	NC	
69	NC	
70	3.3V	Supplypin, 3.3V
71	GND	Ground
72	3.3V	Supplypin, 3.3V
73	GND	Ground
74	3.3V	Supplypin, 3.3V
75	GND	Ground

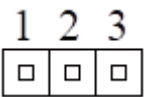
Note: PCIe Lane0 support PCIe Gen2

2.5.2 KL720-1 UART0 connector (Option) (CN2)



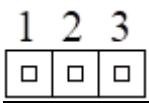
Pin	Pin Name	Signal Type	Signal level
1	X_UART0_TX_1	I/O	3.3V
2	X_UART0_RX_1	I/O	3.3V
3	GND	GND	

2.5.3 KL720-1 UART1 connector (Option) (CN3)



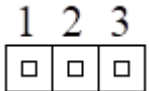
Pin	Pin Name	Signal Type	Signal level
1	X_UART1_TX_1	I/O	3.3V
2	X_UART1_RX_1	I/O	3.3V
3	GND	GND	

2.5.4 KL720-2 UART0 connector (Option) (CN4)



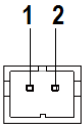
Pin	Pin Name	Signal Type	Signal level
1	X_UART0_TX_2	I/O	3.3V
2	X_UART0_RX_2	I/O	3.3V
3	GND	GND	

2.5.5 KL720-2 UART1 connector (Option) (CN5)



Pin	Pin Name	Signal Type	Signal level
1	X_UART1_TX_2	I/O	3.3V
2	X_UART1_RX_2	I/O	3.3V
3	GND	GND	

2.5.6 FAN connector (CN6)



Pin	Pin Name	Signal Type	Signal level
1	+3.3V	PWR	3.3V
2	GND	GND	