M2AI-2280-520

Kneron KL520 NPU
M.2 22x80mm Module

User's Manual 2nd Ed

Copyright Notice

Acknowledgements

All other products' name or trademarks are properties of their respective owners.

Packing List

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

Item	Quantity
● M2AI-2280-520 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.

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

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   QO4-381 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.

Table of Contents

Chapter 1

Product Specifications

1.1 M2AI-2280-520 Kneron NPU Module Specifications

System	
IC	Kneron KL520
Type	Integrated SoC
Supported Frameworks	ONNX, TensorFlow, Keras, Caffe
Supported Models	Vgg16, Resnet, GoogleNet, YOLO, Tiny YOLO, Lenet, MobileNet, DenseNet
Memory Type	LPDDR2
NPU Power Efficiency	0.56TOPS/W
Overall Power Consumption	0.5W

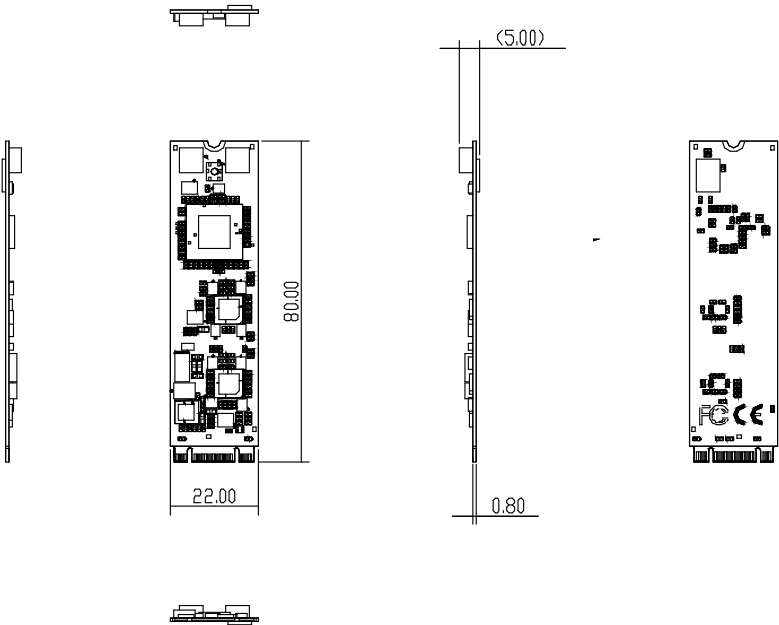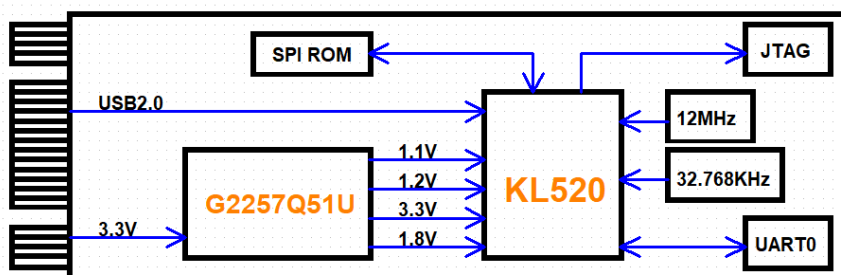| Other Specifications	
Operating Temperature	32°F ~ 158°F (0°C ~ 70°C)
Storage Temperature	-40°F ~ 185°F (-40°C ~ 85°C)
Operating Humidity	0% ~ 90% relative humidity, non-condensing
Certification	CE/FCC Class A

Chapter 2

Hardware Information

2.1   Dimensions

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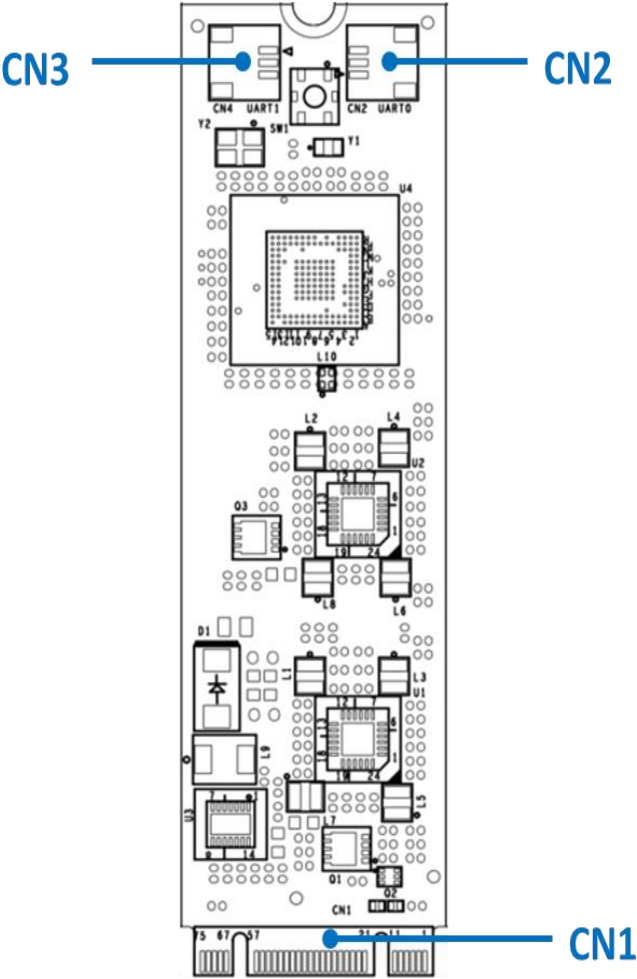
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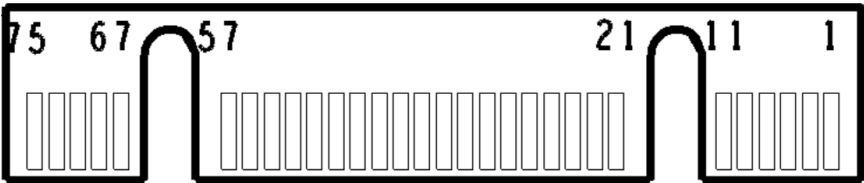## 2.2   Block Diagram

2.3   Board Design

2.4   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 B-Key 75pin Connector
CN2	UART Connector
CN3	UART Connector

2.4.1   M.2 B-Key 75pin Connector (CN1)

Note: M2AI-2280-520 supports B-Key only.

Pin	Signal Description	Pin	Signal Description
1	GND	39	GND
2	3.3V_M2	40	NC
3	GND	41	NC
4	3.3V_M2	42	NC
5	GND	43	NC
6	NC	44	NC
7	USB_D+	45	GND
8	X_PTN	46	NC

Pin	Signal Description	Pin	Signal Description
9	USB_D-	47	NC
10	NC	48	NC
11	GND	49	NC
20	NC	50	NC
21	GND	51	GND
22	NC	52	NC
23	NC	53	NC
24	NC	54	NC
25	NC	55	NC
26	NC	56	NC
27	GND	57	GND
28	NC	58	NC
29	NC	67	NC
30	NC	68	NC
31	NC	69	NC
32	NC	70	3.3V_M2
33	GND	71	GND
34	NC	72	3.3V_M2
35	NC	73	GND
36	NC	74	3.3V_M2
37	NC	75	GND
38	X_PTN		

2.4.2 UART Connector (CN2)
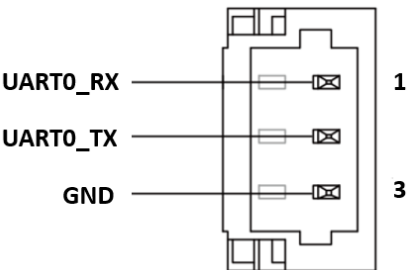
Pin	Signal Description
1	UART0_RX
2	UART0_TX
3	GND

2.4.3 UART Connector (CN3)
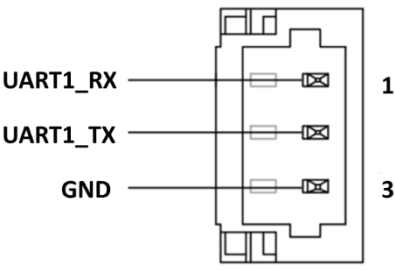
Pin	Signal Description
1	UART1_RX
2	UART1_TX
3	GND

Appendix A

Toolchain User Manual

A.1 Toolchain User Manual

The following attachment, Toolchain User Manual, is supplied with this document and is meant for use with AAEON products featuring the Kneron KL520 NPU Module. If you have any questions regarding this document or your AAEON product, please contact your sales representative for assistance.