

# NV8600-Nano AI Developer Kit

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AI@Edge Embedded Board with  
NVIDIA<sup>®</sup> Jetson Orin Nano<sup>™</sup>

User's Manual 1<sup>st</sup> Ed

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# Packing List

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

| Item                           | Quantity |
|--------------------------------|----------|
| ● NV8600-Nano AI Developer Kit | 1        |
| ● Fan Kit & 60W Power Adapter  | 1        |
| ● Raspberry Pi Camera Module 2 | 1        |

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

## About this Document

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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 at [AAEON.com](http://AAEON.com) for the latest version of this document.

## Safety Precautions

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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. All cables and adapters supplied by AAEON are certified and in accordance with the material safety laws and regulations of the country of sale. Do not use any cables or adapters not supplied by AAEON to prevent system malfunction or fires.
3. Make sure the power source matches the power rating of the device.
4. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
5. Always completely disconnect the power before working on the system's hardware.
6. No connections should be made when the system is powered as a sudden rush of power may damage sensitive electronic components.
7. 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.
8. Always disconnect this device from any power supply before cleaning.
9. While cleaning, use a damp cloth instead of liquid or spray detergents.
10. Make sure the device is installed near a power outlet and is easily accessible.
11. Keep this device away from humidity.
12. Place the device on a solid surface during installation to prevent falls
13. Do not cover the openings on the device to ensure optimal heat dissipation.
14. Watch out for high temperatures when the system is running.
15. Do not touch the heat sink or heat spreader when the system is running
16. Never pour any liquid into the openings. This could cause fire or electric shock.

17. 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.
18. 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
19. DO NOT LEAVE THIS DEVICE IN AN UNCONTROLLED ENVIRONMENT WITH TEMPERATURES BEYOND THE DEVICE'S PERMITTED STORAGE TEMPERATURES (SEE CHAPTER 1) TO PREVENT DAMAGE.

### **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.*

产品中有毒有害物质或元素名称及含量

AAEON Main Board/ Daughter Board/ Backplane

| 部件名称                                                                                                                                                                           | 有毒有害物质或元素 |           |           |                 |               |                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------------|---------------|-----------------|
|                                                                                                                                                                                | 铅<br>(Pb) | 汞<br>(Hg) | 镉<br>(Cd) | 六价铬<br>(Cr(VI)) | 多溴联苯<br>(PBB) | 多溴二苯醚<br>(PBDE) |
| 印刷电路板<br>及其电子组件                                                                                                                                                                | X         | X         | ○         | ○               | ○             | ○               |
| 外部信号<br>连接器及线材                                                                                                                                                                 | X         | X         | ○         | ○               | ○             | ○               |
| <p>○：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<br/>SJ/T 11363-2006 标准规定的限量要求以下。</p> <p>X：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出<br/>SJ/T 11363-2006 标准规定的限量要求。</p> <p>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。</p> |           |           |           |                 |               |                 |

China RoHS Requirement (EN)

Poisonous or Hazardous Substances or Elements in Products

AAEON Main Board/ Daughter Board/ Backplane

| Component                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Poisonous or Hazardous Substances or Elements |                 |                 |                                    |                                      |                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-----------------|-----------------|------------------------------------|--------------------------------------|---------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Lead<br>(Pb)                                  | Mercury<br>(Hg) | Cadmium<br>(Cd) | Hexavalent<br>Chromium<br>(Cr(VI)) | Polybrominated<br>Biphenyls<br>(PBB) | Polybrominated<br>Diphenyl Ethers<br>(PBDE) |
| PCB & Other<br>Components                                                                                                                                                                                                                                                                                                                                                                                                                                          | X                                             | X               | O               | O                                  | O                                    | O                                           |
| Wires &<br>Connectors<br>for External<br>Connections                                                                                                                                                                                                                                                                                                                                                                                                               | X                                             | X               | O               | O                                  | O                                    | O                                           |
| <p>O: The quantity of poisonous or hazardous substances or elements found in each of the component's parts is below the SJ/T 11363-2006-stipulated requirement.</p> <p>X: The quantity of poisonous or hazardous substances or elements found in at least one of the component's parts is beyond the SJ/T 11363-2006-stipulated requirement.</p> <p>Note: The Environment Friendly Use Period as labeled on this product is applicable under normal usage only</p> |                                               |                 |                 |                                    |                                      |                                             |

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# Chapter 1

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Product Specifications



## 1.1 Specifications

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### System

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AI Accelerator    | NVIDIA® Jetson Orin Nano™                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| CPU               | Orin Nano 8GB: 6-core Arm® Cortex® -A78AE<br>v8.2 64-bit CPU 1.5MB L2 + 4MB L3 CPU                                                                                                                                                                                                                                                                                                                                                                                                 |
| System Memory     | 8GB LPDDR5                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Storage Device    | 256GB M.2 2280 M-key NVME SSD<br>SATA Connector x 1                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Display Interface | HDMI 1.4 (Type-A) x 1                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Ethernet          | RJ-45 x 4 for GbE LAN<br>(optional: power module for PoE, 25.6W per port)                                                                                                                                                                                                                                                                                                                                                                                                          |
| I/O               | MIPI Connector x 2 (4 Lanes for each MIPI Connector, default IMX219)<br>DB-9 x 1 for RS-232(RX/TX/GND)/422/485<br>DB-9 x 1 for CANBus<br>USB 3.2 Gen 2 (Type-A) x 6<br>Micro USB for Image Flash x 1<br>Power Button with LED Indicator x 1<br>2 pin Phoenix Type x 1 for Power Input<br>Recovery Button x 1<br>40-pin Header (compliant with NVIDIA Jetson Orin Nano Developer Kit)<br>Pin Header x 1 for RS/232/422/485 (jumper select)<br>UART to 40-pin Box Header x 1 for OOB |

## System

|            |                                                                                                             |
|------------|-------------------------------------------------------------------------------------------------------------|
| I/O Cont.  | SATA Connector x 1<br>SATA Power Connector x 1                                                              |
| Expansion  | M.2 2230 E-Key x 1<br>M.2 2242/3042/3052 B-Key x 1 (SIM onboard)<br>M.2 2280 M-Key x 1 for extending module |
| Indicator  | Power LED x 1                                                                                               |
| OS Support | Linux (NVIDIA Jetpack™ 6.0 and above)                                                                       |

## Power Supply

|                   |                                               |
|-------------------|-----------------------------------------------|
| Power Requirement | 12V ~ 24V DC in with 2-pin Terminal Block x 1 |
|-------------------|-----------------------------------------------|

## Mechanical

|                        |                               |
|------------------------|-------------------------------|
| Mounting               | —                             |
| Dimensions (W x D x H) | 6.53" x 5.24" (166mm x 133mm) |
| Gross Weight           | 0.79 lb. (0.36Kg)             |
| Net Weight             | 0.42 lb. (0.19Kg)             |

## Environmental

|                       |                                                                                        |
|-----------------------|----------------------------------------------------------------------------------------|
| Operating Temperature | -13°F ~ 158°F (-25°C ~ 70°C) w/ heatsink, according to IEC60068-2 with 0.5 m/s Airflow |
| Storage Temperature   | -40°F ~ 185°F (-40°C ~ 85°C)                                                           |
| Storage Humidity      | 5 ~ 95% @40°C, non-condensing                                                          |
| Anti-Vibration        | —                                                                                      |
| Anti-Shock            | —                                                                                      |
| Certification         | CE/FCC Class A                                                                         |



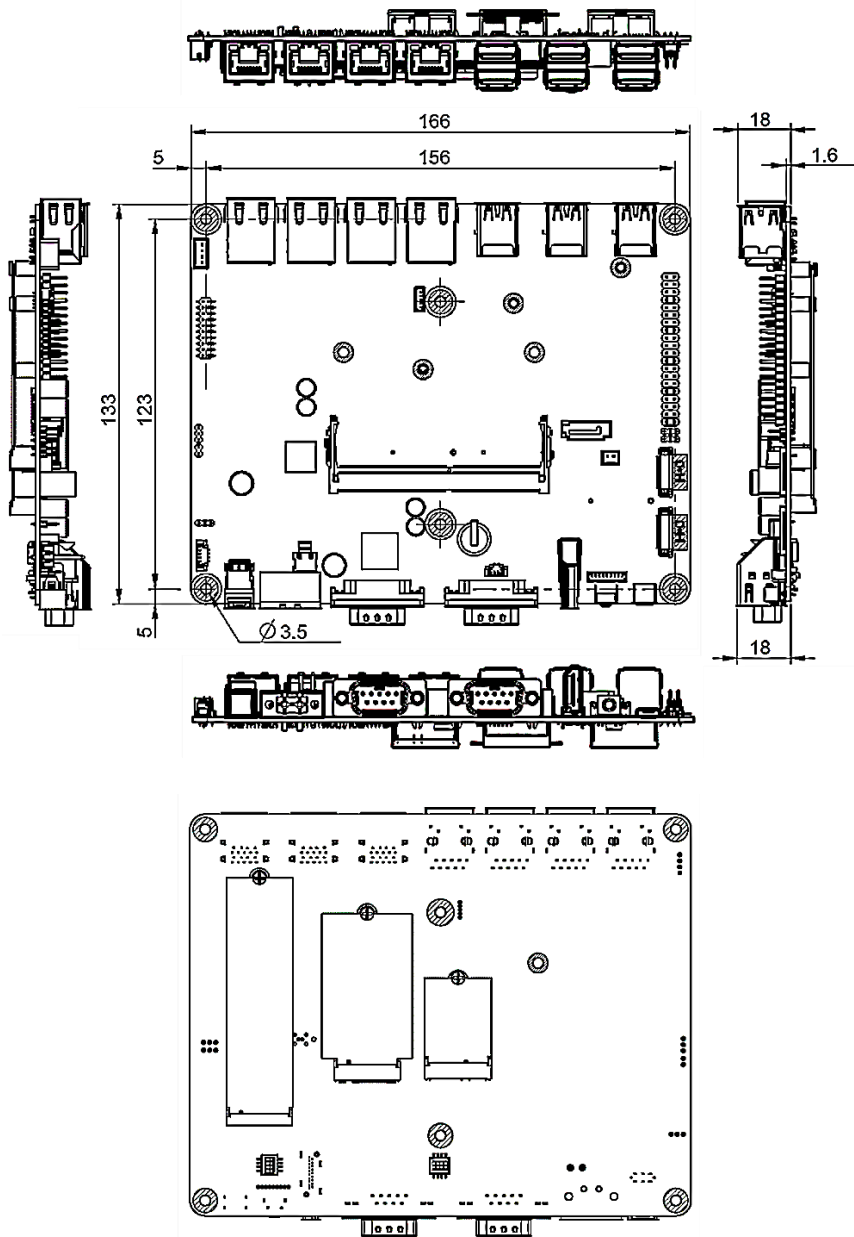
# Chapter 2

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Hardware Information

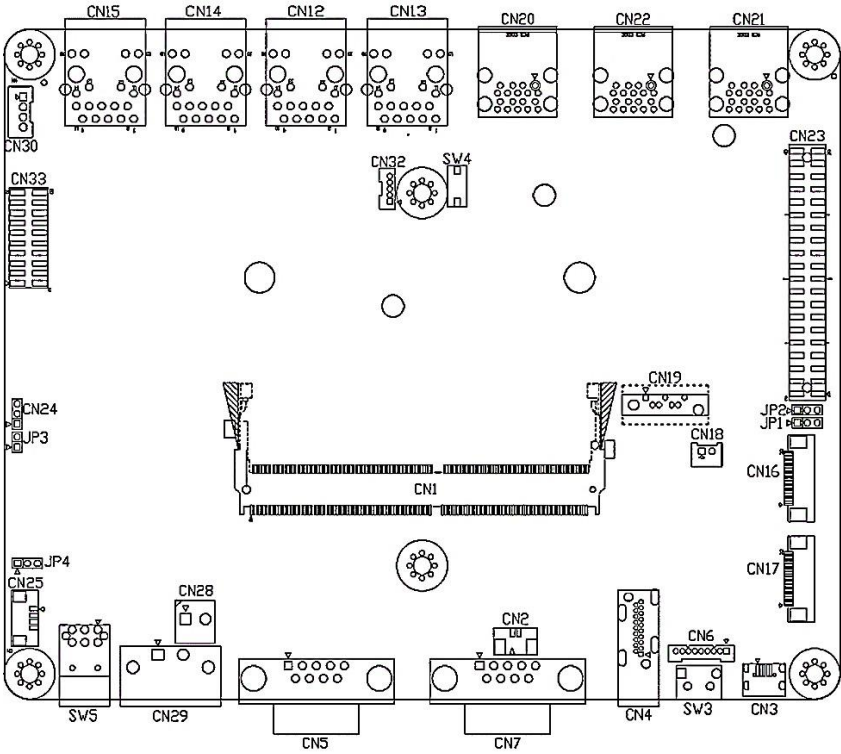


# 2.1 Dimensions

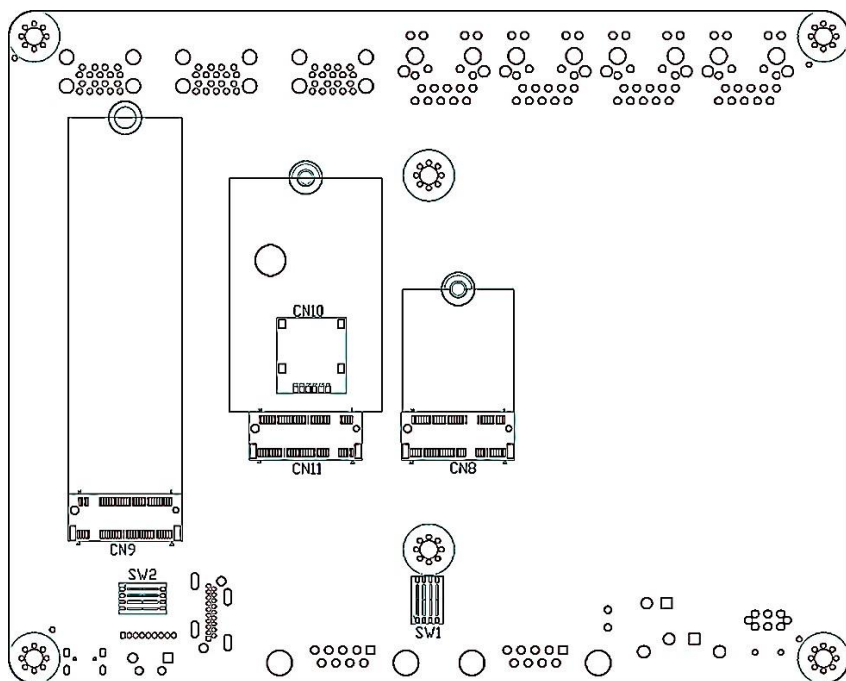


## 2.2 Jumpers and Connectors

Top



## Bottom



## 2.3 List of Jumpers

The board has a number of jumpers that allow you to configure your system to suit your application.

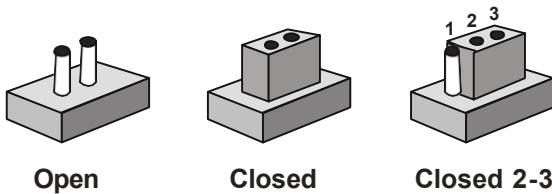
The table below shows the function of each of the board's jumpers

| Label | Function                    |
|-------|-----------------------------|
| JP1   | 40-Pin SPI & TPM Select     |
| JP2   | 40-Pin UART & RS-232 Select |
| JP3   | AT/ATX Select               |
| JP4   | Fan 5V/12V Voltage          |

### 2.3.1 Jumper Settings

You configure your card to match the needs of your application by setting jumpers. A jumper is the simplest kind of electric switch. 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 you connect the pins with the clip.

To "open" a jumper you remove the clip. Sometimes a jumper will have three pins, labeled 1, 2 and 3. In this case you would connect either pins 1 and 2 or 2 and 3.

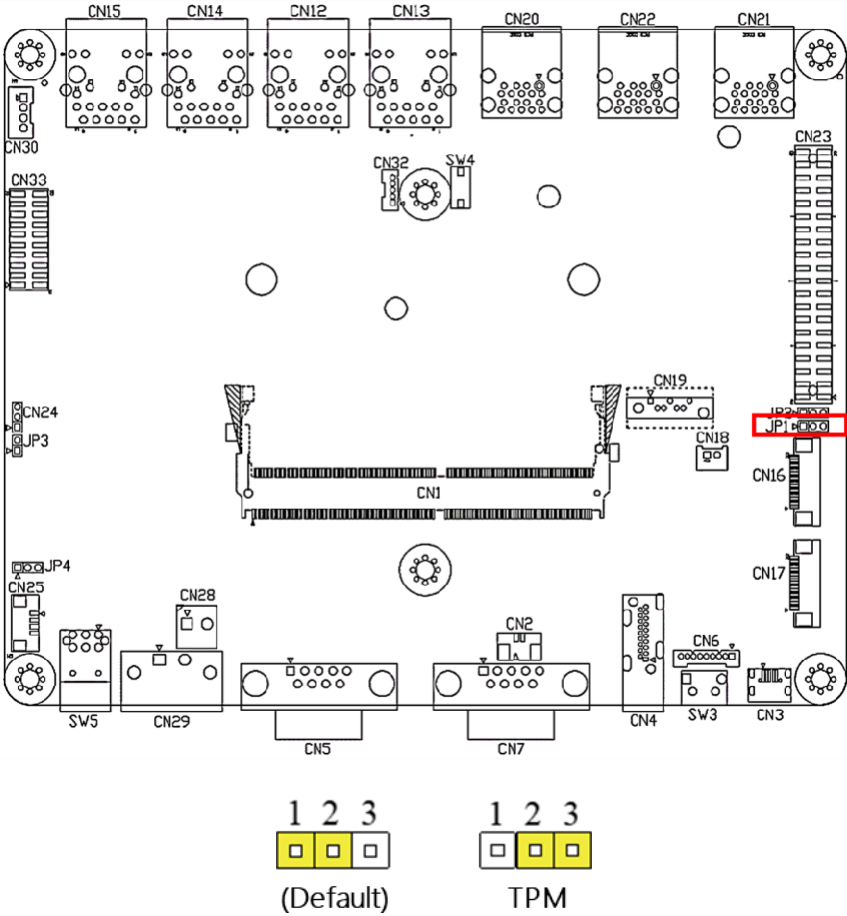


A pair of needle-nose pliers may be helpful when working with jumpers.

If you have any doubts about the best hardware configuration for your application, contact your local distributor or sales representative before you make any change.

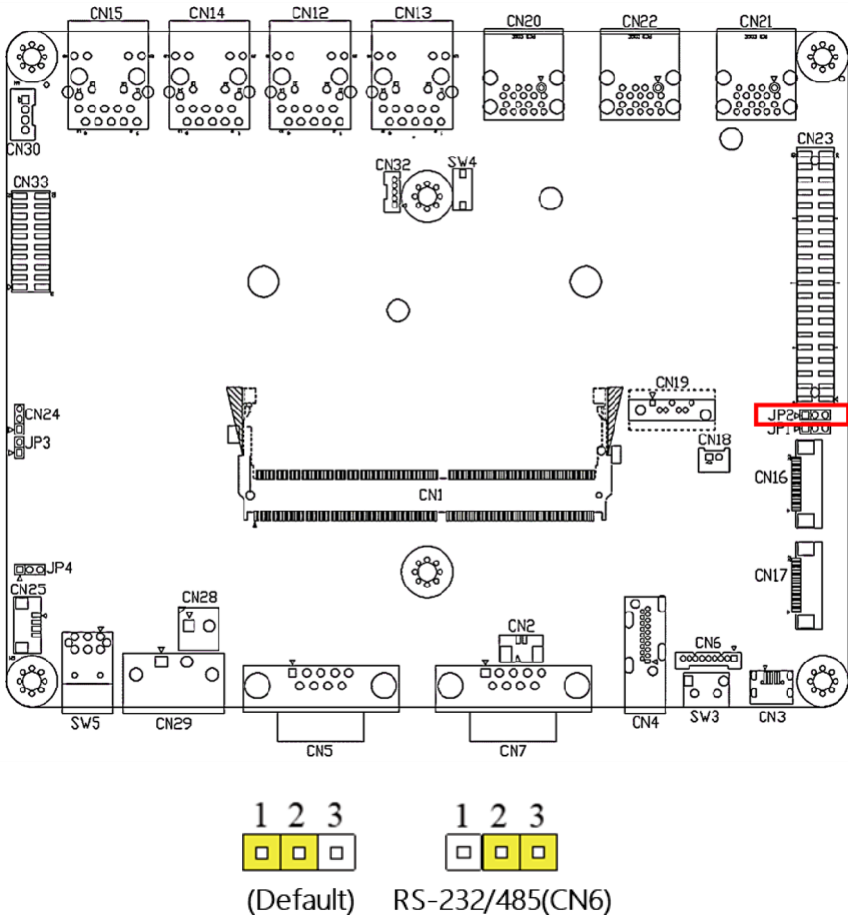
Generally, you simply need a standard cable to make most connections.

### 2.3.2 40-Pin SPI & TPM Select (JP1)



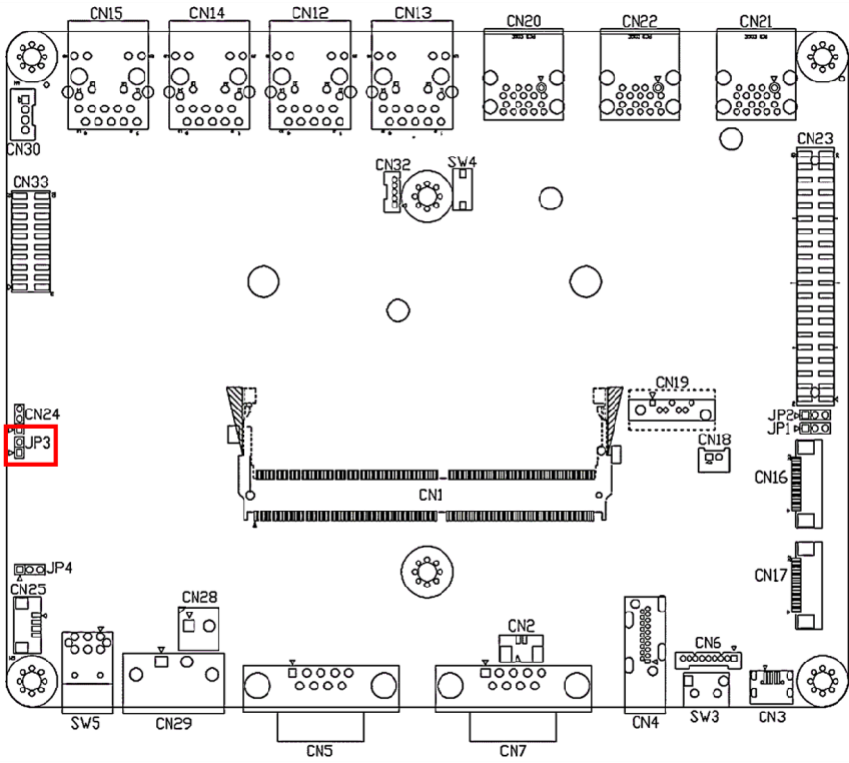
| Pin | Function                       |
|-----|--------------------------------|
| 1-2 | 40-Pin Extension I/O (Default) |
| 2-3 | TPM                            |

### 2.3.3 40-Pin UART & RS-232 Select (JP2)



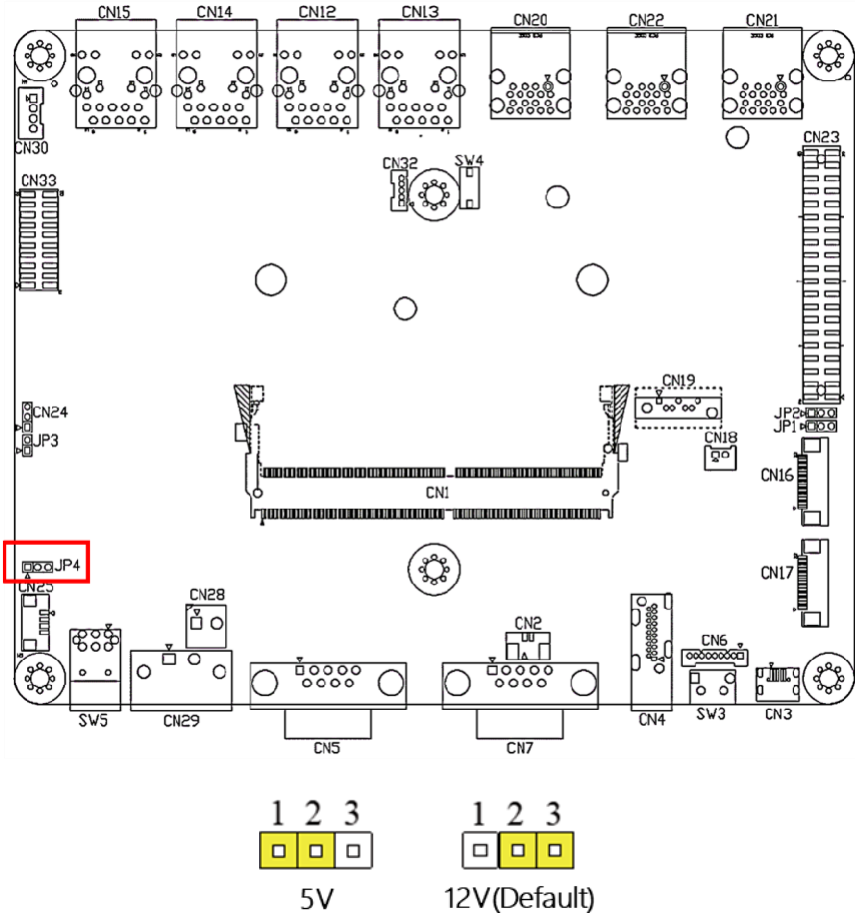
| Pin | Function                       |
|-----|--------------------------------|
| 1-2 | 40-Pin Extension I/O (Default) |
| 2-3 | RS-232/485(CN6)                |

### 2.3.4 AT/ATX Mode Selection (JP3)



| Pin | Function            |
|-----|---------------------|
| 1-2 | Open AT             |
| 1-2 | Close ATX (Default) |

### 2.3.5 Fan 5V/12V Voltage Selection (JP4)



## 2.4 List of Connectors

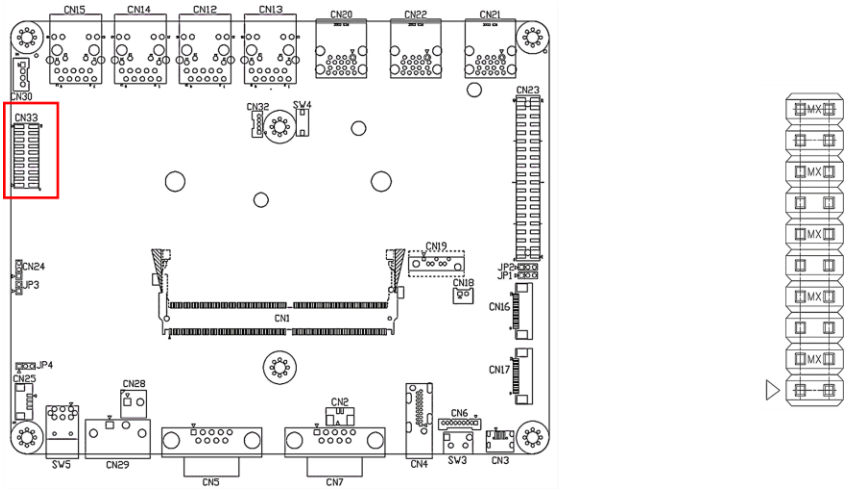
The board has a number of connectors that allow you to configure your system to suit your application.

The table below shows the function of each of the board's connectors

| Label | Function                          |
|-------|-----------------------------------|
| CN1   | Jetson Orin Nano Connector        |
| CN2   | RTC Battery Connector             |
| CN3   | Micro USB 2.0 for Flash Connector |
| CN4   | HDMI Connector                    |
| CN5   | RS-232/422/485 Connector          |
| CN6   | RS-232/422/485 Internal Connector |
| CN7   | CANBus Connector                  |
| CN8   | M.2 2230 E-Key                    |
| CN9   | M.2 2280 M-Key                    |
| CN10  | Nano SIM Slot                     |
| CN11  | M.2 2242/3042/3052 B-Key          |
| CN12  | PoE GbE RJ-45 (ETH)               |
| CN13  | PoE GbE RJ-45 (ETH)               |
| CN14  | PoE GbE RJ-45 (ETH)               |
| CN15  | PoE GbE RJ-45 (ETH)               |
| CN16  | MIPI CSI-2 FPC Connector (CSI0/1) |
| CN17  | MIPI CSI-2 FPC Connector (CSI2/3) |
| CN18  | SATA 5V Power Connector           |
| CN19  | SATA Connector                    |
| CN20  | USB 3.2 Gen 2 Connector           |
| CN21  | USB 3.2 Gen 2 Connector           |
| CN22  | USB 3.2 Gen 2 Connector           |
| CN23  | 40 Pin Extension I/O              |
| CN25  | Fan Connector                     |
| CN26  | Debug UART                        |
| CN28  | Internal Power Connector          |
| CN29  | DC In Connector (5.0mm)           |
| CN30  | PoE Power Connector               |
| CN33  | NC-SI Connector                   |
| SW1   | RS-232/422/485 Select             |
| SW2   | RS-232/422/485 Select             |

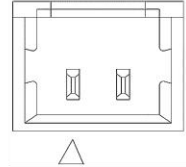
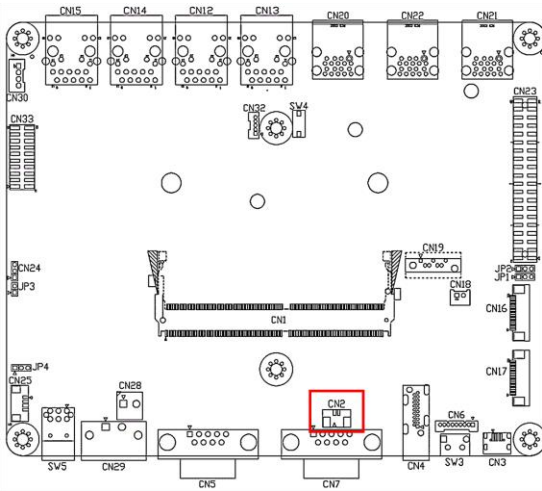
| Label | Function        |
|-------|-----------------|
| SW3   | Recovery Button |
| SW4   | Reset Button    |
| SW5   | Power Button    |

### 2.4.1 NC-SI Connector (CN27)



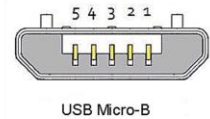
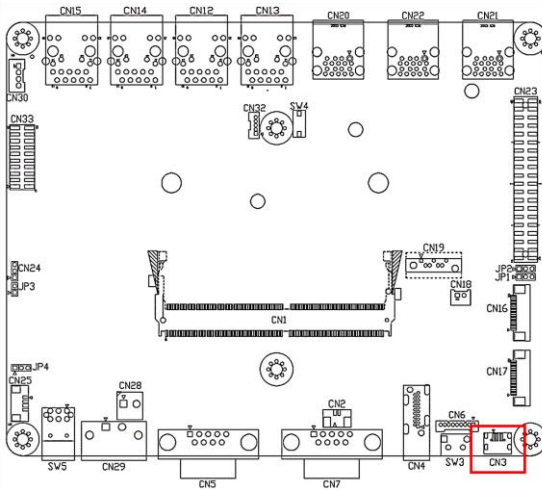
| Pin | Signal        | Pin | Signal       |
|-----|---------------|-----|--------------|
| 1   | 3.3V_AO       | 2   | 5V_AO        |
| 3   | Debug UART TX | 4   | NC_SI_TXD0   |
| 5   | Debug UART RX | 6   | NC_SI_TXD1   |
| 7   | I2C1 SCL      | 8   | NC_SI_RXD0   |
| 9   | I2C1 SDA      | 10  | NC_SI_RXD1   |
| 11  | System Reset  | 12  | NC_SI_CLK_IN |
| 13  | GND           | 14  | NC_SI_CRB    |
| 15  | Button power  | 16  | NC_SI_TX_EN  |
| 17  | GND           | 18  | OOB_UART_TX  |
| 19  | 5V_SYS        | 20  | OOB_UART_RX  |

## 2.4.2 RTC Battery Connector (CN2)



| Pin | Signal   | Pin | Signal   |
|-----|----------|-----|----------|
| 1   | Positive | 2   | Negative |

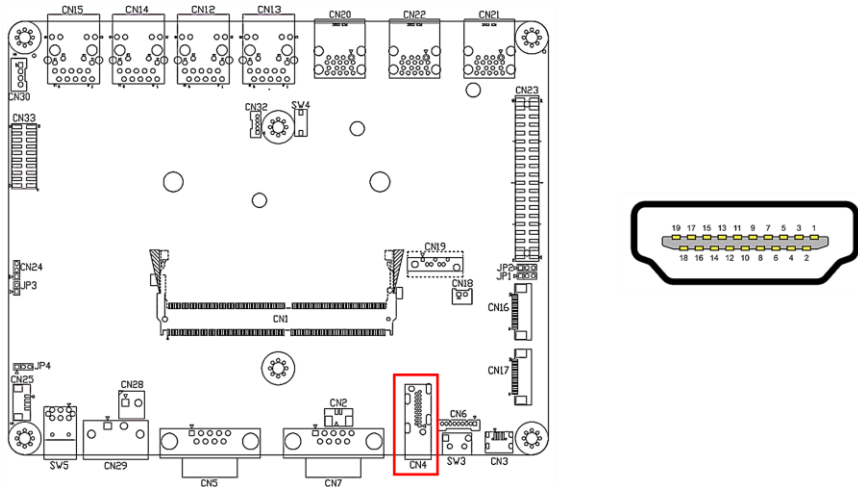
## 2.4.3 Micro USB 2.0 for Flash OS (CN3)



| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 1   | +5V    | 2   | USB1-  |

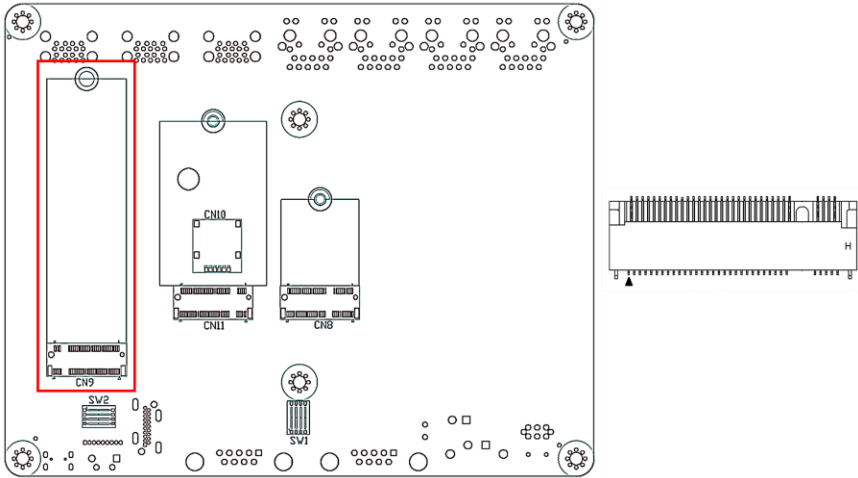
| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 3   | USB1+  | 4   |        |
| 5   | GND    |     |        |

## 2.4.4 HDMI Connector (CN5)



| Pin | Signal       | Pin | Signal       |
|-----|--------------|-----|--------------|
| 1   | HDMI_DATA2_P | 2   | GND          |
| 3   | HDMI_DATA2_N | 4   | HDMI_DATA1_P |
| 5   | GND          | 6   | HDMI_DATA1_N |
| 7   | HDMI_DATA0_P | 8   | GND          |
| 9   | HDMI_DATA0_N | 10  | HDMI_CLK_P   |
| 11  | GND          | 12  | HDMI_CLK_N   |
| 13  | NC           | 14  | NC           |
| 15  | HDMI_SCL     | 16  | HDMI_SDA     |
| 17  | GND          | 18  | HDMI_PWR     |
| 19  | HDMI_HDP     |     |              |

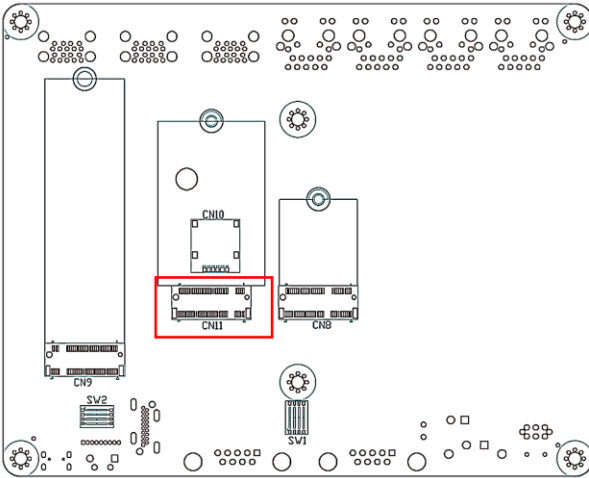
## 2.4.5 M.2 2280 M-Key (CN9)



| Pin | Signal   | Signal  | Pin |
|-----|----------|---------|-----|
| 74  | 3.3 V    | GND     | 75  |
| 72  | 3.3 V    | GND     | 73  |
| 70  | 3.3 V    | GND     | 71  |
| 68  | SUSCLK   | PEDET   | 69  |
|     |          | NC      | 67  |
|     | Key M    | Key M   |     |
|     | Key M    | Key M   |     |
|     | Key M    | Key M   |     |
|     | Key M    | Key M   |     |
| 58  | NC       | GND     | 57  |
| 56  | NC       | REFCLKp | 55  |
| 54  | PEWAKE#  | REFCLKn | 53  |
| 52  | CLKREQ#  | GND     | 51  |
| 50  | PERST#   | PETp0   | 49  |
| 48  | NC       | PETn0   | 47  |
| 46  | NC       | GND     | 45  |
| 44  | ALERT#   | PERp0   | 43  |
| 42  | SMB_DATA | PERn0   | 41  |
| 40  | SMB_CLK  | GND     | 39  |
| 38  | DEVSLP   | PETp1   | 37  |
| 36  | NC       | PETn1   | 35  |
| 34  | NC       | GND     | 33  |

| Pin | Signal  | Signal | Pin |
|-----|---------|--------|-----|
| 32  | NC      | PERp1  | 31  |
| 30  | NC      | PERn1  | 29  |
| 28  | NC      | GND    | 27  |
| 26  | NC      | PETp2  | 25  |
| 24  | NC      | PETn2  | 23  |
| 22  | NC      | GND    | 21  |
| 20  | NC      | PERp2  | 19  |
| 18  | 3.3 V   | PERn2  | 17  |
| 16  | 3.3 V   | GND    | 15  |
| 14  | 3.3 V   | PETp3  | 13  |
| 12  | 3.3 V   | PETn3  | 11  |
| 10  | DAS/DSS | GND    | 9   |
| 8   | NC      | PERp3  | 7   |
| 6   | NC      | PERn3  | 5   |
| 4   | 3.3 V   | GND    | 3   |
| 2   | 3.3 V   | GND    | 1   |

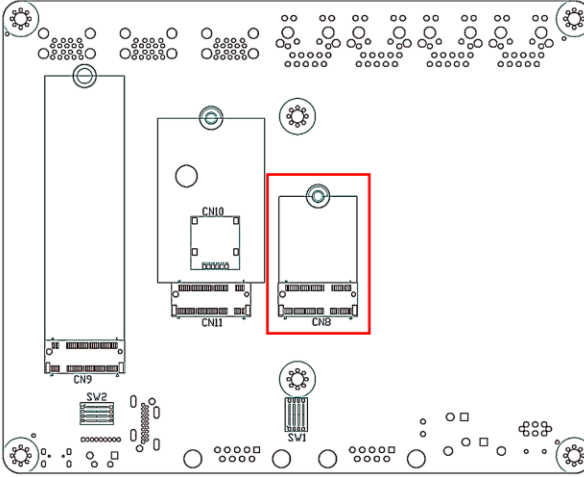
#### 2.4.6 M.2 2242/3042/3052 B-Key (CN11)



| Pin | Signal        | Signal   | Pin |
|-----|---------------|----------|-----|
| 74  | 3.3 V         | CONFIG_2 | 75  |
| 72  | 3.3 V         | GND      | 73  |
| 70  | 3.3 V         | GND      | 71  |
| 68  | SUSCLK(32kHz) | CONFIG_1 | 69  |

| Pin | Signal                | Signal     | Pin |
|-----|-----------------------|------------|-----|
| 66  | SIM DETECT            | RESET#     | 67  |
| 64  | COEX_RXD              | ANTCTL3    | 65  |
| 62  | COEX_TXD              | ANTCTL2    | 63  |
| 60  | COEX3                 | ANTCTL1    | 61  |
| 58  | NC                    | ANTCTL0    | 59  |
| 56  | NC                    | GND        | 57  |
| 54  | PEWAKE#               | NC         | 55  |
| 52  | CLKREQ#               | NC         | 53  |
| 50  | PERST#                | GND        | 51  |
| 48  | UIM2-PWR              | NC         | 49  |
| 46  | UIM2-RESET            | NC         | 47  |
| 44  | UIM2-CLK              | GND        | 45  |
| 42  | UIM2-DATA             | NC         | 43  |
| 40  | GPIO_0/SMB_CLK        | NC         | 41  |
| 38  | DEVSLP                | GND        | 39  |
| 36  | UIM1-PWR              | USB3.1-Tx+ | 37  |
| 34  | UIM1-DATA             | USB3.1-Tx- | 35  |
| 32  | UIM1-CLK              | GND        | 33  |
| 30  | UIM1-RESET            | USB3.1-Rx+ | 31  |
| 28  | GPIO_8                | USB3.1-Rx- | 29  |
| 26  | GPIO_10               | GND        | 27  |
| 24  | GPIO_7                | DPR        | 25  |
| 22  | GPIO_6                | GPIO_11    | 23  |
| 20  | GPIO_5                | CONFIG_0   | 21  |
|     |                       | Key B      |     |
|     |                       | Key B      |     |
|     |                       | Key B      |     |
|     |                       | Key B      |     |
|     |                       | GND        | 11  |
| 10  | GPIO_9/DAS/DSS/LED_1# | USB_D-     | 9   |
| 8   | W_DISABLE1#           | USB_D+     | 7   |
| 6   | FULL_CARD_POWER_OFF#  | GND        | 5   |
| 4   | 3.3 V                 | GND        | 3   |
| 2   | 3.3 V                 | CONFIG_3   | 1   |

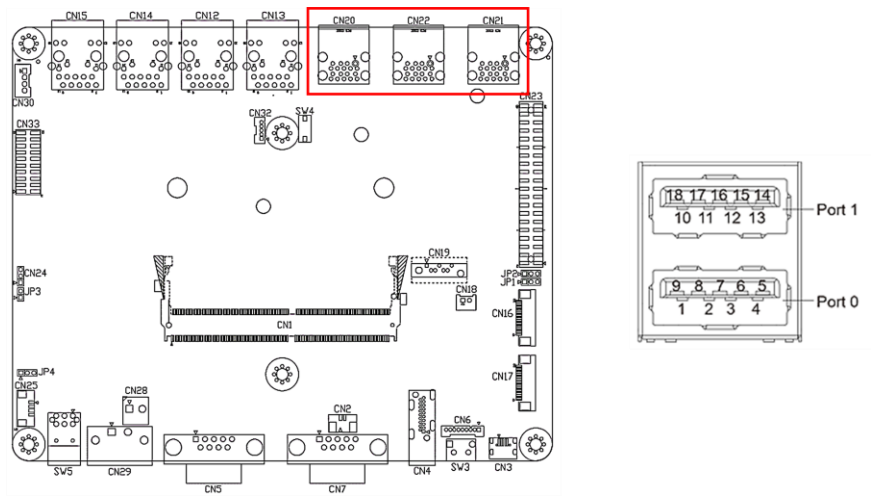
## 2.4.7 M.2 2230 E-Key (CN8)



| Pin | Signal        | Signal            | Pin |
|-----|---------------|-------------------|-----|
| 74  | 3.3V          | GND               | 75  |
| 72  | 3.3V          | RESERVED/REFCLKn1 | 73  |
| 70  | NC            | RESERVED/REFCLKp1 | 71  |
| 68  | NC            | GND               | 69  |
| 66  | NC            | RESERVED/PERn1    | 67  |
| 64  | RESERVED      | RESERVED/PERp1    | 65  |
| 62  | ALERT#        | GND               | 63  |
| 60  | I2C_CLK       | RESERVED/PETn1    | 61  |
| 58  | I2C_DATA      | RESERVED/PETp1    | 59  |
| 56  | W_DISABLE1#   | GND               | 57  |
| 54  | W_DISABLE2#   | PEWAKE0#          | 55  |
| 52  | PERST0#       | CLKREQ0#          | 53  |
| 50  | SUSCLK(32kHz) | GND               | 51  |
| 48  | NC            | REFCLKn0          | 49  |
| 46  | NC            | REFCLKp0          | 47  |
| 44  | NC            | GND               | 45  |
| 42  | NC            | PERn0             | 43  |
| 40  | NC            | PERp0             | 41  |
| 38  | NC            | GND               | 39  |
| 36  | NC            | PETn0             | 37  |
| 34  | NC            | PETp0             | 35  |
| 32  | NC            | GND               | 33  |

| Pin | Signal     | Signal | Pin |
|-----|------------|--------|-----|
|     |            | Key E  |     |
|     |            | Key E  |     |
|     |            | Key E  |     |
|     |            | Key E  |     |
|     |            | NC     | 23  |
| 22  | NC         | NC     | 21  |
| 20  | UART WAKE# | NC     | 19  |
| 18  | GND        | NC     | 17  |
| 16  | NC         | NC     | 15  |
| 14  | I2S SD_OUT | NC     | 13  |
| 12  | I2S SD_IN  | NC     | 11  |
| 10  | I2S WS     | NC     | 9   |
| 8   | I2S SCK    | GND    | 7   |
| 6   | NC         | USB_D- | 5   |
| 4   | 3.3V       | USB_D+ | 3   |
| 2   | 3.3V       | GND    | 1   |

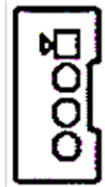
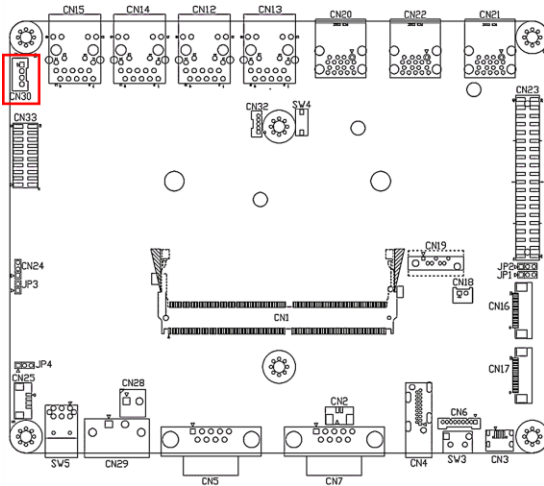
### 2.4.8 USB 3.2 Gen 2 Port (CN20/CN21/CN22)



| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| U1  | VBUS_1 | U10 | VBUS_2 |
| U2  | (A)D-  | U11 | (B)D-  |
| U3  | (A)D+  | U12 | (B)D+  |
| U4  | GND    | U13 | GND    |

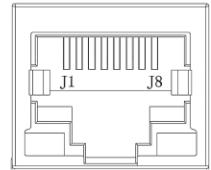
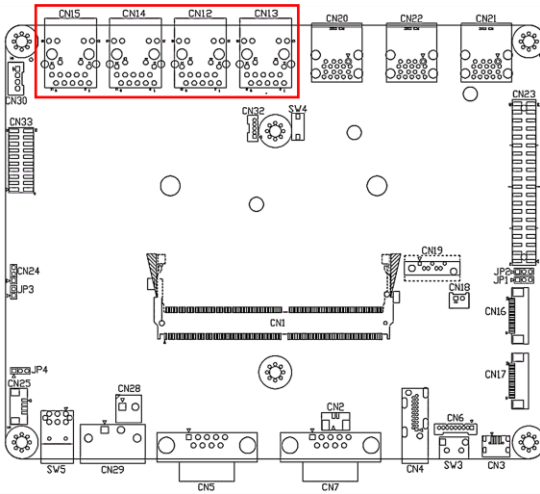
| Pin | Signal   | Pin | Signal   |
|-----|----------|-----|----------|
| U5  | (A)SSRX- | U14 | (B)SSRX- |
| U6  | (A)SSRX+ | U15 | (B)SSRX+ |
| U7  | GND      | U16 | GND      |
| U8  | (A)SSTX- | U17 | (B)SSTX- |
| U9  | (A)SSTX+ | U18 | (B)SSTX+ |

### 2.4.9 PoE Power Connector for use with PER-P32D (CN30)



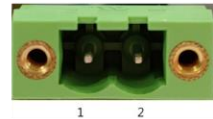
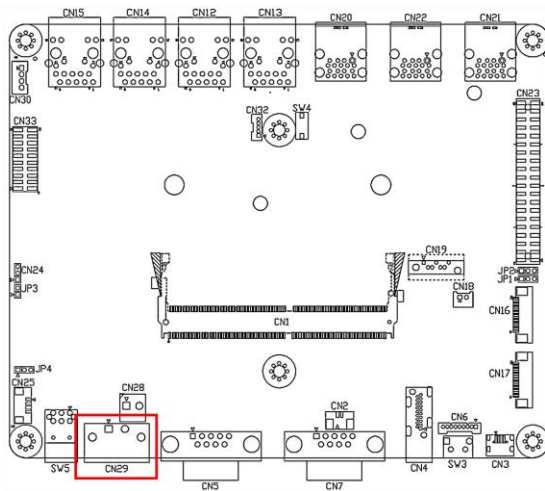
| CN30 Pin | Function |
|----------|----------|
| 1        | V+       |
| 2        | V+       |
| 3        | V-       |
| 4        | V-       |

## 2.4.10 PoE GbE RJ-45 (CN12/CN13/CN14/CN15)



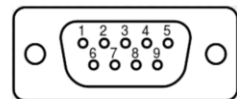
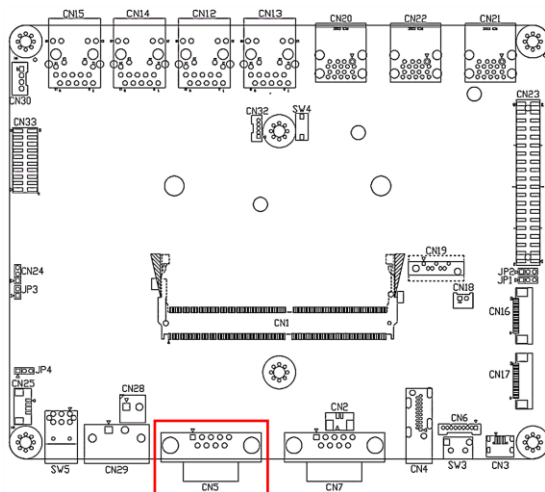
| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 1   | MDI0+  | 2   | MDI0-  |
| 3   | MDI1+  | 4   | MDI1-  |
| 5   | MDI2+  | 6   | MDI2-  |
| 7   | MDI3+  | 8   | MDI3-  |

### 2.4.11 DC in Connector (5.0mm) (CN29)



| Pin | Signal      | Pin | Signal      |
|-----|-------------|-----|-------------|
| 1   | DC Positive | 2   | DC Negative |

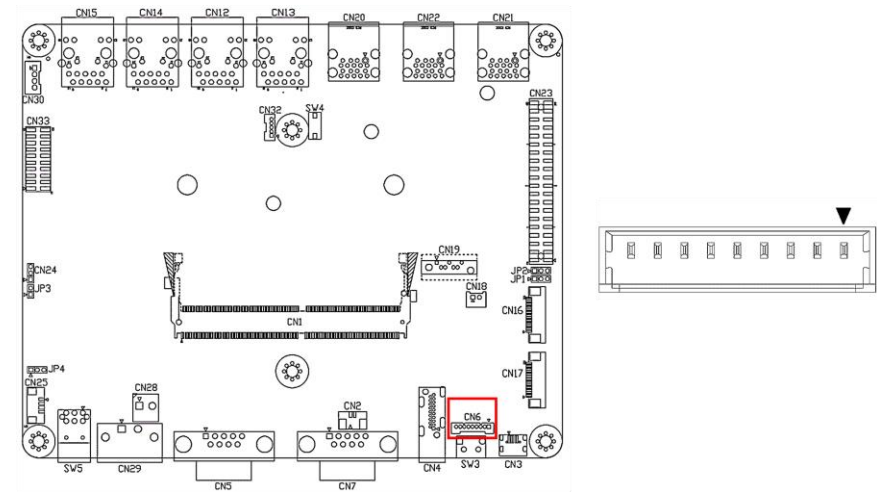
### 2.4.12 COM Port (CN5/SW1)



| Pin | RS-232 | RS-422 | RS-485 |
|-----|--------|--------|--------|
| 1   |        | TX-    | D-     |

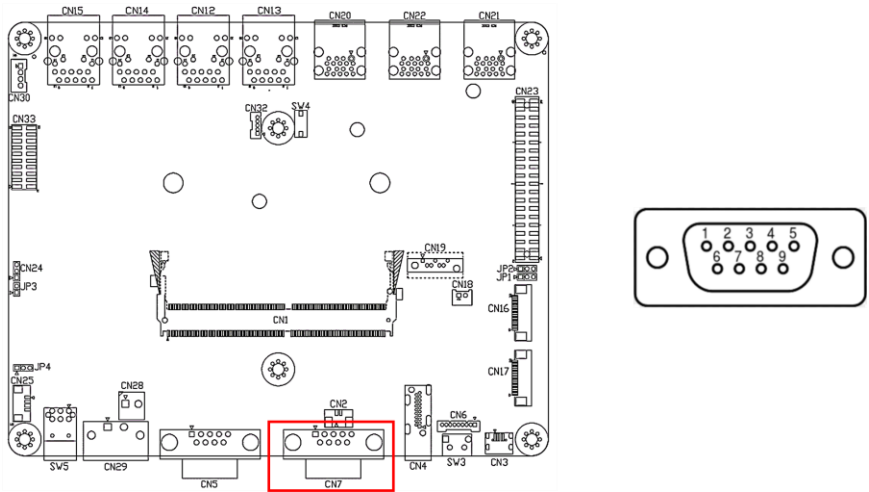
| Pin | RS-232 | RS-422 | RS-485 |
|-----|--------|--------|--------|
| 2   | RXD    | TX+    | D+     |
| 3   | TXD    | RX+    |        |
| 4   |        | RX-    |        |
| 5   | GND    | GND    | GND    |
| 6   |        |        |        |
| 7   |        |        |        |
| 8   |        |        |        |
| 9   |        |        |        |

### 2.4.13 COM Port Connector (/dev/ttyTHS1) (CN6/SW2)



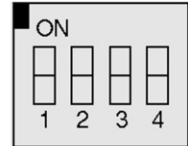
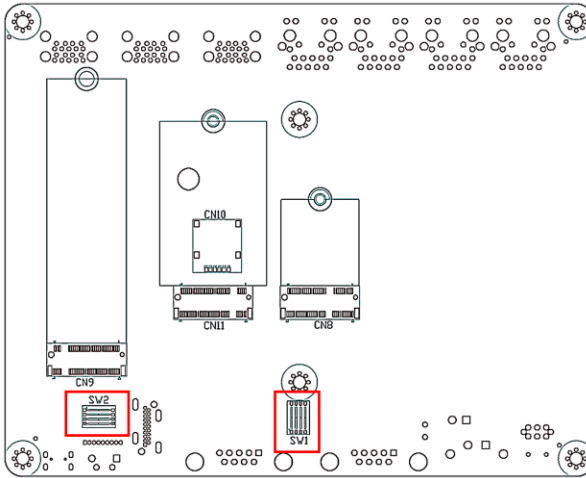
| Pin | RS-232 | RS-422 | RS-485 |
|-----|--------|--------|--------|
| 1   |        | TX-    | D-     |
| 2   |        | TX+    |        |
| 3   | RXD    | RX+    | D+     |
| 4   |        | RX-    |        |
| 5   | TXD    |        |        |
| 6   |        |        |        |
| 7   |        |        |        |
| 8   |        |        |        |
| 9   | GND    | GND    | GND    |

## 2.4.14 CANBus Connector (CN7)



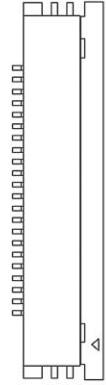
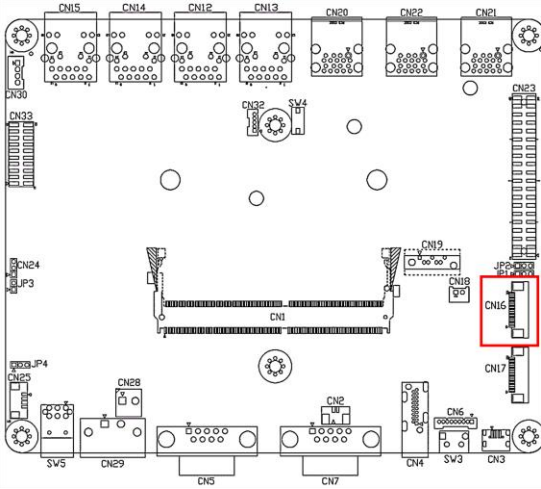
| Pin | Function |
|-----|----------|
| 1   |          |
| 2   | CAN L    |
| 3   | GND      |
| 4   |          |
| 5   |          |
| 6   | GND      |
| 7   | CAN H    |
| 8   |          |
| 9   |          |

### 2.4.15 RS-232/422/485 Switch (SW1/SW2)



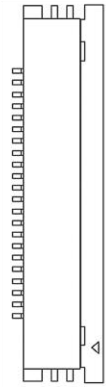
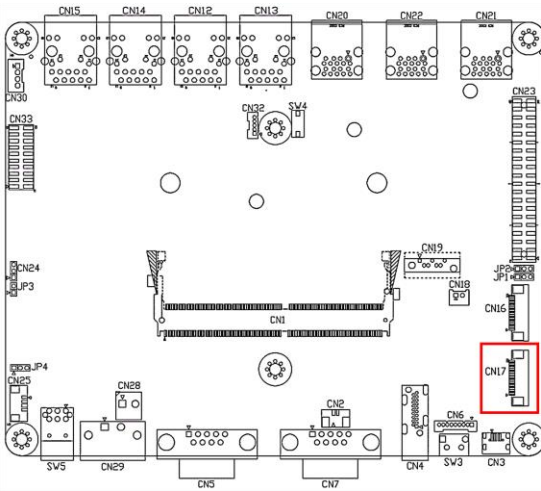
| Mode                                           | S-1 | S-2 | S-3 | S-4 |
|------------------------------------------------|-----|-----|-----|-----|
| 1T/1R RS-232                                   | On  | On  |     |     |
| 1T/1R RS-422                                   | On  | Off |     |     |
| 1T/1R RS-485                                   | Off | On  |     |     |
| Low power shutdown                             | Off | Off |     |     |
| 250kbps for RS-232 and RS-485                  |     |     |     | On  |
| RS-232 to 3Mbps and RS-485 to 20Mbps           |     |     |     | Off |
| Enable RS-485 bias and termination resistors.  |     |     | On  |     |
| Disable RS-485 bias and termination resistors. |     |     | Off |     |

## 2.4.16 MIPI CSI-2 FPC Connector (CSI0/1) (CN16)



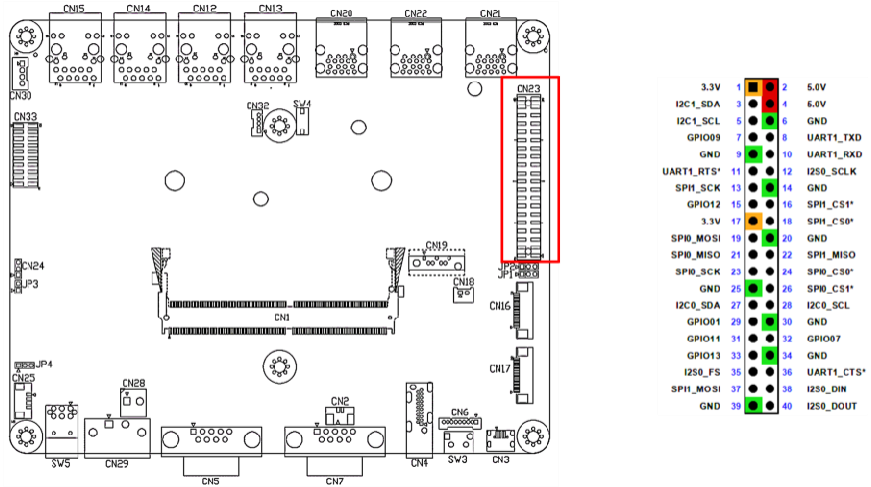
| Pin | Signal    | Pin | Signal     |
|-----|-----------|-----|------------|
| 1   | +3.3V     | 12  | CSI0_D0_N  |
| 2   | CAM0 SDA  | 13  | GND        |
| 3   | CAM0 SCL  | 14  | CSI1_CLK_P |
| 4   | GND       | 15  | CSI1_CLK_N |
| 5   | CAM0 MCLK | 16  | GND        |
| 6   | CAM0 PWDN | 17  | CSI1_D1_P  |
| 7   | GND       | 18  | CSI1_D1_N  |
| 8   | CSI0_D1_P | 19  | GND        |
| 9   | CSI0_D1_N | 20  | CSI1_D0_P  |
| 10  | GND       | 21  | CSI1_D0_N  |
| 11  | CSI0_D0_P | 22  | GND        |

### 2.4.17 MIPI CSI-2 FPC Connector (CSI2/3) (CN17)



| Pin | Signal    | Pin | Signal     |
|-----|-----------|-----|------------|
| 1   | +3.3V     | 12  | CSI3_D0_N  |
| 2   | CAM1 SDA  | 13  | GND        |
| 3   | CAM1 SCL  | 14  | CSI2_CLK_P |
| 4   | GND       | 15  | CSI2_CLK_N |
| 5   | CAM1 MCLK | 16  | GND        |
| 6   | CAM1 PWDN | 17  | CSI2_D1_P  |
| 7   | GND       | 18  | CSI2_D1_N  |
| 8   | CSI3_D1_P | 19  | GND        |
| 9   | CSI3_D1_N | 20  | CSI2_D0_P  |
| 10  | GND       | 21  | CSI2_D0_N  |
| 11  | CSI3_D0_P | 22  | GND        |

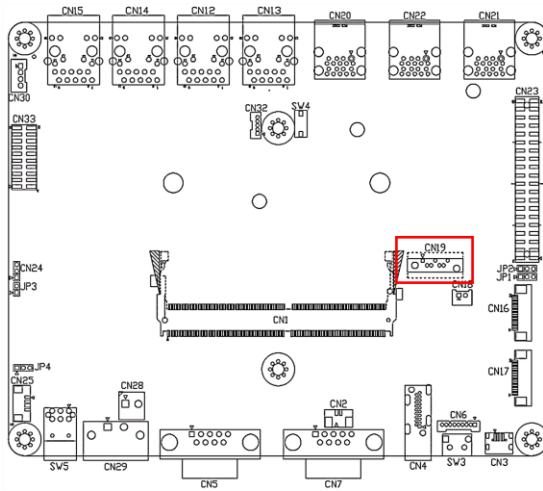
## 2.4.18 Expansion Header Connections (CN23)



| Header Pin # | Module Pin Name | Module Pin # | SoC Pin Name               | Default Usage / Description | Alternate Functionality         | Type/ Dir            | Pin Drive or Power Pin Max Current | SoC GPIO Port # | Power-on Default | PU/PD on Module | Notes |
|--------------|-----------------|--------------|----------------------------|-----------------------------|---------------------------------|----------------------|------------------------------------|-----------------|------------------|-----------------|-------|
| 1            | -               | -            | -                          | Main 3.3V Supply            | -                               | Power (input)        | 1A                                 | -               | -                | -               | 1     |
| 2            | -               | -            | -                          | Main 5.0V Supply            | -                               | Power (input/output) | 1A                                 | -               | -                | -               | 1     |
| 3            | I2C1_SDA        | 191          | GP16_I2C8_DAT              | I2C #1 Data                 | -                               | Bidir OD             | ±2 mA                              | PDD.02          | z                | 2.2KΩ PU        | 2     |
| 4            | -               | -            | -                          | Main 5.0V Supply            | -                               | Power                | 1A                                 | -               | -                | -               | -     |
| 5            | I2C1_SCL        | 189          | GP15_I2C8_CLK              | I2C #1 Clock                | -                               | Bidir OD             | ±2 mA                              | PDD.01          | z                | 2.2KΩ PU        | 2     |
| 6            | -               | -            | -                          | Ground                      | -                               | Ground               | -                                  | -               | -                | -               | -     |
| 7            | GPIO09          | 211          | GP167                      | GPIO                        | Audio Primary Clock             | Bidir/Output         | ±20uA                              | PAC.06          | pd               | -               | 3     |
| 8            | UART1_TXD       | 203          | GP70_UART1_TXD_BOOT2_STRAP | UART #1 Transmit            | GPIO                            | Output/Bidir         | ±20uA                              | PR.02           | pd               | -               | 3     |
| 9            | -               | -            | -                          | Ground                      | -                               | Ground               | -                                  | -               | -                | -               | -     |
| 10           | UART1_RXD       | 205          | GP71_UART1_RXD             | UART #1 Receive             | GPIO                            | Input/Bidir          | ±20uA                              | PR.03           | pd               | -               | 3     |
| 11           | UART1_RTS*      | 207          | GP72_UART1_RTS_N           | GPIO                        | UART #2 Request to Send         | Bidir/Output         | ±20uA                              | PR.04           | pd               | -               | 3     |
| 12           | I2S0_SCLK       | 199          | GP122                      | GPIO                        | Audio I2S #0 Clock              | Bidir                | ±20uA                              | PH.07           | pd               | -               | 3     |
| 13           | SPI1_SCK        | 106          | GP36_SPI3_CLK              | GPIO                        | SPI #1 Shift Clock              | Bidir/Output         | ±20uA                              | PY.00           | pd               | -               | 3     |
| 14           | -               | -            | -                          | Ground                      | -                               | Ground               | -                                  | -               | -                | -               | -     |
| 15           | GPIO12          | 218          | GP88_PWM1                  | GPIO                        | -                               | Bidir                | ±20uA                              | PN.01           | z                | -               | 3     |
| 16           | SPI1_CS1*       | 112          | GP40_SPI3_CS1_N            | GPIO                        | SPI #1 Chip Select #1           | Bidir/Output         | ±20uA                              | PY.04           | z                | -               | 3     |
| 17           | -               | -            | -                          | Main 3.3V Supply            | -                               | Power                | 1A                                 | -               | -                | -               | 1     |
| 18           | SPI1_CS0*       | 110          | GP39_SPI3_CS0_N            | GPIO                        | SPI #0 Chip Select #0           | Bidir/Output         | ±20uA                              | PZ.06           | z                | -               | 3     |
| 19           | SPI0_MOSI       | 89           | GP49_SPI1_MOSI             | GPIO                        | SPI #0 Primary Out/Secondary In | Bidir/Output         | ±20uA                              | PZ.05           | pd               | -               | 3     |
| 20           | -               | -            | -                          | Ground                      | -                               | Ground               | -                                  | -               | -                | -               | -     |
| 21           | SPI0_MISO       | 93           | GP48_SPI1_MISO             | GPIO                        | SPI #0 Primary In/Secondary Out | Bidir/Input          | ±20uA                              | PZ.04           | pd               | -               | 3     |
| 22           | SPI1_MISO       | 108          | GP37_SPI3_MISO             | GPIO                        | SPI #1 Primary In/Secondary Out | Bidir/Input          | ±20uA                              | PY.01           | pd               | -               | 3     |
| 23           | SPI0_SCK        | 91           | GP47_SPI1_CLK              | GPIO                        | SPI #0 Shift Clock              | Bidir/Output         | ±20uA                              | PZ.03           | pd               | -               | 3     |

| Header Pin # | Module Pin Name | Module Pin # | SoC Pin Name     | Default Usage / Description | Alternate Functionality         | Type/ Dir      | Pin Drive or Power Pin Max Current | SoC GPIO Port # | Power-on Default | PU/PD on Module | Notes |
|--------------|-----------------|--------------|------------------|-----------------------------|---------------------------------|----------------|------------------------------------|-----------------|------------------|-----------------|-------|
| 24           | SPI0_CS0*       | 95           | GP50_SPI1_CS0_N  | GPIO                        | SPI #0 Chip Select #0           | Bidir/Output   | ±20uA                              | PZ.06           | z                |                 | 3     |
| 25           | -               | -            | -                | Ground                      | -                               | Ground         | -                                  | -               | -                | -               | -     |
| 26           | SPI0_CS1*       | 97           | GP51_SPI1_CS1_N  | GPIO                        | SPI #0 Chip Select #1           | Bidir/Output   | ±20uA                              | PZ.07           | pu               |                 | 3     |
| 27           | I2C0_SDA        | 187          | GP14_I2C2_DAT    | I2C #0 Data                 | GPIO                            | Bidir OD/Bidir | ±2 mA                              | PDD.00          | z                | 1.5KΩ PU        | 2     |
| 28           | I2C0_SCL        | 185          | GP13_I2C2_CLK    | I2C #0 Clock                | GPIO                            | Bidir OD/Bidir | ±2 mA                              | PCC.07          | z                | 1.5KΩ PU        | 2     |
| 29           | GPIO01          | 118          | GP65             | GPIO                        | General Purpose Clock #0        | Bidir/Output   | ±20uA                              | PQ.05           | pd               |                 | 3     |
| 30           | -               | -            | -                | Ground                      | -                               | Ground         | -                                  | -               | -                | -               | -     |
| 31           | GPIO11          | 216          | GP66             | GPIO                        | General Purpose Clock #1        | Bidir/Output   | ±20uA                              | PQ.06           | pd               |                 | 3     |
| 32           | GPIO07          | 206          | GP113_PWM7       | GPIO                        | PWM                             | Bidir/Output   | ±20uA                              | PG.06           | z                |                 | 3     |
| 33           | GPIO13          | 228          | GP115            | GPIO                        | PWM                             | Bidir/Output   | ±20uA                              | PH.00           | z                |                 | 3     |
| 34           | -               | -            | -                | Ground                      | -                               | Ground         | -                                  | -               | -                | -               | -     |
| 35           | I2S0_FS         | 197          | GP125            | GPIO                        | Audio I2S #0 Field Select       | Bidir          | ±20uA                              | PI.02           | pd               |                 | 3     |
| 36           | UART1_CTS*      | 209          | GP73_UART1_CTS_N | GPIO                        | UART #1 Clear to Send           | Bidir/Input    | ±20uA                              | PR.05           | pd               |                 | 3     |
| 37           | SPI1_MOSI       | 104          | GP38_SPI3_MOSI   | GPIO                        | SPI #1 Primary Out/Secondary In | Bidir/Output   | ±20uA                              | PY.02           | pd               |                 | 3     |
| 38           | I2S0_DIN        | 195          | GP124            | GPIO                        | Audio I2S #0 Data In            | Bidir/Input    | ±20uA                              | PI.01           | pd               |                 | 3     |
| 39           | -               | -            | -                | Ground                      | -                               | Ground         | -                                  | -               | -                | -               | -     |
| 40           | I2S0_DOUT       | 193          | GP123            | GPIO                        | Audio I2S #0 Data Out           | Bidir/Output   | ±20uA                              | PI.00           | pd               |                 | 3     |

## 2.4.19 SATA Connector (CN19)



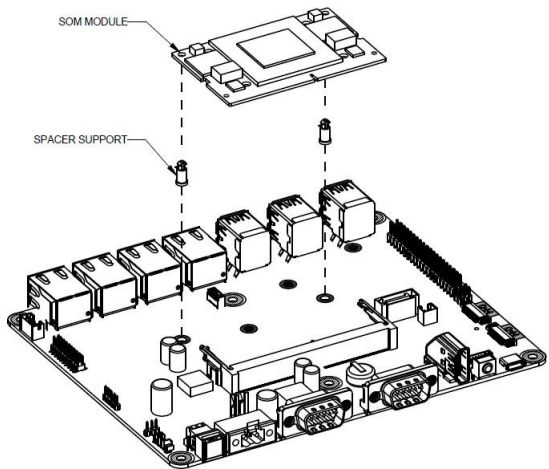
| Pin | Function |
|-----|----------|
| 1   | GND      |
| 2   | TX+      |
| 3   | TX-      |
| 4   | GND      |
| 5   | RX+      |
| 6   | RX-      |
| 7   | GND      |

## 2.5 Hardware Assembly

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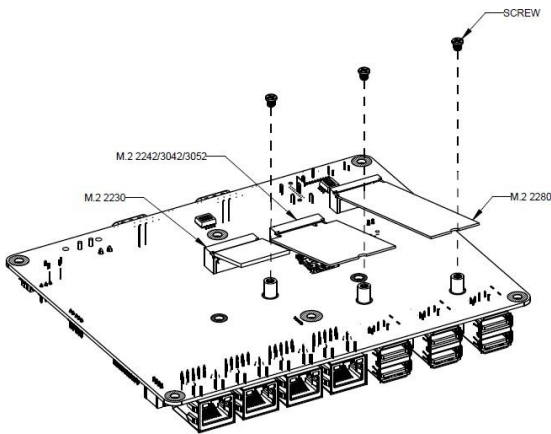
### 2.5.1 Module Installation

---



### 2.5.2 M.2 Module Installation

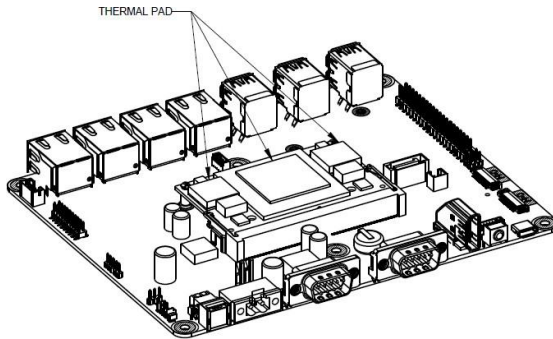
---



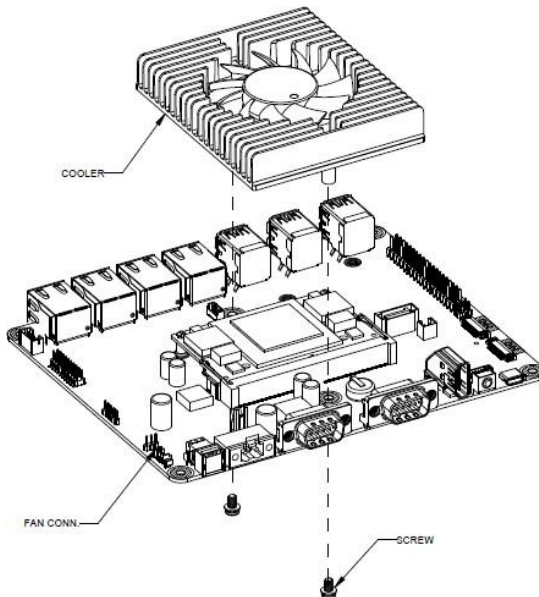
### 2.5.3 Active Cooler Installation

Ensure the SoM module is installed prior to cooler installation. Please also ensure a thermal pad is placed in-between the SoM module and the cooler module when installing.

1.



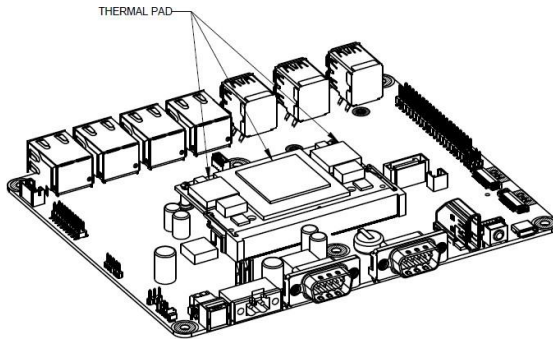
2.



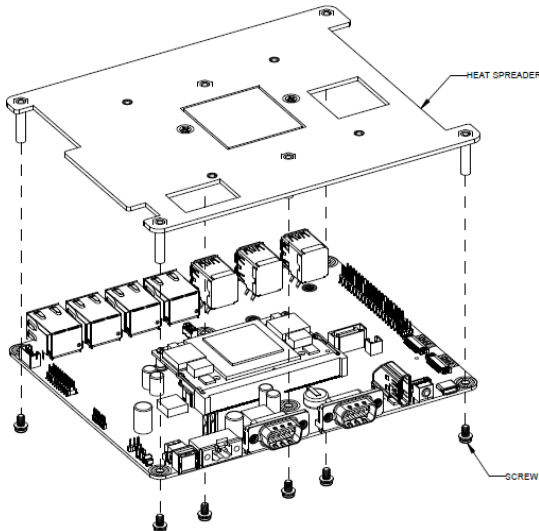
## 2.5.4 Heatspreader Installation

Ensure the SoM module is installed prior to heatspreader installation. Please also ensure a thermal pad is placed in-between the SoM module and the heatspreader when installing.

1.



2.

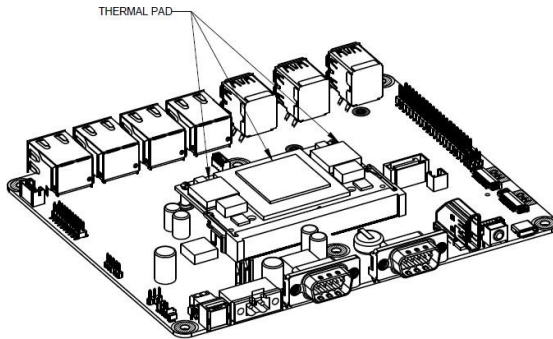


## 2.5.5 Heatsink Installation

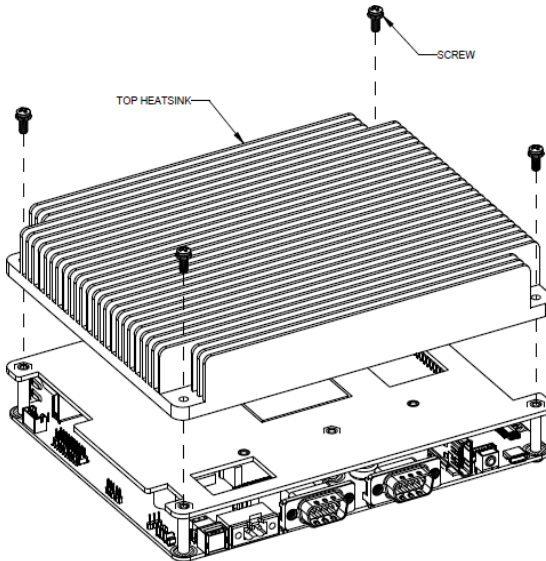
---

Ensure the SoM module is installed prior to heatsink installation. Please also ensure a thermal pad, followed by the heat plate, is placed in-between the SoM module and the top heatsink.

1.



2.



# Chapter 4

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OS User Guide

## 1.1 Introduction

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The NV8600 Nano AI Developer Kit's OS, Ubuntu/Linux version, and preinstalled SDK components are as follows:

For **Jetpack 6.2 (L4t 36.3)**

1. Jetpack 6.2, L4T 36.3.0
  - a. Ubuntu version: 22.04.4
  - b. Kernel version: 5.15.136-tegra
  - c. UEFI version: 36.3.0-gcid-36191598
2. Pre-installed NV components, deepstream
  - a. CUDA 12.2.1
  - b. cuDNN 8.9.4
  - c. TensorRT 8.6.2
  - d. OpenCV 4.8
  - e. Vulkan 1.3
  - f. VPI 3.1
  - g. NVIDIA Container Runtime 2.1
  - h. Multimedia API 36.3.0
  - i. Nsight Systems 2024.2
  - j. Nsight Graphics 2023.4
  - k. Nsight Perf SDK 2023.5
  - l. Deepstream 7.0

Default login user/password is:

Account: **devkit**

Password: **devkit**

## 1.2 Update Note

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Running \$ `sudo apt upgrade` command in terminal will overwrite the Aaeon kernel device tree(.dtb)/kernel image(Image)/bootloader in OS, which can lead to unexpected results including losing I/O ports.

So Aaeon default disable Nvidia apt Repo for updating Nvidia apt package.

AAEON maintains updated versions of BSP on the product page, which follow updates to the NVIDIA Jetpack software. Contact your AAEON representative or visit the product page to download the latest version of Aaeon BSP for your system:

<https://www.aaeon.com/en/>

### 1.3 Power Mode for NV8600 Nano AI Developer Kit

NVIDIA Jetson Orin Nano power mode can be selected and monitored by GUI, please refer to the following image:



Note: Power mode is dependent on DRAM size. For more detailed information please visit: <https://developer.nvidia.com/embedded/jetson-modules>

## 1.4 DIO/GPIO Setting Command for NV8600 Nano AI Developer Kit

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### 1. GPIO test command:

Please refer HW DIO/GPIO section for PIN Number and GPIO ID mapping. Take "PIN 2 <-> GPIO ID:PY.02" as an example on JP6 :

1. Set GPIO to 0  
\$ sudo gpioset -m time -u 300000 -b \$(sudo gpiofind "PY.02")=0
2. Read the input value of GPIO  
\$ sudo gpioget \$(sudo gpiofind "PY.02")

Note: Jp6 no need to export and set direction of the gpio, when using gpioget, the direction will auto change to input, and vice versa

### 2. FAN PWM test command:

To use FAN PWM as Normal PWM control

1. Stop NV fan control daemon  
\$ sudo systemctl stop nvfancontrol
2. Set PWM value  
\$ echo [PWM\_duty\_cycle] > /sys/devices/platform/pwm-fan/hwmon/hwmon<x>/pwm1

Where: [PWM\_duty\_cycle] is a value in the range [0,255]. <x> is a kernel enumerated number for fan hwmon.