BOXER-8222AI

Compact Fanless Embedded AI@Edge Box PC
with NVIDIA**®** Jetson Nano™
User's Manual 3rd Ed

Copyright Notice

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Packing List

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

Item	Quantity
● BOXER-8222AI	1
● Power Connector	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 at 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. 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 AC 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.

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.

产品中有毒有害物质或元素名称及含量

AAEON System   QO4-381 Rev.A0

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	×	○	○	○	○	○
外壳	○	○	○	○	○	○
中央处理器 与内存	×	○	○	○	○	○
硬盘	×	○	○	○	○	○
液晶模块	×	×	○	○	○	○
光驱	×	○	○	○	○	○
触控模块	×	○	○	○	○	○
电源	×	○	○	○	○	○
电池	×	○	○	○	○	○

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。

备注：
一、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。
二、上述部件物质中央处理器、内存、硬盘、光驱、电源为选购品。
三、上述部件物质液晶模块、触控模块仅一体机产品适用。

Compact Fanless Embedded AI@Edge Box PC

BOXER-8222AI

Hazardous and Toxic Materials List

AAEON System   QO4-381 Rev.A0

Component Name	Hazardous or Toxic Materials or Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (CrVI))	Polybrominated biphenyls (PBBs)	Polybrominated diphenyl ethers (PBDEs)
PCB and Components	X	O	O	O	O	O
Wires & Connectors for Ext.Connections	X	O	O	O	O	O
Chassis	O	O	O	O	O	O
CPU & RAM	X	O	O	O	O	O
HDD Drive	X	O	O	O	O	O
LCD Module	X	X	O	O	O	O
Optical Drive	X	O	O	O	O	O
Touch Control Module	X	O	O	O	O	O
PSU	X	O	O	O	O	O
Battery	X	O	O	O	O	O

This form is prepared in compliance with the provisions of SJ/T 11364.

O: The level of toxic or hazardous materials present in this component and its parts is below the limit specified by GB/T 26572.

X: The level of toxic of hazardous materials present in the component exceed the limits specified by GB/T 26572, but is still in compliance with EU Directive 2011/65/EU (RoHS 2).

Notes:

1.   The Environment Friendly Use Period indicated by labelling on this product is applicable only to use under normal conditions.

2.   Individual components including the CPU, RAM/memory, HDD, optical drive, and PSU are optional.

3.   LCD Module and Touch Control Module only applies to certain products which feature these components.

Table of Contents

Chapter 1

Product Specifications

1.1   Specifications

System	
CPU	Quad Core ARM® Cortex®-A57 MPCore Processor
System Memory	4GB LPDDR4
AI Solution	NVidia® Jetson Nano™
Display Interface	HDMI 2.0 x 1
Storage Device	32 GB MicroSD Card (Jetson Nano version B)
	Mini-Card (Full Size) x 1 (PCIE+SATA+USB)
Ethernet	10/100/1000Base-TX x 2
I/O	USB3.2 Gen 1 x 4 (USB Type A)
	GbE LAN x 2 (GbE PD x 1 + GbE LAN x 1)
	40-pin I/O x 1 (GPIO/I2S/I2C/Audio/SPI/UART)
	DB-9 (RS-232) x1
	HDMI 2.0 a/b x 1 (HDMI Type A)
	OS Flash port x 1 (Micro USB)
	Recovery port x1
	Antenna opening x 2
Expansion	Antenna x 2
	M.2 2230 E Key x 1 (for Wi-Fi)
Indicator	Power LED x 1
OS Support	ACLinux 4.9 or above (Compatible with Ubuntu 18.04)

Power Supply

Power Requirement	DC 12V~24V 2-pin terminal

Mechanical

Mounting	Wall-mount
Dimensions (W x D x H)	6.92" x 3.94" x 1.54"
	(175.8mm x 100.0mm x 39.0mm)
Gross Weight	2.31 lbs. (1.05 kg)
Net Weight	1.28 lbs. (0.58 kg)

Environmental

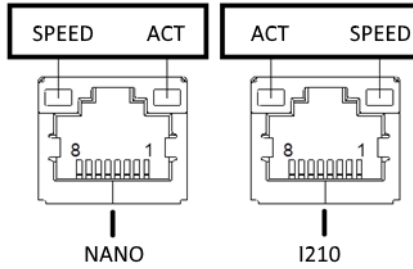|	
Operating Temperature	-10°C ~ 70°C with 0.5m/s airflow
Storage Temperature	-40°F ~ 176°F (-40°C ~ 80°C)
Storage Humidity	95% @ 40°C, non-condensing
Anti-Vibration	Random, 3.5 Grms/ 5 ~ 500Hz
Certification	CE/FCC class A

1.2   Product Notice

Micro-USB: Micro-USB port is ideally for flashing image only.

USB ports: USB ports are not support USB DVD ROM because of file system.
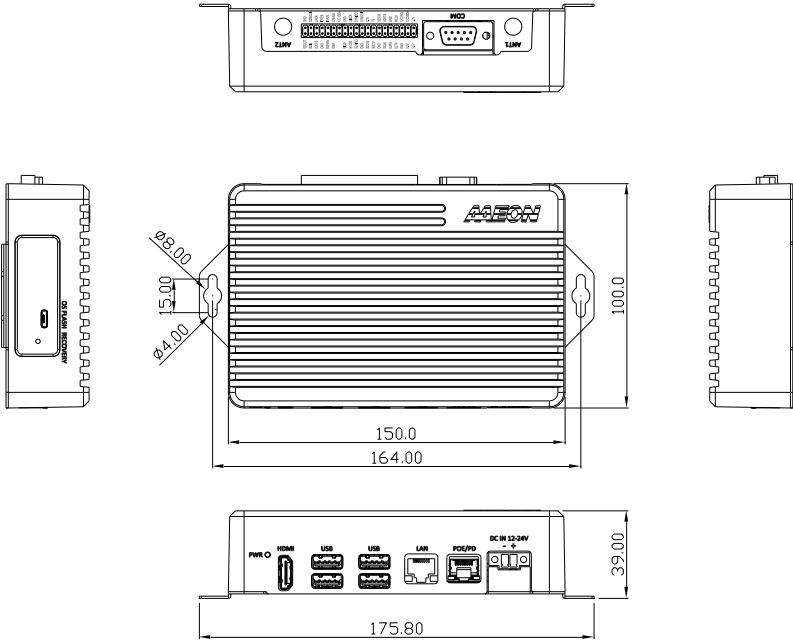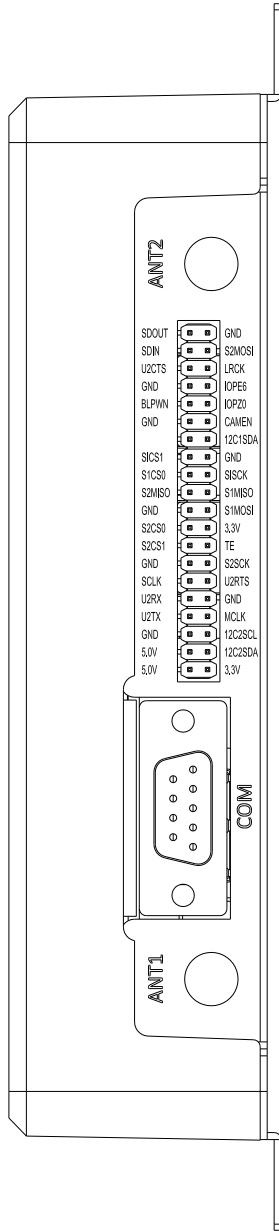
LAN Indicator Behavior

Chapter 2

Hardware Information

2.1 Dimensions

DIO Port

ANT2

SDOUT	GND
SDIN	S2MOSI
U2CTS	LRCK
GND	IOPE6
BLPWN	IOPZ0
GND	CAMEN
	I2C1SDA
S1CS1	GND
S1CS0	S1SCK
S2MISO	S1MISO
GND	S1MOSI
S2CS0	3.3V
S2CS1	TE
GND	S2SCK
SCLK	U2RTS
U2RX	GND
U2TX	MCLK
GND	I2C2SCL
5.0V	I2C2SDA
5.0V	3.3V

COM

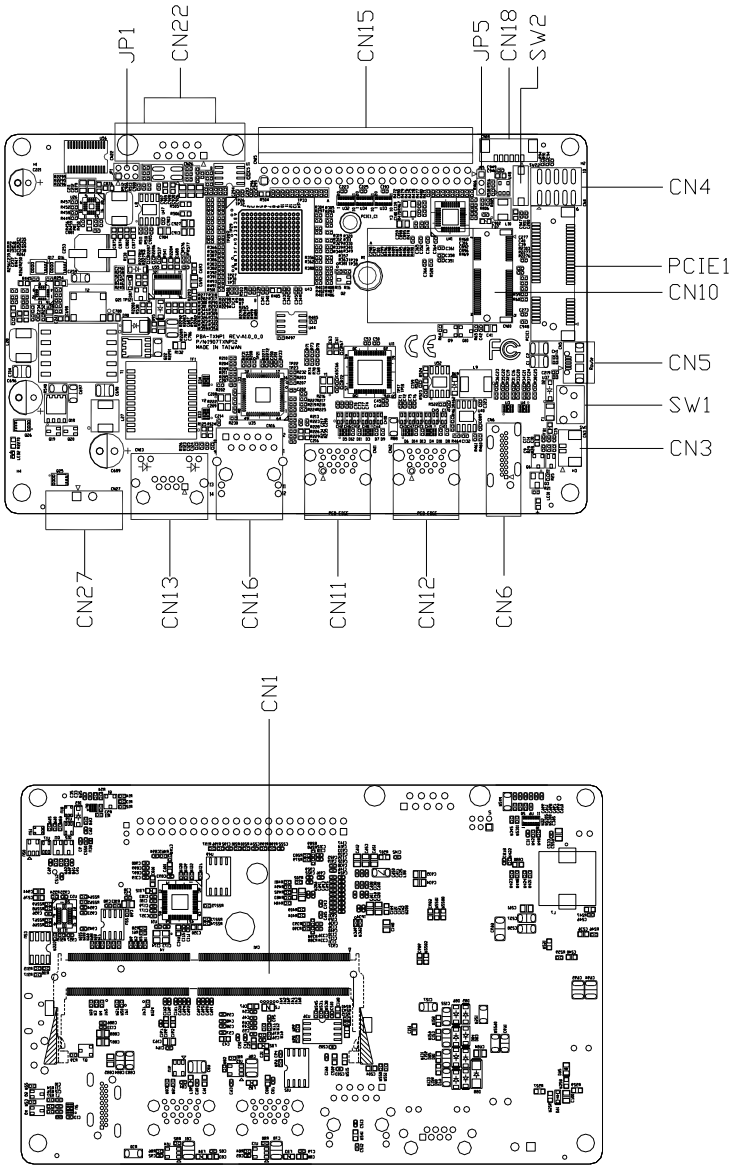ANT1

2.2 Jumpers and connectors

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
CN4 (Pin 7-8)	AT/ATX Mode Select
JP1	RS-232
JP5	PCIe/SATA Mode Select

2.3.1   Setting Jumpers

You can configure your system 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.

Open   **Closed**   **Closed 2-3**
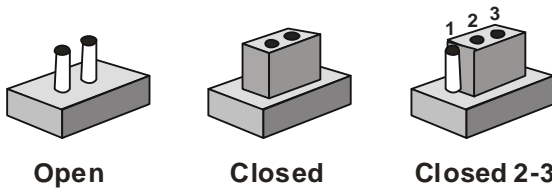
A pair of needle-nose pliers may be helpful when working with jumpers.
If you have any questions about the best hardware configuration for your application, contact your local distributor or sales representative before you make any changes.
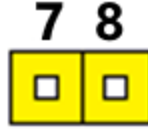Generally, you simply need a standard cable to make most connections.

2.3.2   AT/ATX Mode Select (CN4 Pins 7-8)

The AT/ATX Mode Select functions by connecting pins 7 and 8 of CN4. To prevent damage to the system, do not connect pins 7 and 8 to any other pin.
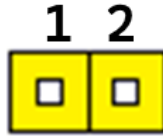
Open – AT Mode   **Closed – ATX Mode**
(Default)

CN4 pins 7-8	Function
7-8 Open	AT Power Mode
7-8 Closed	ATX Power Mode (Default)

2.3.3   RS-232 (JP1)

RS-232 functions by connecting pins 1 and 2 of JP1. To prevent damage to the system, do not connect pins 1 and 2 to any other pin.
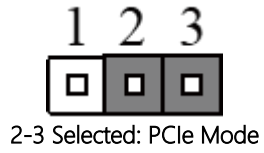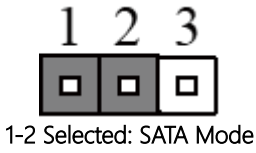
Closed – RS-232
(Defualt)

JP1 pins 1-2	Function
1-2 Closed	RS-232 (Default)

2.3.4   PCIe/SATA Mode Selection (JP5)

1-2 Selected: SATA Mode   2-3 Selected: PCIe Mode

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 Nano CPU module Connector
CN3	RTC Battery Connector
CN4	Front Panel Connector
CN5	Micro USB for Image Flash
CN6	HDMI Connector
CN10	M.2 E Key
CN11	USB 3.0 Connector
CN12	USB 3.0 Connector
CN13	Gigabit LAN Connector (PD)
CN15	40-pin Header
CN16	LAN Connector
CN18	UART Debug Port
CN22	COM Port
CN27	Power IN
SW1	Recovery Switch

2.4.1 Jetson Nano CPU Module Connector (CN1)

Signal Name	Pin # Top Odd	Pin # Bottom Even	Signal Name		Signal Name	Pin # Top Odd	Pin # Bottom Even	Signal Name
GND	1	2	GND		PEX_RX2_P	133	134	PEX_TX2_N
CSI_E_D0_P	3	4	CSI_B_D0_N		GND	135	136	PEX_TX2_P
CSI_E_D0_N	5	6	CSI_B_D0_P		PEX_RX1_N	137	138	GND
GND	7	8	GND		PEX_RX1_P	139	140	PEX_TX1_N
CSI_E_CLK_P	9	10	RSVD		GND	141	142	PEX_TX1_P
CSI_E_CLK_N	11	12	RSVD		RSVD	143	144	GND
GND	13	14	GND		KEY	KEY	KEY	KEY
CSI_E_D1_P	15	16	CSI_B_D1_P		RSVD	145	146	GND
CSI_E_D1_N	17	18	CSI_B_D1_N		GND	147	148	PEX_TX3_N
GND	19	20	GND		PEX_RX3_P	149	150	PEX_TX3_P
CSI_F_D0_P	21	22	CSI_A_D0_P		PEX_RX3_N	151	152	GND
CSI_F_D0_N	23	24	CSI_A_D0_N		GND	153	154	PEX_CLK1_N
GND	25	26	GND		PEX_RX4_P	155	156	PEX_CLK1_P
CSI_F_CLK_P	27	28	CSI_A_CLK_P		PEX_RX4_N	157	158	GND
CSI_F_CLK_N	29	30	CSI_A_CLK_N		GND	159	160	PEX_TX4_P
GND	31	32	GND		PEX_RX6_N	161	162	PEX_TX4_N
CSI_F_D1_P	33	34	CSI_A_D1_N		PEX_RX6_P	163	164	GND
CSI_F_D1_N	35	36	CSI_A_D1_P		GND	165	166	PEX_TX6_P
GND	37	38	GND		RSVD	167	168	PEX_TX6_N
HDMI_TXD0_N	39	40	CSI_C_D0_N		RSVD	169	170	GND
HDMI_TXD0_P	41	42	CSI_C_D0_P		GND	171	172	RSVD
GND	43	44	GND		GND	173	174	RSVD
HDMI_TXC_P	45	46	CSI_C_CLK_N		RSVD	175	176	GND
HDMI_TXC_N	47	48	CSI_C_CLK_P		GND	177	178	GPIO_PA6
GND	49	50	GND		PEX_WAKE	179	180	PEX_L0_CLKREQ
HDMI_TXD1_P	51	52	CSI_C_D1_P		PEX_L0_RST	181	182	RSVD
HDMI_TXD1_N	53	54	CSI_C_D1_N		RSVD	183	184	GBE_MDI3_P
GND	55	56	GND		GEN1_I2C_SCL	185	186	GBE_MDI3_N
HDMI_TXD2_N	57	58	CSI_D_D0_P		GEN1_I2C_SDA	187	188	GBE_LED1
HDMI_TXD2_P	59	60	CSI_D_D0_N		GEN2_I2C_SCL	189	190	GBE_MDI2_N
GND	61	62	GND		GEN2_I2C_SDA	191	192	GBE_MDI2_P
EDP_TXD1_N	63	64	CSI_D_D1_P		DAP4_DIN	193	194	GBE_LED0
EDP_TXD1_P	65	66	CSI_D_D1_N		DAP4_FS	195	196	GBE_MDI1_N
GND	67	68	GND		DAP4_DOUT	197	198	GBE_MDI1_P
EDP_TXD3_N	69	70	DSI_A_D1_N		DAP4_SCLK	199	200	GND
EDP_TXD3_P	71	72	DSI_A_D1_P		GND	201	202	GBE_MDI0_N
GND	73	74	GND		UART2_RTS	203	204	GBE_MDI0_P
EDP_TXD0_P	75	76	DSI_A_CLK_N		UART2_CTS	205	206	LCD_BL_PWM
EDP_TXD0_N	77	78	DSI_A_CLK_P		UART2_TXD	207	208	GPIO_PZ2 (FAN_TACH)
GND	79	80	GND		UART2_RXD	209	210	CLK_32K_OUT
EDP_TXD2_P	81	82	DSI_A_D0_N		AUD_MCLK	211	212	LCD_BL_EN
EDP_TXD2_N	83	84	DSI_A_D0_P		CAM_I2C_SCL	213	214	FORCE_RECOVERY*
GND	85	86	GND		CAM_I2C_SDA	215	216	GPIO_P28
USB_VBUS_EN0	87	88	HDMI_INT_DP_HPD		GND	217	218	LCD_TE
SPI1_MOSI	89	90	HDMI_CEC		SDMMC3_DAT0	219	220	DAP3_DOUT
SPI1_SCK	91	92	DP_HPD		SDMMC3_DAT1	221	222	DAP3_DIN
SPI1_MISO	93	94	DP_AUX_CH0_P		SDMMC3_DAT2	223	224	DAP3_FS
SPI1_CS0	95	96	DP_AUX_CH0_N		SDMMC3_DAT3	225	226	DAP3_SCLK
SPI1_CS1	97	98	DP_AUX_CH1_N		SDMMC3_CMD	227	228	GPIO_PE6
UART3_TXD	99	100	DP_AUX_CH1_P		SDMMC3_CLK	229	230	GPIO_PE7 (FAN PWM)
UART3_RTS	101	102	GND		GND	231	232	GEN3_I2C_SDA
UART3_CTS	103	104	SPI2_CS0		SHUTDOWN_REQ*	233	234	GEN3_I2C_SCL
UART3_RXD	105	106	SPI2_MISO		PMIC_BBAT	235	236	UART1_TXD
GND	107	108	SPI2_SCK		POWER_EN	237	238	UART1_RXD
USB0_DN	109	110	SPI2_MOSI		SYS_RESET_IN*	239	240	BUTTON_PWR_ON*
USB0_DP	111	112	SPI2_CS1		GND	241	242	GND
GND	113	114	CAM2_PWDN		GND	243	244	GND
USB1_DN	115	116	CAM2_MCLK		GND	245	246	GND
USB1_DP	117	118	CAM_AF_EN		GND	247	248	GND
GND	119	120	CAM1_PWDN		GND	249	250	GND
USB2_DN	121	122	CAM1_MCLK		VDD_IN	251	252	VDD_IN
USB2_DP	123	124	GPIO_PH6		VDD_IN	253	254	VDD_IN
GND	125	126	GPS_EN		VDD_IN	255	256	VDD_IN
NFC_INT	127	128	AP_WAKE_NFC		VDD_IN	257	258	VDD_IN
GND	129	130	NFC_EN		VDD_IN	259	260	VDD_IN
PEX_RX2_N	131	132	GND					

2.4.2 RTC Battery Connector (CN3)
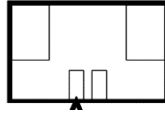
Pin	Signal	Pin	Signal
1	+3V	2	GND

2.4.3 Front Panel Connector (CN4)
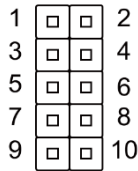
Pin	Signal	Pin	Signal
1	Button power	2	GND
3	Recovery	4	GND
5	Reset	6	GND
7	Latch set	8	Latch set
9	PWR LED	10	+5V

Note: Pin 7 and 8 are used for setting AT/ATX Power Mode. See Chapter 2.3.2 for information. To prevent damage to your system, do not connect Pins 7 and 8 with any other pin.

2.4.4   USB 2.0 Connector for Image Flash (CN5)
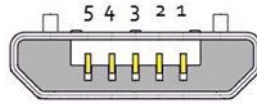
USB Micro-B

Pin	Signal	Pin	Signal
1		2	USB1-
3	USB1+	4	
5	GND		

2.4.5   HDMI Connector (CN6)
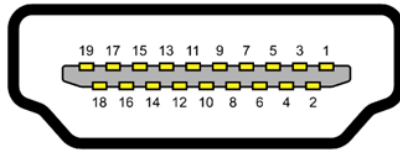
Pin	Signal	Pin	Signal
1	HDMI_DATA2_P	2	GND
3	HDMI_DATA2_N	4	HDMI_DATA1_P
5	GND	6	HDMI_DATA1_N
7	HDMI_DATA0_P	8	GND
9	HDMI_DATA0_N	10	HDMI_CLK_P
11	GND	12	HDMI_CLK_N
13	NC	14	NC
15	HDMI_SCL	16	HDMI_SDA
17	GND	18	HDMI_PWR
19	HDMI_HDP		

2.4.6   M.2 E Key (CN10)
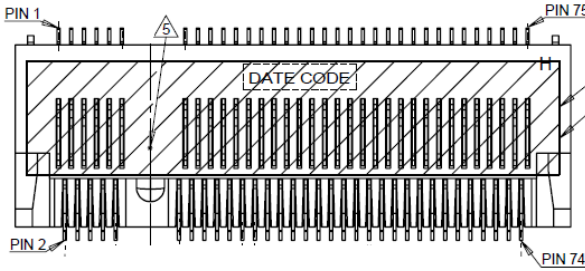
CN10 Uses standard M.2 E Key specifications

2.4.7   USB 3.0 Connector (CN11/12)
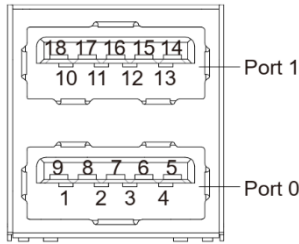
Pin	Signal	Pin	Signal
U1	VBUS_1	U10	VBUS_2
U2	(A)D-	U11	(B)D-
U3	(A)D+	U12	(B)D+
U4	GND	U13	GND
U5	(A)SSRX-	U14	(B)SSRX-
U6	(A)SSRX+	U15	(B)SSRX+
U7	GND	U16	GND
U8	(A)SSTX-	U17	(B)SSTX-
U9	(A)SSTX+	U18	(B)SSTX+

2.4.8   PD Connector (RJ45) (CN13)
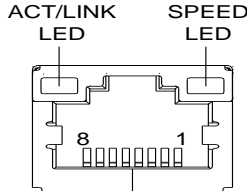
Pin	Signal	Pin	Signal
1	MDIP0_0_TF	2	MDIN0_0_TF
3	MDIP1_0_TF	4	MDIN2_0_TF
5	MDIP2_0_TF	6	MDIN1_0_TF
7	MDIP3_0_TF	8	MDIN3_0_TF

2.4.9   40-Pin Header (CN15)
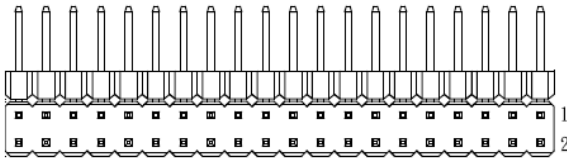
Pin	Signal	Pin	Signal
1	3.3V	2	5V
3	I2C1_SDA	4	5V
5	I2C1_SCL	6	GND
7	GPIO09	8	UART1_TXD
9	GND	10	UART1_RXD
11	UART1_RTS	12	I2S0_SCLK
13	SPI1_SCK	14	GND
15	GPIO12	16	SPI1_CS1

Pin	Signal	Pin	Signal
17	3.3V	18	SPI1_CS0
19	SPI0_MOSI	20	GND
21	SPI0_MISO	22	SPI1_MISO
23	SPI0_SCK	24	SPI0_CS0
25	GND	26	SPI0_CS1
27	ID_I2C_SDA	28	ID_I2C_SCL
29	GPIO01	30	GND
31	GPIO11	32	GPIO07
33	GPIO13	34	GND
35	I2S0_LRCK	36	UART1_CTS
37	SPI1_MOSI	38	I2S0_SDIN
39	GND	40	I2S0_SDOUT

2.4.10   LAN RJ45 Port (CN16)
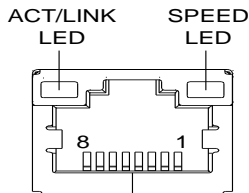
Pin	Signal	Pin	Signal
1	MDI0+	2	MDI0-
3	MDI1+	4	MDI1-
5	MDI2+	6	MDI2-
7	MDI3+	8	MDI3-

2.4.11   COM Port Connector (CN22)
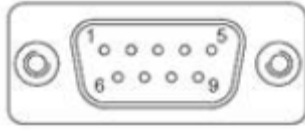
Pin	Signal	Pin	Signal
1		6	
2	RXD	7	RTS
3	TXD	8	CTS
4	485_RX1B	9	485_TX1B
5	GND		

2.4.12   UART Debug Port Connector (CN18)
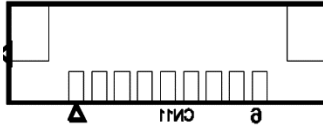
Pin	Signal	Pin	Signal
1	3.3V	2	UART0 TXD
3	UART0 RXD	4	
5		6	I2C SCL
7	I2C SDA	8	GND
9	GND		

2.4.13   DC Power In Connector (CN27)
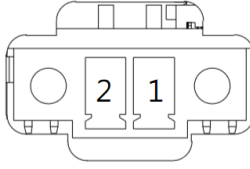
Pin	Signal	Pin	Signal
1	PWR IN	2	GND

2.5   Hardware Installation

2.5.1   M.2 Installation
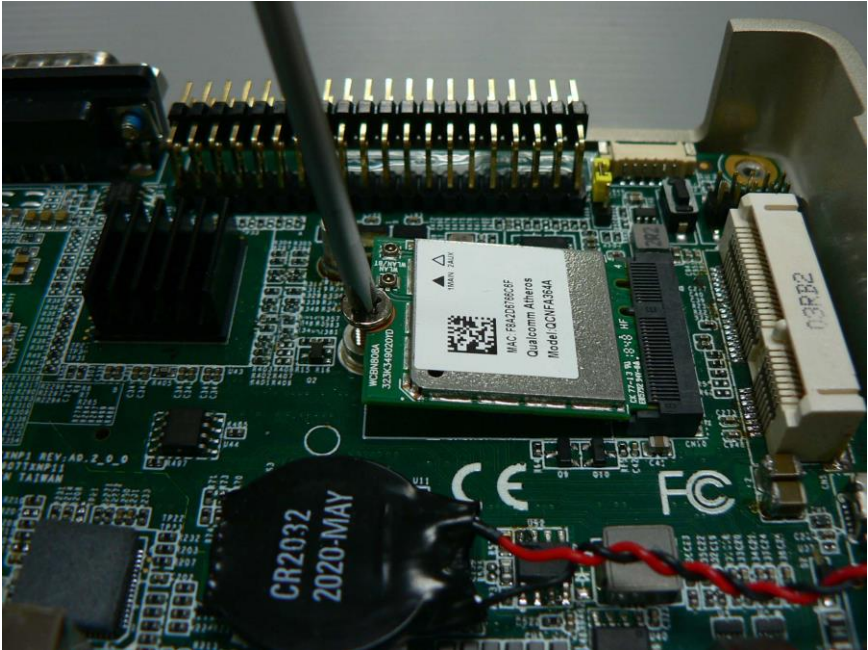
2.5.2   mPCIe Card Installation
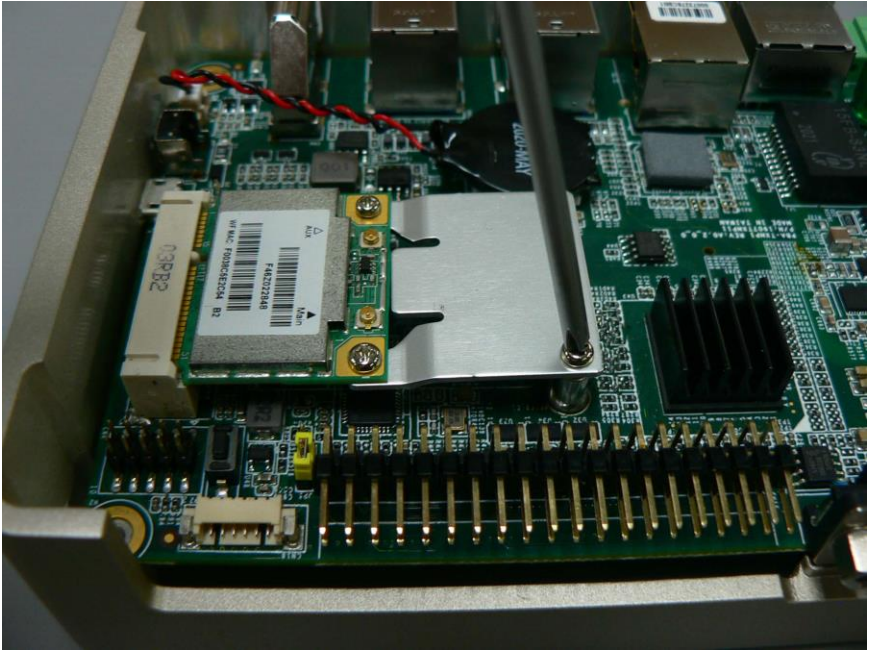
2.5.3   SD Card Installation
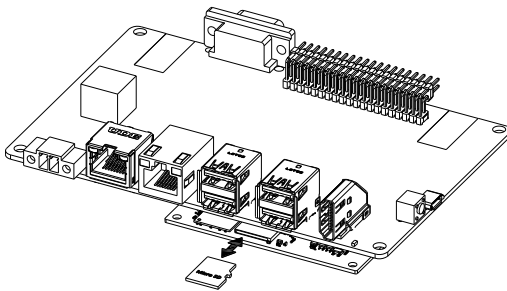
2.5.4   Chassis Assembly
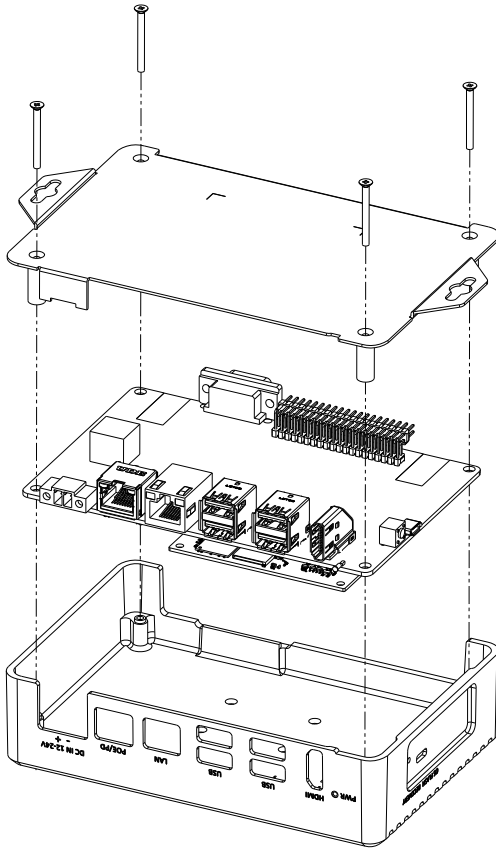
Chapter 3

OS Flash guide

3.1   Flash OS Image to SD-Card

3.1.1   Introduction

This chapter details the steps to flashing the AAEON ACLinux OS to your BOXER-8222AI NVIDIA Jetson Nano system. The ACLinux image can be downloaded from the product page at:

https://www.aaeon.com/en/p/edge-ai-box-pc-nvidia-jetson-nano-boxer-8222ai

The instructions in this chapter are only applicable to ACLinux build number 3 or later. To identify the build number, check the file name of the download. It should be formatted as follows, with {BN} being the build number

```
ACLinux_4.9_ACLNX49D.NV03.BOXER-8222AI.{BN}.tar.gz
```

For example, build number 4 will be named as:

```
ACLinux_4.9_ACLNX49D.NV03.BOXER-8222AI.4.tar.gz
```

If you have any questions or need help installing an older build, please contact AAEON support or your AAEON representative for assistance.

3.1.2   Before You Begin

Before beginning the process ensure you have the following:

-       ACLinux Image Build 3 or later

-       One host PC with operating system Ubuntu 16.04 or 18.04

-       Micro-SD Card 16GB or larger

-       Micro-SD Card USB adapter/reader (if host PC does not have a Micro-SD Slot)

-       Jetson Nano Development Kit B01 module (no onboard eMMC storage); see

image below for reference
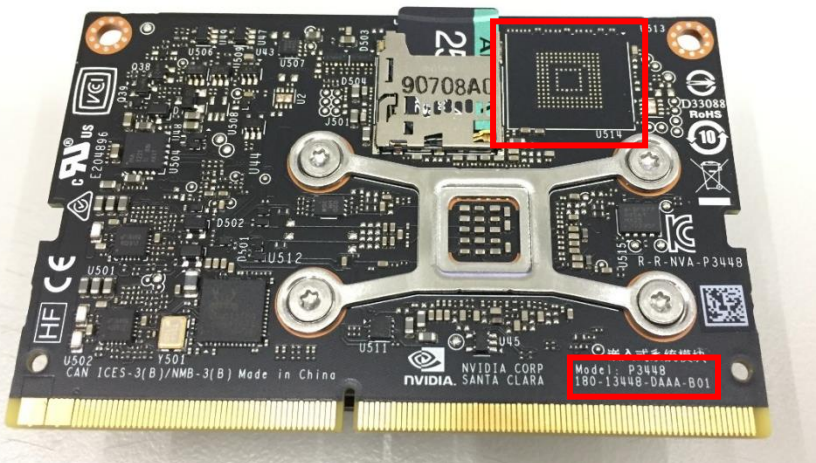
AAEON recommends downloading balenaEtcher for the image flash process. You can

download the program the balena website: https://www.balena.io/etcher/

Finally, before starting, on the Linux host PC, extract the image file you downloaded

using the following command in terminal (remember to replace {BN} with the build

number in the file name):

```
$ tar xzf ACLinux_4.9_ACLNX49D.NV03.BOXER-8222AI.{BN}.tar.gz
```
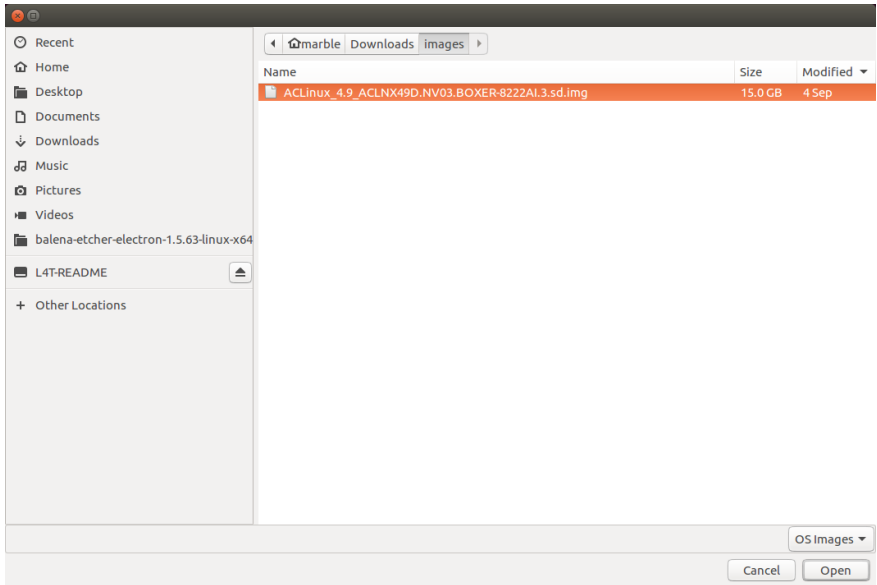
3.1.3   Flash Image to Micro SD Card

Step 1: Insert the Micro-SD card you want to flash into the host PC.
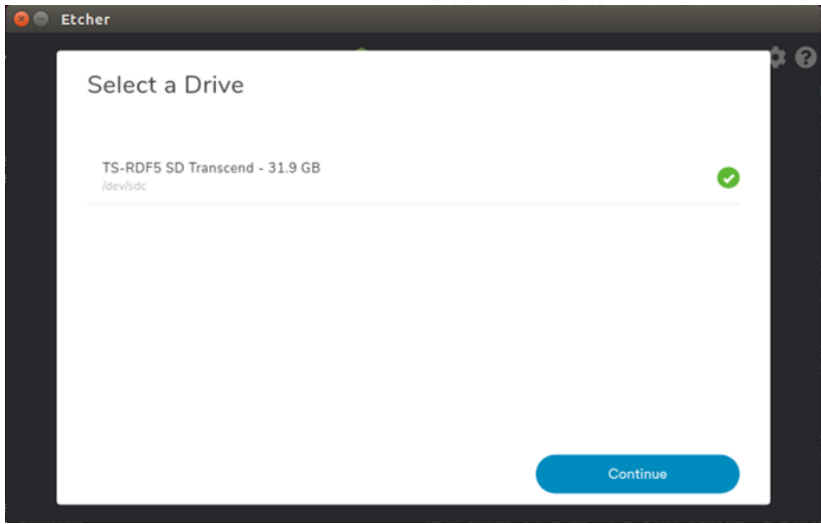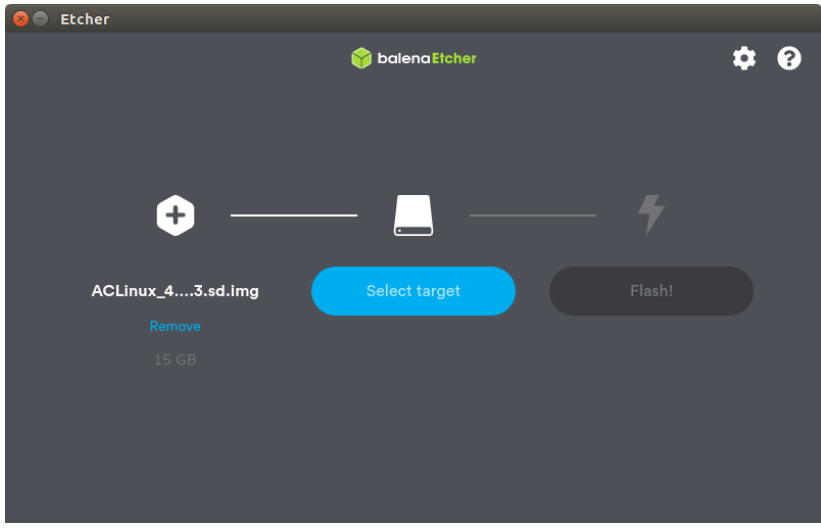
Step 2: Run the Etcher flash tool.
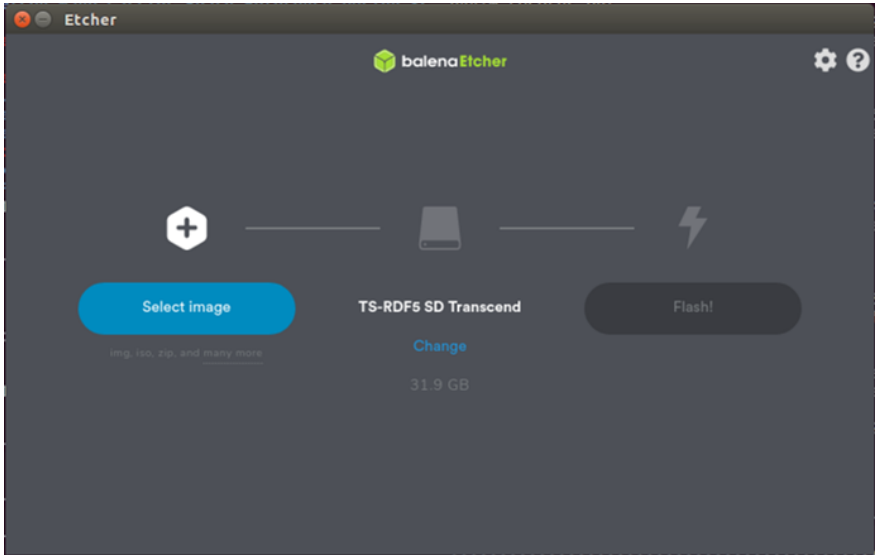
Step 3: Click "Select image" and choose the image file you extracted. File name should look like:
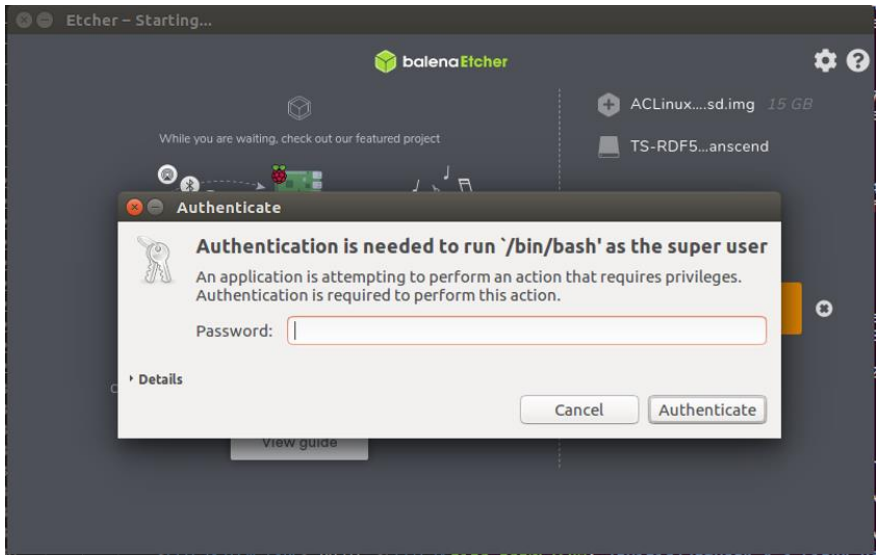
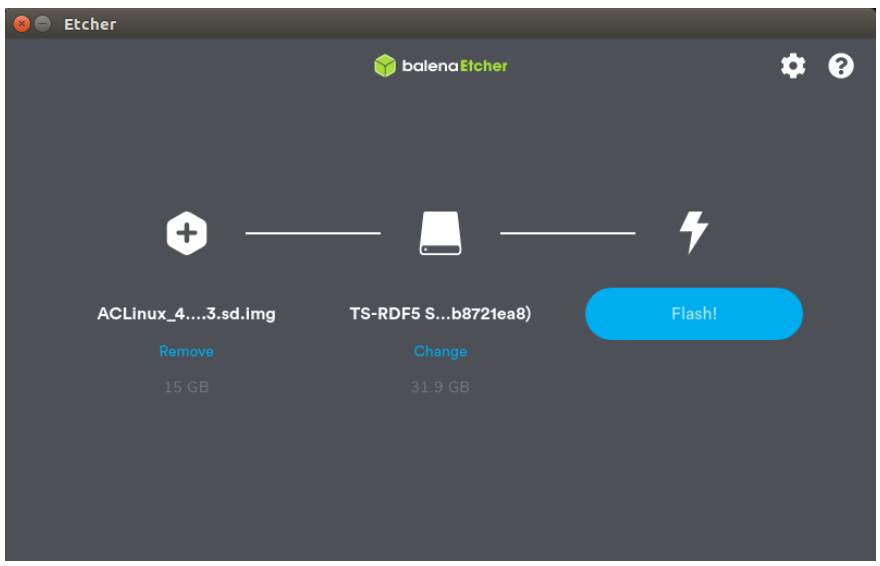ACLinux_4.9_ACLNX49D.NV03.BOXER-8222AI.{BN}.sd.img

Step 4: Etcher will automatically choose a USB device to write to. Click "Change" or "Select Target" to select the correct device if Etcher has not defaulted to the SD Card.

Step 5: Click "Flash!" to flash image to your SD Card. Ubuntu may ask for a password to continue the operation. Enter your password to continue.

Step 6: Wait for Etcher to complete the process.

Step 7: After Etcher successfully finishes, remove the SD Card from the host PC, and insert the Micro-SD card into the NVIDIA Jetson Nano SOC. Then, insert the Jetson Nano SOC into the BOXER-8222AI board if you have not already done so.
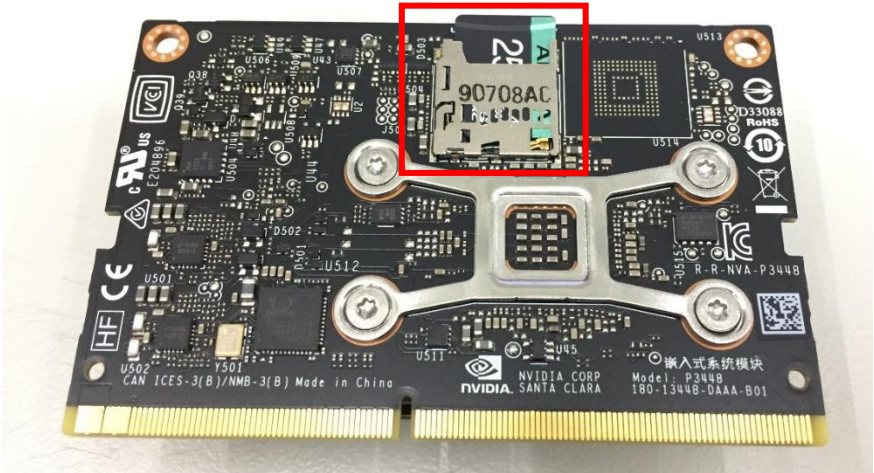
Follow assembly instructions in Chapter 2.5 to assemble the BOXER-8222AI system.