

AUVIDEA

JN30D

TECHNICAL REFERENCE MANUAL

SCOPE OF WORK

Providing technical information and documentation to the product line JN30D for NVIDIA Jetson Nano & TX2 NX & Xavier NX

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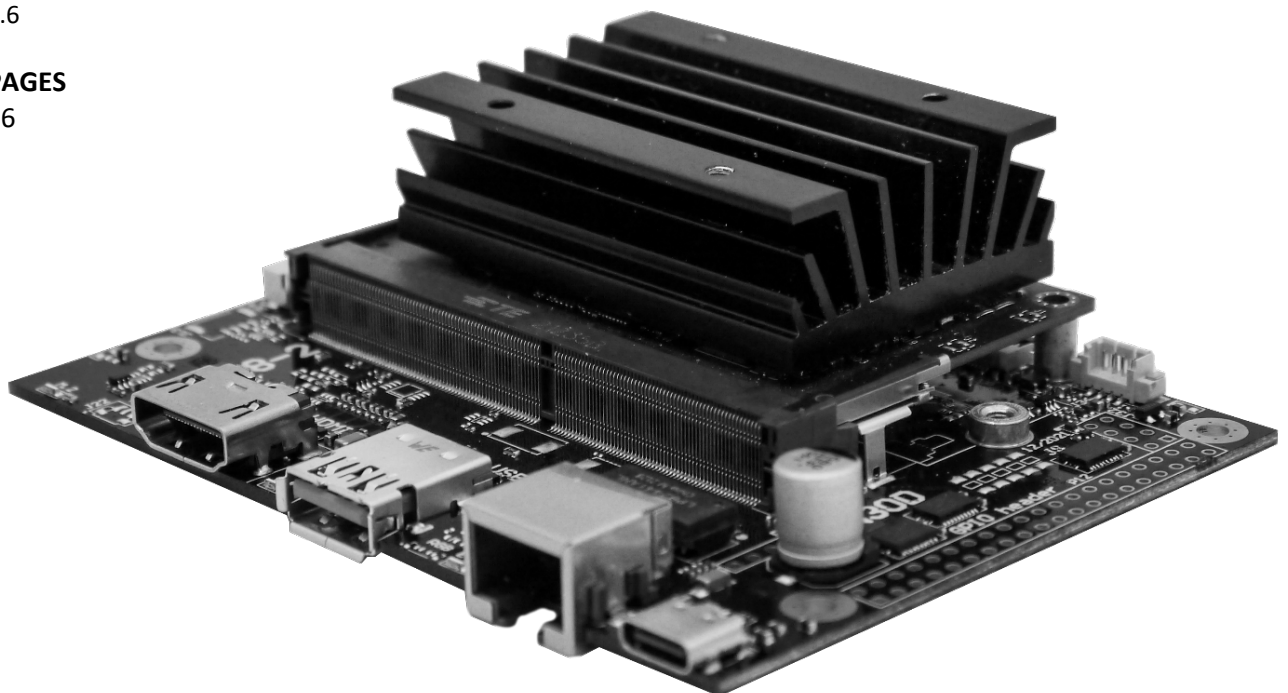
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Version

1.6

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SECTION 1 Document revisions and changes

Document version	Changes
1.0	Initial document, internal verification process
1.1	Internal verification process
1.2	Updated contents, new pictures
1.3	Added Appendix E & D
1.4	Corrected information in the features and comparison list
1.6	Corrected information in the features and comparison list



SECTION 2 Product revisions and changes

Product version	Changes
38488	Engineering prototype
38488	Production release

SECTION 3 Overview

3.1 Jetson compute module

This new JN30D carrier board has been designed primarily for the Jetson Nano compute modules. When using other modules like the Jetson NX power limits may be exceeded as the USB C power supply only supplies up to 3A. More power may be supplied to the board via the two 5V pins on the GPIO header. The JN30D may be powered alternatively by the 5V pin on the 10 pin GPIO header. Please make sure that you only connect one power source: USB-C cable or 5V cable. Both are directly connected on the PCB of the JN30D.

3.2 JN30D

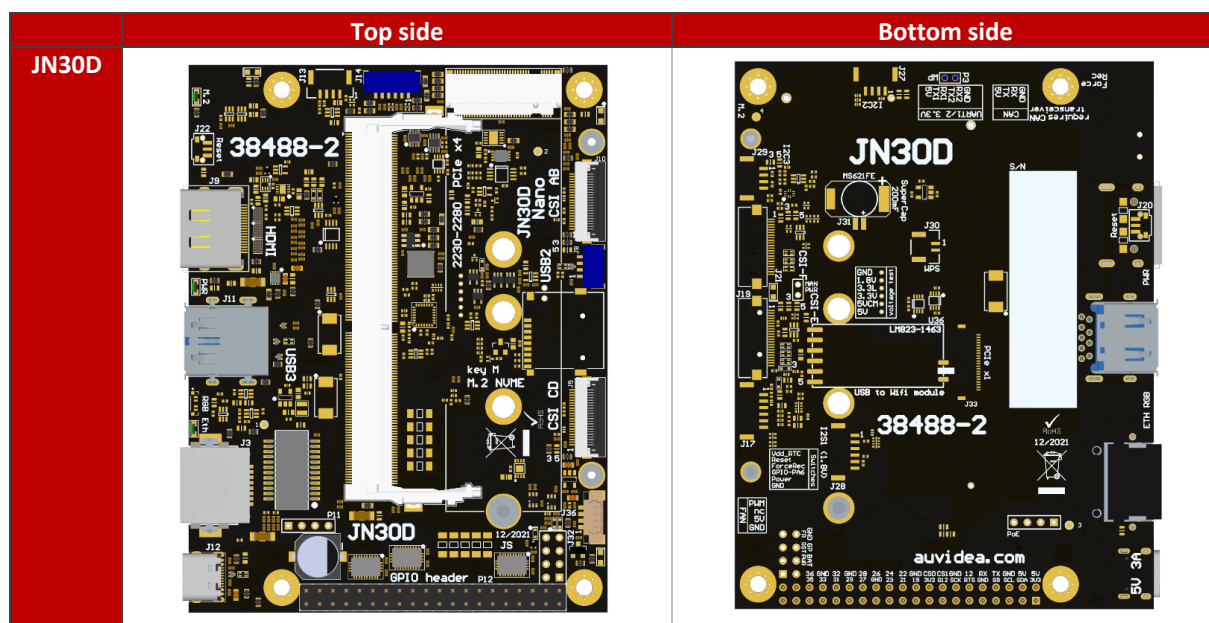
- Easy integration into passively cooled systems
- Optionally available as complete system in passively cooled enclosure
- Easy flashing: just connect a USB OTG cable (Auto Flash)
- High performance storage: M.2 NVME PCIe x4

3.3 JN30D features and comparison

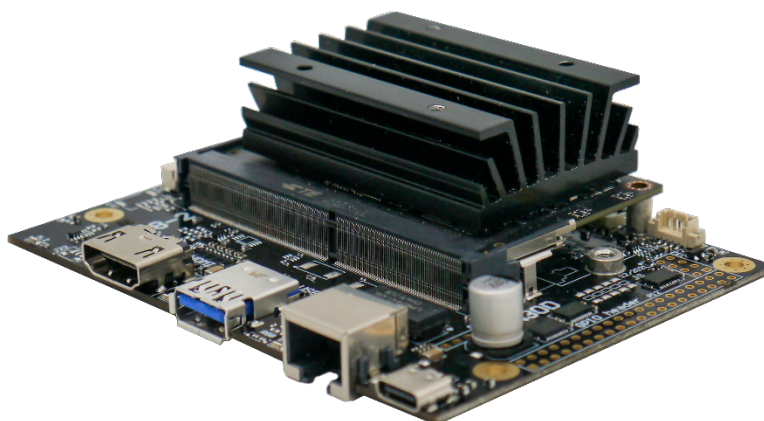
Description	JN30D	NVIDIA Devkit
Power	5V 3A (USB C)	5V – 19V
Compatible Modules	Jetson Nano	Jetson Nano
Display Port	-	yes
HDMI	yes	yes
Fan connector	yes	yes
M.2 NVME Key M	yes (x4 PCIe)	-
M.2 Key E	with external module (using J8)	yes
Micro SD card	yes	-
CAN RX / TX	(optional)	yes
USB 3.0	1x USB Typ A (native)	4x USB Typ A (USB hub - shared)
USB 2.0	1x USB C 1x JST-GH (J8)	1x Micro USB (device mode only)
Auto Flashing	yes (USB C)	-
Ethernet	Gigabit RJ45 (one LED)	Gigabit RJ45 (2 LEDs)
PoE option	yes (P11)	yes
CSI	2x CSI-2 (4 lanes) plus camera LED (hardware sync available)	2x CSI-2
UART	2x (J14 and 40 pin GPIO header)	2x (40 pin header)
I2C	2x (40 pin header)	2x (40 pin header)
I2S	1x (40 pin header) (5V tolerant, unidirectional)	1x (40 pin header)
SPI	2x (40 pin header) (5V tolerant, unidirectional)	2x (40 pin header)
GPIO	3x in + 3x out (40 pin header) (5V tolerant, unidirectional)	6x bi dir (40 pin header)
Size	105 mm x 82 mm	69 mm x 45 mm

Additional features		
Protection	overvoltage protection (TVS diode)	?
Level shifters	unidirectional level shifters (work better)	bi dir (can cause problems)
Expandability	1. Fully populated variants available	no
	2. Add-on boards for more USB and Ethernet	
	3. IMU	
	4. board EEPROM and crypto chip (for SW copy protection)	
	5. PCIe x1 connector	
	6. LM823 WIFI module	
	7. 2 more CSI-2 interfaces (2 lanes each)	
	8. RTC battery (rechargeable)	
	9. Over current fuse (product safety)	
	10. UPS option for graceful power down	
	11. On board MCU for watchdog and remote power cycle (LTE)	

3.4 Model pictures



JN30D



The 40 pin GPIO header is included (but not soldered in).

3.5 Technical specifications

Description		Note
HDMI	standard HDMI connector (2.0)	
USB 3	5Gb/s or 10Gb/s	
Physical size	105 mm x 82 mm	
Mounting holes	4x M3	
Temperature range	0 to 70°C (extended range optional)	
Humidity	noncondensing	
Longevity	no temperature sensitive components (like electrolytic capacitors)	

3.6 Power consumption

Description	JN30D
Carrier board logic	< 1 watt
3.3V power converter efficiency	> 90%

3.7 Options

- Flexible design and manufacturing
- designed and manufactured in Germany
- in-house fully automated production line with 3D AOI
- special configuration possible with minimum purchase quantity (display port, M.2, PoE, 48V power in, super cap option, 2 RPi camera module connectors, SPI, I2C, switches, etc.)
- design services: you architect your custom carrier board and Auvideo designs and produces it
- please ask for a quote



SECTION 4 Features

4.1 GPIO-Header

A 40 pin 2.54mm header for GPIO, I2C, I2S and UART. The pinout is similar to the GPIO header on the NVIDIA dev kits and on the Raspberry Pi. Please note that all signals (except I2C) have uni-directional level shifters. In other boards some of these signals may be bi-directional which may cause compatibility issues. Auvideo does not guarantee the compatibility to any specific add-on boards. Please check the compatibility yourself. Some signals are 5V tolerant inputs and therefore may be driven from 5V logic outputs.

The 40 pin GPIO header is included (but not soldered in).

4.2 Crypto chip

The crypto chip has been added to support software licensing and copy protection. Please check the data sheet of the manufacturer for details.

Model: ATSHA204A-MAHCZ-T

<https://ww1.microchip.com/downloads/en/DeviceDoc/ATSHA204A-Data-Sheet-40002025A.pdf>

4.3 Microcontroller (MCU)

A MCU for additional power management and watchdog functions is optional. It is standard on some of the extended versions of the JN30D.



SECTION 5 Pinout description

Please note that the software GPIO number differs from the socket pin number. This software GPIO number must be calculated with a special formula and differs between the various compute modules. Please see appendix B for details.

5.1 J3 - Ethernet (GbE)

Standard RJ45 pinout with PoE capable magnetics class 3 and 4 (PD or PSE). Connected to the Ethernet controller on the compute module.

5.2 J4 - M.2 PCIe4 NVME SSDs

Please note that only NVME SSDs are supported. SATA SSDs are not supported. We recommend the 128GB Transcend SSDs (TS128GMTE110S). This SSD is standard in some of the Auvideo development system offerings.

5.3 J5 - CSI-2 CD

22 pin 0.5mm pitch FPC connector

Pin	Description	Socket pin	Note
1	3.3V		Power: connected with bead to 3.3V (5V optional if bead is moved)
2	GEN1_I2C_SDA	187	
3	GEN1_I2C_SCL	185	
4	GND		
5	CAM2-MCLK		IN: Input - connect to 1.8V or 3.3V output of the camera to drive the CAM LED. 1: enable CAM LED 0: disable CAM LED
6	CAM2_PWDN	206	OUT: Output (open drain with 2.2k pullup to 3.3V) - connect to power enable of camera. The control signal is connected via level shifting inverter to pin 152 of the compute module.
7	GND		
8	CSI_D_D1_P	66	
9	CSI_D_D1_N	64	
10	GND		
11	CSI_D_D0_P	42	
12	CSI_D_D0_N	40	
13	GND		
14	CSI_C_CLK_P	54	
15	CSI_C_CLK_N	52	
16	GND		
17	CSI_C_D1_P	60	
18	CSI_C_D1_N	58	
19	GND		

20	CSI_C_DO_P	48
21	CSI_C_DO_N	46
22	GND	

Please note that on the JN30D each camera connector uses its own I2C bus. This setup is different from the NVIDIA dev kit. If you like to use CSI-2 cameras, please install the Auvideo BSP (firmware).

This CSI-2 connector has the same 22 pin pinout as the 22-pin connector on the Raspberry Pi Zero and Raspberry Pi compute module dev kit board. With adapter cable it may connect to Raspberry Pi camera 2.1 and Vision Component camera modules. Alivium cameras require the Alivium adapter.

Pin 6: by default the device tree puts a PWM signal on pin 206 (LCD_BL_PWM - GPIO_07). For most cameras (like Raspberry Pi camera with iMX219 sensor) this needs to be changed to a constant low output to send a high to the camera for power enable. This is part of the device tree changes.

Some Vision Component camera modules use this pin to synchronise multiple cameras. The pin 5s of all CSI-2 connectors are OR 'red together and drive the CAM LED output.

5.4 J8 - USB 2.0

JST-GH 1.25mm

Pin	Description	Socket pin	Note
1	5V		
2	USB2_D_N	121	
3	USB2_D_P	123	
4	GND		

Internal USB 2.0 JST-GH connector to connect to internal USB 2.0 add-on modules (like U100, U110, U120, etc).

5.5 J9 - HDMI

Standard pinout

CEC is not supported (pin 13 of HDMI connector)

Power pin 18 is current limited by PTC fuse (5V 50mA)

5.6 J10 - CSI-2 AB

22 pin 0.5mm pitch FPC connector

Pin	Description	Socket pin	Note
1	3.3V		Power: connected with bead to 3.3V (5V optional if bead is moved)
2	CAM-I2C_SDA	215	
3	CAM-I2C_SCL	213	
4	GND		

5	CAM1-MCLK		IN: Input - connect to 1.8V or 3.3V output of the camera to drive the CAM LED. 1: enable CAM LED 0: disable CAM LED
6	CAM1_PWDN	206	OUT: Output (open drain with 2.2k pullup to 3.3V) - connect to power enable of camera. The control signal is connected via level shifting inverter to pin 152 of the compute module.
7	GND		
8	CSI_B_D1_P	17	
9	CSI_B_D1_N	15	
10	GND		
11	CSI_B_D0_P	5	
12	CSI_B_D0_N	3	
13	GND		
14	CSI_A_CLK_P	12	
15	CSI_A_CLK_N	10	
16	GND		
17	CSI_A_D1_P	18	
18	CSI_A_D1_N	16	
19	GND		
20	CSI_A_D0_P	6	
21	CSI_A_D0_N	4	
22	GND		

See further details in the J5 description.

5.7 J11 - USB 3.0 – 3.1

USB 3.0 Type A standard pinout

In Rev 1: power control is always on (5V 1A)

In Rev 2 and up: Controllable with GPIO pin 126 power on[0]/off[1] (default on[0]) (5V 1A)

5.8 J12 – USB-C

Main power input to the carrier board is the 5V 3A USB C power connector.

No overcurrent and no reverse voltage protection implemented.

Power is limited by the USB power supply.

Alternative 5V powering via the two 5V pins of the GPIO header.

Supports device mode and can be used to flash the compute module.

5.9 J14 - UART connector

JST-GH 1.25mm

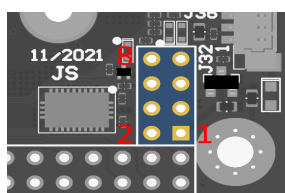
Pin	Description	Socket pin	Note
1	5V		
2	UART0_TXD	99	OUT (3.3V)

3	UART0_RXD	101	IN (3.3V)
4	UART2_TXD	236	OUT, Debug port (3.3V)
5	UART2_RXD	238	IN, Debug port (3.3V)
6	GND		

Unidirectional directional 1.8V to 3.3V level shifters and 10 Ohm series resistance (plus ESD protection).

5.10 J32 - Button and LED header

Pin	Description	Socket pin	Note
1	CAM_LED	218	OUT: open drain (3.3V to 12V)
2	5V		Connection to internal power rail (PoE power injection possible with optional PoE module). No reverse power protection, this could back power J12 USB-C connector
3	BTN PWR ON	-	default: auto power on, no function in rev 1
4	VDD RTC	235	real time clock battery
5	SYS RST IN	239	IN, open drain (1.8V)
6	GPIO_PA6	178	IN/OUT, no level shifter (1.8V)
7	Force recovery	214	IN: open drain (1.8V)
8	GND		



CAM_LED: open drain output to drive cathode of camera LED.

Controlled by 3 signals which are OR 'red together:

J5 pin 5 (CSI CD camera)

J10 pin 5 (CSI AB camera)

Compute module GPIO_12: pin 218 (0: LED off, 1: LED on, float: LED on)

CAM_LED flash signal can be used to control external camera LED. When using external LED please limit current with external resistor. Connect cathode to this pin and anode to 3.3V to 12V power. Maximum current 2A.

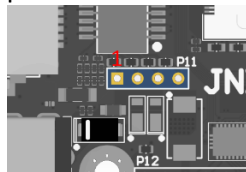
5.11 J36 - Fan connector

Pico blade 1.5mm

Pin	Description	Socket pin	Note
1	GND		
2	5V		max. 1A
3	TACH	-	not connected
4	PWM	230	

5.12 P11 - PoE connector

This connects to the 4 center pins of the ethernet magnetics on the cable side to extract or inject PoE power. This connector may be used for PoE add-on solutions.



5.13 P12 - GPIO header



Pin	Description	Socket pin	Note
1	3.3V		
2	5V		alternative power supply input
3	I2C1_SDA	189	GEN2_I2C_SDA (3.3V)
4	5V		alternative power supply input
5	I2C1_SCL	189	GEN2_I2C_SCL (3.3V)
6	GND		
7	GPIO09_LS	211	OUT (3.3V)
8	UART1_TXD_LS	203	OUT (3.3V)
9	GND		
10	UART1_RXD_LS	205	IN (3.3V, 5V tolerant)
11	UART1_RTS_LS	207	OUT (3.3V)
12	I2S0_SCLK_LS	199	OUT (3.3V)
13	SPI1_SCK_LS	106	OUT (3.3V)
14	GND		
15	GPIO12_LS	218	OUT (3.3V)
16	SPI1_CS1_LS	112	OUT (3.3V)
17	3.3V		
18	SPI1_CS0_LS	110	OUT (3.3V)
19	SPI0_MOSI_LS	89	OUT (3.3V)
20	GND		
21	SPI0_MISO_LS	93	IN (3.3V, 5V tolerant)
22	SPI1_MISO_LS	108	IN (3.3V, 5V tolerant)
23	SPI0_SCK_LS	91	IN (3.3V, 5V tolerant)
24	SPI0_CS0_LS	95	OUT (3.3V)
25	GND		
26	SPI0_CS1_LS	97	OUT (3.3V)
27	ID_I2C_SDA	187	GEN1_I2C_SDA (3.3V)
28	ID_I2C_SCL	185	GEN1_I2C_SCL (3.3V)
29	GPIO01_LS	118	IN (3.3V, 5V tolerant)
30	GND		
31	GPIO11_LS	216	IN (3.3V, 5V tolerant)
32	GPIO07_LS	206	OUT (3.3V)

33	GPIO13_LS	228	IN (3.3V, 5V tolerant)
34	GND		
35	I2S0_LRCK_LS	197	OUT (3.3V)
36	UART1_CTS_LS	209	IN (3.3V, 5V tolerant)
37	SPI1_MOSI_LS	197	OUT (3.3V)
38	I2S0_SDIN_LS	195	IN (3.3V, 5V tolerant)
39	GND		
40	I2S0_SDOOUT_LS	193	OUT (3.3V)

Please use any Raspberry Pi hats with care and carefully check compatibility as compatibility was in mind but cannot be guaranteed for all modules.

All GPIO signals are unidirectional (input or output).

5.14 U10 - Crypto chip

Model: ATSHA204A

Pin	Description	Socket pin	Note
1	NC		
2	NC		
3	NC		
4	GND		
5	GEN3_I2C_SDA		
6	GEN3_I2C_SCL		
7	NC		
8	3.3V		

Integrated for software protection and licensing.

Datasheet Link:

<https://ww1.microchip.com/downloads/en/DeviceDoc/ATSHA204A-Data-Sheet-40002025A.pdf>

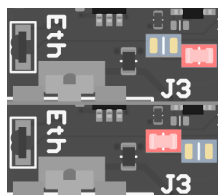
5.15 LED - M.2

Shows M.2 activity.

5.16 LED - Eth

Shows Ethernet activity on Socket pin 194 - on[0]/off[1], default: off

At own risk resistor can be moved to control Eth-LED via socket pin 188 (link LED)



ACT-Ethernet

Control with
socket pin 188



5.17 LED - PWR

Connected to 3.3V power rail. This LED is always on when 3.3V is present on the power rail.



SECTION 6 Frequently Asked Questions

- Why is my X221 not going into force recovery?
 - If your system is not going into force recovery, please contact our support as you may have a system with a mismatched firmware.
- Why is my system not entering the force recovery state?
 - Most of our carrier boards are designed to enter force recovery mode when they detect a Host PC. This detection only works one time automatically after the system was connected to its power supply. We recommend unplugging your system before connecting to a Host PC and plugging it back in to power after connecting.
 - If your system still does not enter force recovery you may have to press the force recovery button or short the respective pins before connecting to power (please see the Technical Reference Manual for a detailed pinout description).
 - If you cannot disconnect your system from power, it is also possible to enter force recovery via a button sequence.
 1. Press/jumper "force recovery" button/pins
 2. Press/jumper "reset" button/pins
 3. Release/disconnect "reset" button/pins
 4. Release/disconnect "force recovery" button/pins a few seconds later then the "reset" button/pins



SECTION 7 Disclaimer

Thank you for reading this manual. If you have found any typos or errors in this document, please let us know.

This is the preliminary version of this data sheet. Please treat all specifications with caution as there may be any typos or errors.

The Auvidea Team



SECTION 8 Copyright notice

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SECTION 9 Appendix A [CSI-Cameras]

This Appendix shows different CSI camera connection options and how to test your camera

9.1 Camera connection example

CSI cameras can connect to J5-CSI-2-CD and J19-CSI-2-AB connector as shown below.





9.2 Test CSI-Camera functionality

The CSI-Cameras should show up under `/dev/video0` and `/dev/video1`

You can test the CSI-Cameras with the Gstreamer.

This framework should be already included in your Jetpack and can be used as follows:

```
//CSI-Camera0:
gst-launch-1.0 nvarguscamerasrc sensor-id=0 ! 'video/x-raw(memory:NVMM),width=3820, height=2464,
framerate=21/1, format=NV12' ! nvvidconv flip-method=0 ! 'video/x-raw,width=960, height=616' !
nvvidconv ! nvegltransform ! nveglglessink -e

//CSI-Camera1:
gst-launch-1.0 nvarguscamerasrc sensor-id=1 ! 'video/x-raw(memory:NVMM),width=3820, height=2464,
framerate=21/1, format=NV12' ! nvvidconv flip-method=0 ! 'video/x-raw,width=960, height=616' !
nvvidconv ! nvegltransform ! nveglglessink -e
```

*tested with raspberry pi camera module v2

A window with the camera stream is going to pop up if everything worked out correctly.

SECTION 10 Appendix B [GPIO]

This Appendix covers the basics of GPIO usage and provides a reference sheet for the socket pin – GPIO number correlation.

10.1 GPIO control

This example shows how to set and readout GPIO 414.
For different GPIO numbers replace 414 accordingly.

10.1.1 Export GPIO

```
nvidia@nvidia-desktop:~$ echo 414 > /sys/class/gpio/export
nvidia@nvidia-desktop:~$
```

10.1.2 Change direction to in

```
nvidia@nvidia-desktop:~$ echo in > /sys/class/gpio/gpio414/direction
nvidia@nvidia-desktop:~$
```

10.1.3 Change direction to out

```
nvidia@nvidia-desktop:~$ echo out > /sys/class/gpio/gpio414/direction
nvidia@nvidia-desktop:~$
```

10.1.4 Set GPIO low

```
nvidia@nvidia-desktop:~$ echo 0 > /sys/class/gpio/gpio414/value
nvidia@nvidia-desktop:~$
```

10.1.5 Set GPIO high

```
nvidia@nvidia-desktop:~$ echo 1 > /sys/class/gpio/gpio414/value
nvidia@nvidia-desktop:~$
```

10.1.6 Readout GPIO value

```
nvidia@nvidia-desktop:~$ cat /sys/class/gpio/gpio414/value
0
nvidia@nvidia-desktop:~$ cat /sys/class/gpio/gpio414/value
1
```

10.2 Pin to GPIO reference sheet for Xavier-NX/Nano/TX2-NX

Pin number (Socket number)	Xavier NX GPIOName	Xavier NX GPIONumber	Xavier NX Pin direction	Nano GPIOName	Nano GPIONumber	Nano Pin direction	TX2 NX GPIOName	TX2 NX GPIONumber	TX2 NX Pin direction
1									
87	GPIO3_PZ.01	489	Bidirectional	GPIO3_PCC.04	228	Bidirectional	GPIO3_PL.04	412	Bidirectional
88	GPIO3_PM.00	384	Input	GPIO3_PCC.06	230	Input	GPIO3_PP.00	440	Input
89	GPIO3_PZ.05	493	Not Assigned	GPIO3_PC.00	16	Input	GPIO3_PH.02	378	Input
91	GPIO3_PZ.03	491	Not Assigned	GPIO3_PC.02	18	Input	GPIO3_PH.00	376	Input
93	GPIO3_PZ.04	492	Not Assigned	GPIO3_PC.01	17	Input	GPIO3_PH.01	377	Input
94	GPIO3_PM.04	388	Bidirectional	GPIO3_PCC.00	224	Bidirectional	GPIO3_PP.02	442	Bidirectional
95	GPIO3_PZ.06	494	Not Assigned	GPIO3_PC.03	19	Input	GPIO3_PH.03	379	Input
96	GPIO3_PM.01	385	Input	GPIO3_PCC.01	225	Input	GPIO3_PP.01	441	Input
97	GPIO3_PZ.07	495	Not Assigned	GPIO3_PC.04	20	Input	GPIO3_PY.03	515	Input
99	GPIO3_PX.04	476	Output	GPIO3_PD.01	25	Output	GPIO3_PX.00	504	Output
101	GPIO3_PX.05	477	Input	GPIO3_PD.02	26	Input	GPIO3_PX.01	505	Input
103	GPIO3_PX.06	478	Output	GPIO3_PD.03	27	Output	GPIO3_PX.02	506	Output
104	GPIO3_PY.02	482	Not Assigned	GPIO3_PB.04	12	Input	GPIO3_PV.03	491	Input
105	GPIO3_PX.07	479	Input	GPIO3_PD.04	28	Input	GPIO3_PX.03	507	Input
106	GPIO3_PY.00	480	Not Assigned	GPIO3_PB.06	14	Input	GPIO3_PV.01	489	Input
108	GPIO3_PY.01	481	Not Assigned	GPIO3_PB.05	13	Input	GPIO3_PV.02	490	Input
110	GPIO3_PY.03	483	Not Assigned	GPIO3_PB.07	15	Input	GPIO3_PV.04	492	Input
112	GPIO3_PY.04	484	Not Assigned	GPIO3_PDD.00	232	Input	GPIO3_PC.03	339	Input
114	GPIO3_PP.04	412	Output	GPIO3_PS.07	151	Output	GPIO3_PN.00	424	Output
116	GPIO3_PP.00	408	Output	GPIO3_PS.00	144	Output	GPIO3_PO.00	432	Output
118	GPIO3_PQ.05	421	Input	GPIO3_PS.05	149	Input	GPIO3_PN.01	425	Input
120	GPIO3_PP.05	413	Output	GPIO3_PT.00	152	Output	GPIO3_PN.03	427	Output
122	GPIO3_PP.01	409	Output	GPIO3_PS.01	145	Output	GPIO3_PO.01	433	Output
124	GPIO3_PQ.03	419	Input	GPIO3_PH.06	62	Input	GPIO3_PL.01	409	Input
126	GPIO3_PCC.00	264	Output	GPIO3_PL.02	66	Output	GPIO3_PL.02	410	Output
127	GPIO3_PCC.01	265	Input	GPIO3_PL.01	65	Output	GPIO3_PL.03	411	Output
128	GPIO3_PCC.02	266	Output	GPIO3_PH.07	63	Output	GPIO3_PL.00	408	Output
130	GPIO3_PCC.03	267	Output	GPIO3_PL.00	64	Output	GPIO3_PC.04	340	Output
143	GPIO3_PAA.03	251	Input				GPIO3_PZ.02	522	Output
145	GPIO3_PAA.02	250	Output				GPIO3_PZ.03	523	Input
178				GPIO3_PA.06	6	Output			
179	GPIO3_PL.02	378	Input	GPIO3_PA.02	2	Input	GPIO3_PA.02	322	Input
180				GPIO3_PA.01	1	Input	GPIO3_PA.01	321	Bidirectional
181				GPIO3_PA.00	0	Output	GPIO3_PA.00	320	Output
182	GPIO3_PK.02	370	Bidirectional				GPIO3_PA.06	326	Bidirectional
183	GPIO3_PK.03	371	Output				GPIO3_PA.05	325	Output
185	GPIO3_PCC.07	271	Bidirectional	GPIO3_PJ.01	73	Bidirectional	GPIO3_PC.05	341	Bidirectional
187	GPIO3_PDD.00	272	Bidirectional	GPIO3_PI.00	72	Bidirectional	GPIO3_PC.06	342	Bidirectional
189				GPIO3_PI.02	74	Bidirectional	GPIO3_PEE.00	288	Bidirectional
191				GPIO3_PJ.03	75	Bidirectional	GPIO3_PEE.01	289	Bidirectional
193	GPIO3_PT.06	446	Not Assigned	GPIO3_PI.06	78	Input	GPIO3_PJ.01	393	Input
195	GPIO3_PT.07	447	Not Assigned	GPIO3_PI.05	77	Input	GPIO3_PJ.02	394	Input
197	GPIO3_PU.00	448	Not Assigned	GPIO3_PI.04	76	Input	GPIO3_PJ.03	395	Input
199	GPIO3_PT.05	445	Not Assigned	GPIO3_PI.07	79	Input	GPIO3_PJ.00	392	Input
203	GPIO3_PR.02	426	Output	GPIO3_PG.00	48	Output	GPIO3_PW.02	498	Output
205	GPIO3_PR.03	427	Input	GPIO3_PG.01	49	Input	GPIO3_PW.03	499	Input
206	GPIO3_PR.00	424	Input	GPIO3_PV.00	168	Input	GPIO3_PU.00	480	Input
207	GPIO3_PR.04	428	Not Assigned	GPIO3_PG.02	50	Input	GPIO3_PW.04	500	Input
208	GPIO3_PQ.02	418	Input	GPIO3_PZ.02	202	Input	GPIO3_PX.04	508	Input
209	GPIO3_PR.05	429	Not Assigned	GPIO3_PG.03	51	Input	GPIO3_PW.05	501	Input
211	GPIO3_PS.04	436	Not Assigned	GPIO3_PBB.00	216	Input	GPIO3_PJ.04	396	Input
212	GPIO3_PQ.01	417	Input	GPIO3_PV.01	169	Input	GPIO3_PC.01	337	Input
213	GPIO3_PP.02	410	Bidirectional	GPIO3_PS.02	146	Bidirectional	GPIO3_PO.02	434	Bidirectional
214	GPIO3_PG.00	336	Input	GPIO3_PX.06	190	Input	GPIO3_PFF.01	529	Input
215	GPIO3_PP.03	411	Bidirectional	GPIO3_PS.03	147	Bidirectional	GPIO3_PO.03	435	Bidirectional
216	GPIO3_PQ.06	422	Input	GPIO3_PZ.00	200	Input	GPIO3_PEE.02	290	Input
218	GPIO3_PCC.04	268	Not Assigned	GPIO3_PY.02	194	Input	GPIO3_PC.02	338	Input
219	GPIO3_PO.02	402	Bidirectional	GPIO3_PP.05	125	Bidirectional	GPIO3_PG.02	370	Bidirectional
220	GPIO3_PT.02	442	Output	GPIO3_PE.02	34	Bidirectional	GPIO3_PM.03	419	Output
221	GPIO3_PO.03	403	Bidirectional	GPIO3_PP.04	124	Bidirectional	GPIO3_PG.03	371	Bidirectional
222	GPIO3_PT.03	443	Input	GPIO3_PE.01	33	Input	GPIO3_PM.00	416	Input
223	GPIO3_PO.04	404	Bidirectional	GPIO3_PP.03	123	Bidirectional	GPIO3_PG.04	372	Bidirectional
224	GPIO3_PT.04	444	Bidirectional	GPIO3_PE.00	32	Bidirectional	GPIO3_PM.01	417	Bidirectional
225	GPIO3_PO.05	405	Bidirectional	GPIO3_PP.02	122	Bidirectional	GPIO3_PG.05	373	Bidirectional
226	GPIO3_PT.01	441	Bidirectional	GPIO3_PE.03	35	Bidirectional	GPIO3_PM.02	418	Bidirectional
227	GPIO3_PO.01	401	Bidirectional	GPIO3_PP.01	121	Bidirectional	GPIO3_PG.01	369	Bidirectional
228	GPIO3_PN.01	393	Input	GPIO3_PE.06	38	Input	GPIO3_PU.05	485	Input
229	GPIO3_PO.00	400	Output	GPIO3_PP.00	120	Output	GPIO3_PG.00	368	Output
230	GPIO3_PH.01	345	Output	GPIO3_PE.07	39	Output	GPIO3_PV.06	494	Output
232	GPIO3_PI.03	355	Bidirectional	GPIO3_PF.00	40	Bidirectional	GPIO3_PW.00	496	Bidirectional
234	GPIO3_PI.04	356	Bidirectional	GPIO3_PF.01	41	Bidirectional	GPIO3_PW.01	497	Bidirectional
236	GPIO3_PCC.05	269	Output	GPIO3_PO.00	160	Output	GPIO3_PT.00	472	Output
238	GPIO3_PCC.06	270	Input	GPIO3_PU.01	161	Input	GPIO3_PT.01	473	Input
240	GPIO3_PEE.04	284	Input	GPIO3_PX.05	189	Input	GPIO3_PFF.00	528	Input

This Information is provided as is from Auvideo. Auvideo does not guarantee correctness but believes the numbers are correct. If you see any wrong information's, please let us know so we can correct the documentation.



10.3 How to calculate GPIOs

The above list should include every GPIO there is. This “how to” may help you find errors we did in our documentation ore to calculate GPIOs for upcoming models as the NVIDIA Jetson Orin.

10.3.1 GPIOnumber

The basic formular:

$$\text{GPIOnumber} = \text{GPIOletter} * 8 + \text{GPIOdigit} + \text{GPIOoffset}$$

10.3.2 GPIOletter

The GPIOletter is located between [GPIO3_P] and [.digit]

GPIOname	GPIOletter	GPIOletter (referenced)
GPIO3_PO.01	O	14 (for Xavier NX)
GPIO3_PCC.04	CC	2 (for Xavier NX)

This letter needs to be referenced to a number.

This number is individual to every Jetson module and can be found in the “tegra-gpio.h” (name may differ depending on module).

Pleas also see the example table shown in GPIOoffset

10.3.3 GPIOdigit

The GPIOdigit is easiest to get and can be extracted directly from the name.

GPIO3_PO.[GPIOdigit]

GPIOname	GPIOdigit
GPIO3_PO.01	1
GPIO3_PCC.04	4

10.3.4 GPIOoffset

The offset is connected to the GPIOletter. The same GPIOletter has always the same GPIOoffset for one specific module and only differs for AON cores.

GPIOoffsets are listed later in the table.

10.3.5 Example

Calculating GPIO number GPIO3_PO.01 for Jetson Xavier NX:

$$\text{GPIOnumber} = \text{GPIOletter} * 8 + \text{GPIOdigit} + \text{GPIOoffset}$$

$$\text{GPIOnumber} = 401 = 14 * 8 + 1 + 288$$



10.3.6 Table

Jetson Xavier NX			
Alpha Key	Value	Offset	Note
A.	0	288	
B.	1	288	
C.	2	288	
D.	3	288	
E.	4	288	
F.	5	288	
G.	6	288	
H.	7	288	
I.	8	288	
J.	9	288	
K.	10	288	
L.	11	288	
M.	12	288	
N.	13	288	
O.	14	288	
P.	15	288	
Q.	16	288	
R.	17	288	
S.	18	288	
T.	19	288	
U.	20	288	
V.	21	288	
W.	22	288	
X.	23	288	
Y.	24	288	
Z.	25	288	
AA	0	248	AON GPIO
BB	1	248	AON GPIO
CC	2	248	AON GPIO
DD	3	248	AON GPIO
EE	4	248	AON GPIO
FF	26	288	
GG	27	288	

Jetson Nano		
Alpha Key	Value	Offset
A.	0	0
B.	1	0
C.	2	0
D.	3	0
E.	4	0
F.	5	0
G.	6	0
H.	7	0
I.	8	0
J.	9	0
K.	10	0
L.	11	0
M.	12	0
N.	13	0
O.	14	0
P.	15	0
Q.	16	0
R.	17	0
S.	18	0
T.	19	0
U.	20	0
V.	21	0
W.	22	0
X.	23	0
Y.	24	0
Z.	25	0
AA	26	0
BB	27	0
CC	28	0
DD	29	0
EE	30	0
FF	31	0

Jetson TX2 NX			
Alpha Key	Value	Offset	Note
A.	0	320	
B.	1	320	
C.	2	320	
D.	3	320	
E.	4	320	
F.	5	320	
G.	6	320	
H.	7	320	
I.	8	320	
J.	9	320	
K.	10	320	
L.	11	320	
M.	12	320	
N.	13	320	
O.	14	320	
P.	15	320	
Q.	16	320	
R.	17	320	
S.	18	320	
T.	19	320	
U.	20	320	
V.	21	320	
W.	22	320	
X.	23	320	
Y.	24	320	
Z.	25	320	
AA	0	256	AON GPIO
BB	1	256	AON GPIO
CC	2	256	AON GPIO
DD	3	256	AON GPIO
EE	4	256	AON GPIO
FF	26	320	
GG	27	320	

SECTION 11 Appendix C [I2C]

This Appendix shows the basic usage of the I2C bus.

11.1 I2C device bus

I2C Examples of configurations and how to use.

Bus	GEN1_I2C	GEN2_I2C	GEN3_I2C	CAM_I2C
Pins	185 and 187	189 and 191	232 and 234	213 and 215
Voltage (native)	3.3V	3.3V	1.8V	3.3V
Nano device				6
TX2 NX device	0			
Xavier NX device	1			2
Crypto chip		ATSHA204A		
CSI-2 camera	CSI-CD	CSI-E	CSI-F	CSI-AB
GPIO header	27 and 28	3 and 5		
EEPROM		24LC024		

11.2 I2C usage of devices and registers

11.2.1 List i2c devices on a specific bus

Syntax: i2cdetect [options] <busNr>

```
test@test-desktop:~$ i2cdetect -y -r 8
    0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00: -- -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- --
50: -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- -- -- -- -- --
70: -- -- -- -- -- -- 76 --
test@test-desktop:~$
```

11.2.2 Dump i2c device registers

Syntax: i2cdump [options] <busNr> <deviceAddress>

```
test@test-desktop:~$ i2cdump -y -f 8 0x76
No size specified (using byte-data access)
   0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f  0123456789abcdef
00: 00 00 ff ff 00 00 ff ff XX XX XX XX XX XX XX XX .....XXXXXXXXXX
10: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XXXXXXXXXXXXXXXXX
20: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XXXXXXXXXXXXXXXXX
...
d0: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XXXXXXXXXXXXXXXXX
e0: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XXXXXXXXXXXXXXXXX
f0: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XXXXXXXXXXXXXXXXX
test@test-desktop:~$
```

11.2.3 Set register value:

Syntax: i2cset [options] <busNr> <deviceAddress> <register> <address> <value>

```
test@test-desktop:~$ sudo i2cset -y -f 8 0x76 0x06 0x00
test@test-desktop:~$
```

11.2.4 Read register value:

Syntax: i2cget [options] <busNr> <deviceAddress> <register> <address>

```
test@test-desktop:~$ sudo i2cget -y -f 8 0x76 0x06
0x00
test@test-desktop:~$
```

11.2.5 Test IMX219 camera stream

The parameter `sensor-id=` describes the camera target. This id can be found by using `ls /dev/`. If the camera correctly plugged in then there should be a device called `/dev/videoX`, where X is the camera id.

```
test@test-desktop:~$ gst-launch-1.0 nvarguscamerasrc sensor-id=0 ! 'video/x-raw(memory:NVMM), width=(int)1280, height=(int)720, format=(string)NV12, framerate=(fraction)30/1' ! nvvidconv ! queue ! xvimagesink
```

SECTION 12 Appendix D [SSD-Boot]

This guide describes how to set up your system to boot partially or fully from a M.2 SSD depending on your module choice.

This guide is intended for experienced users only.

12.1 Partial SSD boot for Jetson Nano, NX, TX2 NX

The Jetson Nano, NX and TX2 NX modules do not support native boot purely from the SSD. To still benefit from the SSD speed and size this guide describes how to move your RootFS to your SSD. You can also use the Partial SSD boot for the Jetson Xavier series.

Before you start please make sure your system is set up according to our Quick start guide.

You can find the quick start guide on our website:

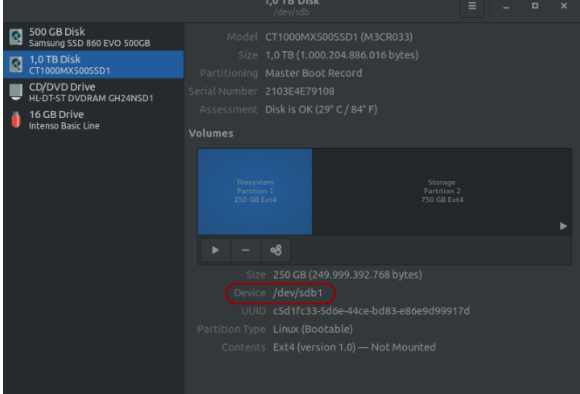
<https://auvidea.eu/manuals/>

Note:

If you run into problems, there is also another resource from JetsonHacks: “Jetson Xavier NX – Run from SSD” which you can find on google.

12.1.1 Locate storage device

The first thing you need to do is to identify the storage device you are intending to use.

Disk	Ubuntu	Note
	 The screenshot shows the Ubuntu disk utility interface. On the left, a list of disks includes a 500 GB disk, a 1.0 TB disk (selected), a CD/DVD drive, and a 16 GB drive. The main window displays details for the 1.0 TB disk, including its model, size, and partitioning scheme (Master Boot Record). A volume of 250 GB is shown, with its device path <code>/dev/sdb1</code> circled in red. The partition type is Linux (Bootable) and it is currently not mounted.	With the disc program you can find your device as shown in the Picture.

Make sure your intended SSD storage device does not hold valuable data as the following steps will format this device.

SSD-Storage device:

When working with NVME SSD your device name should look like this: `/dev/nvme0n1p1`

The ending `p1` stands for partition one. In the following steps you must remove the partition information from the device path. See the following example:

`<YOUR_STORAGE_DEVICE> = /dev/nvme0n1`

USB-Storage device:

When working with external USB devices your device name should look like this: `/dev/sdb1`

The ending `1` stands for partition one. In the following steps you must remove the partition information from the device path. See the following example:

`<YOUR_STORAGE_DEVICE> = /dev/sdb`



12.1.2 Set up RootFS on SSD

Format the storage device

```
sudo parted <YOUR_STORAGE_DEVICE> mklabel gpt
```

Create the RootFS partition

```
sudo parted <YOUR_STORAGE_DEVICE> mkpart APP 0GB <YOUR_ROOTFS_SIZE>
```

Create filesystem

```
sudo mkfs.ext4 <YOUR_STORAGE_DEVICE>1
```

Copy the existing RootFS to the storage device

```
sudo mount <YOUR_STORAGE_DEVICE> /mnt
```

```
sudo rsync -axHAX --numeric-ids --info=progress2 --  
exclude={"/dev/", "/proc/", "/sys/", "/tmp/", "/run/", "/mnt/", "/media/*", "/lost+fo  
und"} / /mnt/
```

12.1.3 Switch boot device to SSD

You need to change your root target in exlinux.conf to the SSD.

Open exlinux.conf

```
sudo nano /boot/exlinux/exlinux.conf
```

Modify the exlinux.conf by changing the root path

```
LABEL primary  
    MENU LABEL primary kernel  
    LINUX /boot/Image  
    INITRD /boot/initrd  
    APPEND ${cbootargs} quiet root=<YOUR_STORAGE_DEVICE>1 rw rootwait  
rootfstype=ext4 console=ttyTCU0,115200n8 console=tty0 fbcon=map:0  
net.ifnames=0
```

After a reboot your system will start from the SSD

12.1.4 Validate

You can validate the SSD boot by using

```
test@test-desktop:~$ df /  
Filesystem      1K-blocks      Used Available Use% Mounted on  
/dev/nvme0n1p1 122507912 14618752 102744904 13% /
```

When <Your_Storage_device> shows up you successfully moved your RootFS and booted from SSD.

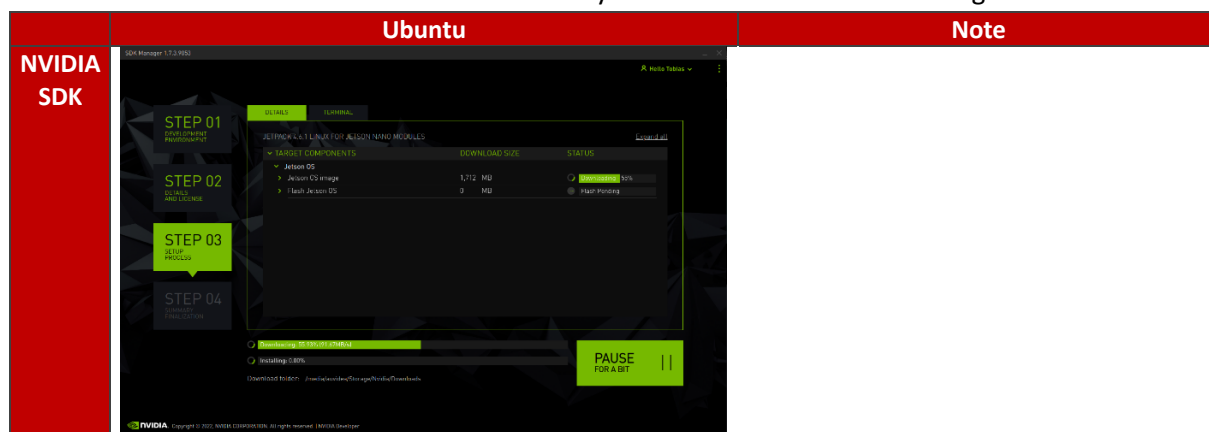
12.2 Native SSD boot for Jetson AGX Xavier and Xavier NX series

This guide is only applicable for the Xavier series. These series support direct boot from NVME SSD.
Note:

If you run in to problems, there is also another resource from JetsonHacks: “Jetson Xavier NX – Run from SSD” which you can find on google.

12.2.1 Install Jetpack 4.6+

To be able to flash the custom BPS from Auvideo you need the NVIDIA SDK manager



12.2.2 Load custom BPS from Auvideo

Download our BPS from our Website and apply it to the L4T folder.

<https://auvideo.eu/firmware/>

12.2.3 Flash system

```
sudo ./nvsdkmanager_flash.sh -s nvme0n1p1
```

SECTION 13 Appendix E [Wi-Fi]

This appendix describes how you can bring Wi-Fi functionality to one of Auvideo JN boards afterwards. If you possess a different carrier board line-up parts of this Appendix still apply and provide valuable information.

Please note that exclusively USB-only Wi-Fi cards are supported at the moment.

This excludes PCIe Wi-Fi cards from Intel ore other vendors.

Future development aims to also provide solutions for PCIe Wi-Fi cards.

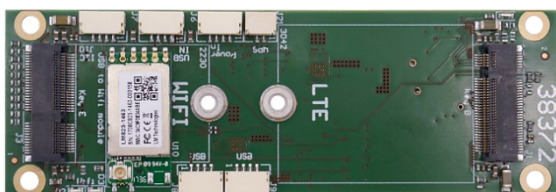
Please contact Auvideo for custom solutions when needed.

13.1 Options from AUVIDEA

13.1.1 U100 Adapter

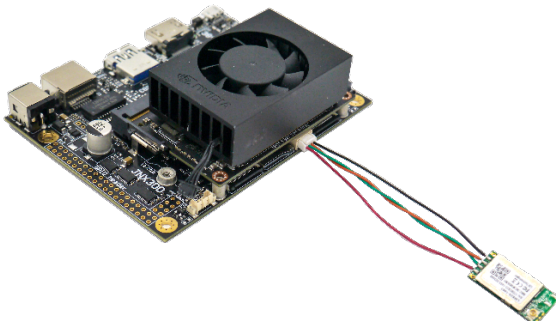
The U100 is an adapter board with four port USB 2.0 hub and 1x M.2 Key E slot for USB only Wi-Fi cards and M.2 Key B for LTE cards.

A version of U100 with already integrated LM823 Wi-Fi is available from Auvideo.

	U100	Note
Image		This adapter connects to the J8 connector as shown in "LM823 with cable" https://auvideo.eu/product/38372/

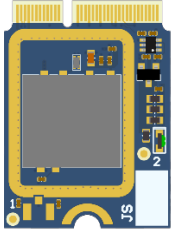
13.1.2 LM823 with cable

Simple solution to connect a LM823 (5V only!) module to the J8 connector on the JNX30D carrier board.

	Setup example	Kabel + LM823-module
Image		

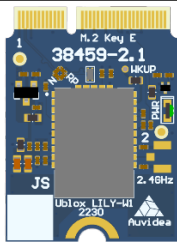
Please contact Auvideo for samples.

13.1.3 38458 Wi-Fi card

	38458 Wi-Fi card	Note
		M.2 Key E Wi-Fi card with RTL8188 module.

Please contact Auvideo for samples.

13.1.4 38459 Wi-Fi card

	38459 Wi-Fi card	38459 Wi-Fi card	Note
			M.2 Key E Wi-Fi card with Ublox Lily W-131 module.

Please contact Auvideo for samples.

13.1.5 U101 Adapter

[in development] A simple adapter from internal USB connector to M.2. Enables the use of USB only Wi-Fi cards.

Please contact Auvideo for samples.

13.1.6 U102 Adapter

[in development] A simple adapter board for the LM823 module with 3.3V power for the 3.3V version of LM823.

Please contact Auvideo for samples.

13.2 Options from other sources

13.2.1 ST60-2230C-UU by Laird

The M.2 Key E ST60-2230C-UU by Laird is evaluated and validated from Auvideo. Can be installed in the U100 Adapter. Auvideo can provide this card. Please ask for a quote.

13.2.2 Further modules

Also, any M.2 USB only Wi-Fi cards should be compatible with the boards from Auvideo. When using different modules then suggested you must conduct your own verification process.

13.3 DIY integration

This example shows the integration of LM823 Wi-Fi module into the JN30D (38488-2). Similar steps may be applicable to your product.

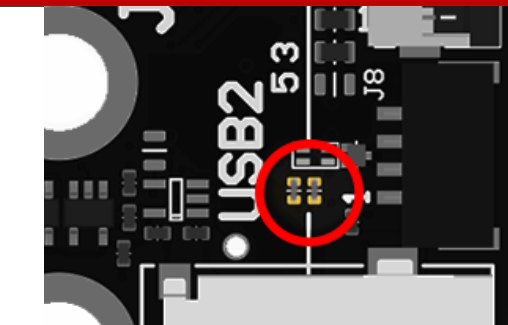
Please contact Auvideo for support if you have problems with different carrier boards.

You will need:

- LM823 Module (3.3V or 5V)
- Three beads (0201 0-Ohm)
- Soldering skills

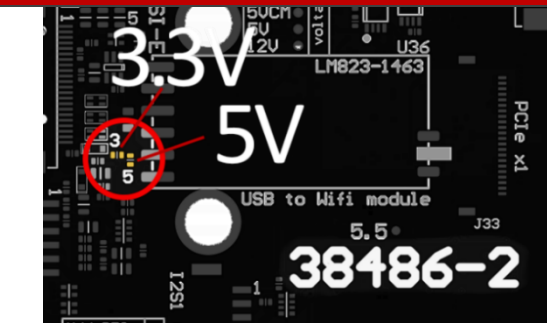
13.3.1 Enable USB interface

The LM823 module when soldered to the appropriate bay is using the USB 2.0 lanes from the J8 USB connector. When performing this modification, the J8 USB port must not be used afterwards!

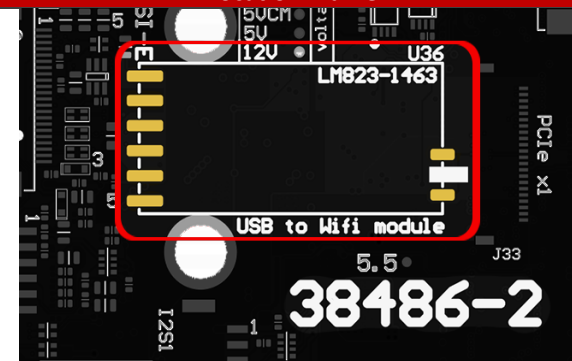
	Location marker	Note
USB-beads		Solder two beads next to the J8 USB 2.0 connector (vertical orientation) to the location marked with the red circle. This will connect J8 to the LM823 solder pins.

13.3.2 Set voltage

On the underside please first set the appropriate voltage for your LM823 module.

	Location marker	Note
Voltage select		Soldering on a bead to either the 3 (3.3V) or 5 (5V) location as displayed in the picture. Please check your LM823 module needs.

13.3.3 Soldering on Module

	Location marker	Note
LM823 bay		The LM823 module can be easily soldered to the pins.

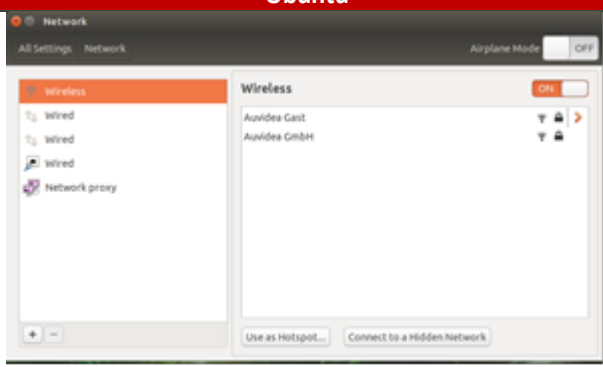
13.3.4 Result

	Location marker	Note
Reference		After soldering on your module your result should look like displayed here. After connecting the antenna to the Wi-Fi module, you can start your system and test if it gets recognised.

13.4 Test Wi-Fi module connection

13.4.1 With GUI

You can check Wi-Fi functionality with the Ubuntu GUI

	Ubuntu	Note
Wi-Fi test		After installing a Wi-Fi module, it should be a visible network in the Ubuntu Network GUI.

13.4.2 Without GUI

USB devices can also be listed with lsusb:
Module is highlighted in red.

```
test@test-desktop:~$ lsusb
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 003: ID 0bda:8179 Realtek Semiconductor Corp. RTL8188EUS 802.11n Wireless Network Adapter <- LM module
Bus 001 Device 006: ID 1058:25a2 Western Digital Technologies, Inc.
Bus 001 Device 005: ID 04ca:007d Lite-On Technology Corp.
Bus 001 Device 004: ID 046d:c077 Logitech, Inc. M105 Optical Mouse
Bus 001 Device 002: ID 05e3:0608 Genesys Logic, Inc. Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
test@test-desktop:~$
```



SECTION 14 END OF DOKUMENT

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