AUVIDEA
JNX30D
TECHNICAL REFERENCE MANUAL

SCOPE OF WORK
Providing technical information and documentation to the product line JNX30D for NVIDIA Jetson Nano & TX2 NX & Xavier NX

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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	Internal verification process
1.3	Internal verification process
1.4	Updated content and pictures
1.5	Added Appendix D & E
1.6	Added information for Rev 3 & up for J32, P12 Pin 7 and updated the GPIO Appendix

SECTION 2 Product revisions and changes

Product version	Changes
38486	Engineering prototype
38486-2	Production release
38486-3	- add 100k Pull up on UART RXD console - added pins to J32 to enable/disable AutoStart - added 1.8V level I2C custom build option to all 4 CSI-2 ports (for Basler and Allied vision cameras) - new feature for boards with MCU: automatically restart 5V power controller, if over current condition occurred. MCU: monitor PG_5V_CM and toggle CM_PWR_ON if PG has become low, due to a over current condition.

SECTION 3 Overview

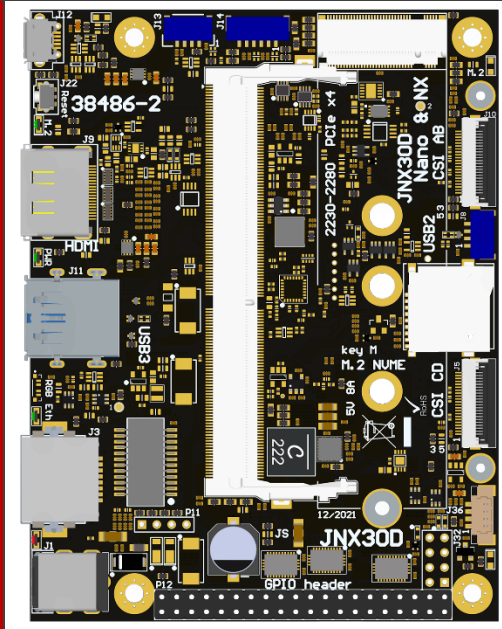
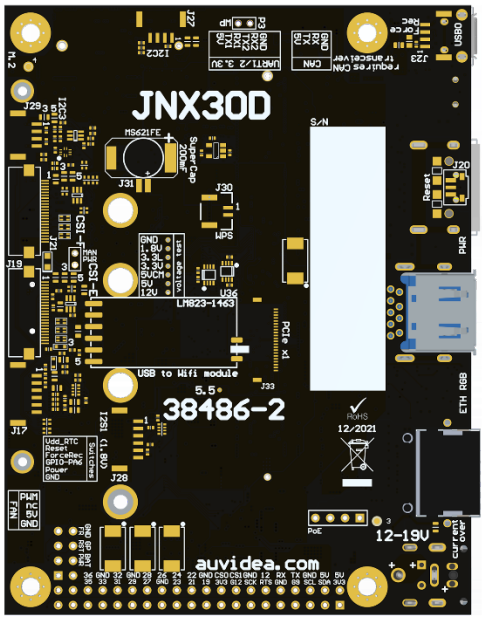
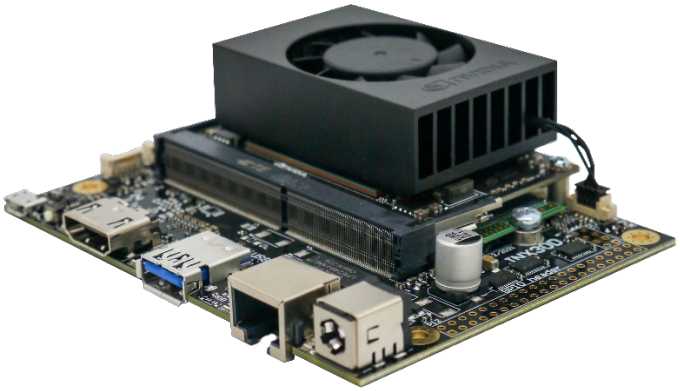
3.1 Jetson compute module

This new JNX30D carrier board has been designed for the Jetson Xavier NX primarily, but it also supports the TX2 NX and Nano compute modules. A 5V 8A on-board power converter supports the high power modes of the Xavier NX.

3.2 JNX30D

- 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 Model pictures

	Top side	Bottom side
JNX30D		
		

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

3.4 JNX30D features and comparison

Description	JNX30D	NVIDIA Devkit
Power	6V - 19V (5.5/2.5mm connector)	5V – 19V
NX powering	5V 8A power supply	?
DP	no	yes
HDMI	yes	yes
Fan connector	yes	yes
M.2 NVME Key M	yes	yes
Micro SD card	yes	no
M.2 Key E	only with external module (using internal USB - J8)	yes
CAN RX / TX	yes	yes
USB 3.0	1x USB 3.1 (native - full performance)	4x USB 3.1 (via USB hub - shared)
Micro USB	1x Micro USB (host and device mode)	1x Micro USB (device mode only)
Auto Flashing	yes (plug in host cable and flash)	no
USB 2.0	1x USB 2.0 (JST-GH, J8)	no
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)
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)	

3.5 Technical specifications

Description		Note
HDMI	standard HDMI connector (2.0)	
USB 3.1	10Gb/s	
Physical size	80x 104.6mm	
Mounting holes	4x M3	
Temperature range	0 to 70°C (extended range optional)	
Humidity	non condensing	
Longevity	No temperature sensitive components (like electrolytic capacitors)	

3.6 Power consumption

Description	JNX30D
Carrier board logic	< 1 watt
3.3/5V power converter efficiency	> 90%
Power in 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 Auvidea 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. Die 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. Auvidea 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.

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 MCU

A MCU for additional power management and watchdog functions is optional. It is standard on some of the extended versions of the JNX30D.

SECTION 5 Pinout description

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

5.1 J1 - Power input jack

Barrel 5.5/2.5mm

Pin	Description	Note
1	12V	12V nominal (absolute max. 19V) recommend power supply 12V 36W (or higher) reverse voltage protection over voltage protection (SMA6J18A/CA) with max 20V peak
2	GND	

Reverse voltage protection also functions as back power protection if PoE injection is used with J32 pin 2. If a voltage higher than 19V is applied, the TRS diode will heat up and possibly get damaged.

5.2 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.

5.3 J4 - M.2 PCIEx4 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 Auvidea development system offerings.

5.4 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_D0_P	48	
21	CSI_C_D0_N	46	
22	GND		

Please note that on the JNX30D 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 Auvidea 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. Alvium 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.

5.5 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).

5.6 J9 - HDMI

Standard pinout
CEC is not supported (pin 13 of HDMI connector)
Power pin 18 is current limited by PTC fuse (5V 50mA)

5.7 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.

5.8 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)

5.9 J12 - Micro USB

Standard pinout
OTG support (to flash the compute module)
Host mode (5V 500mA via power limiting switch)
Host mode usable with device tree changes to power external devices, enable power control with GPIO_02 (Socket pin: 124)

5.10 J13 – CAN

JST-GH 1.25mm

Pin	Description	Socket pin	Note
1	5V		
2	CAN_TX	145	
3	CAN_RX	143	
4	GND		

CAN can only be used with Jetson Nano NX and TX2 NX. These pins are reserved with the Nano. Direct connection to module with no ESD protection!

5.11 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		

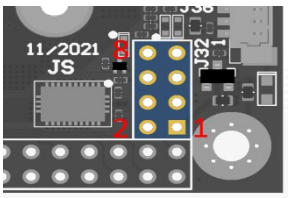
Unidirectional directional 1.8V to 3.3V level shifters and 10 Ohm series resistance (plus ESD protection).

5.12 J22 - Reset Button

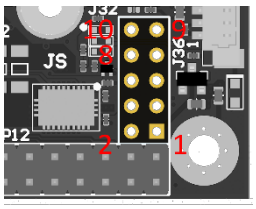
Press to reset the compute module.

5.13 J32 - Button and LED header

Pin	Description	Socket pin	Note
1	CAM_LED	218	OUT: open drain (3.3V to 12V)
2	12V		Connection to internal power rail (PoE power injection possible with optional PoE module)
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		
9	PWR BTN enable		Only available in Rev 3 and up. A jumper between 9 & 10 disables AutoStart. If you disabled AutoStart with this method, you need to use pin 3 (BTN PWR ON) an short it go GND to start the system.
10	PWR BTN enable		Only available in Rev 3 and up. A jumper between 9 & 10 disables AutoStart. If you disabled AutoStart with this method, you need to use pin 3 (BTN PWR ON) an short it go GND to start the system.



Rev 1&2



Rev 3 & up
Added pin 9 & 10 to disable autostart.

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.

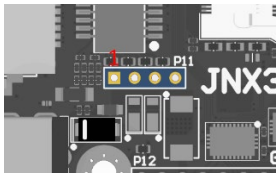
5.14 J36 - Fan connector

Pico blade 1.5mm

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

5.15 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 addon solutions.



5.16 P12 - GPIO header

Pin	Description	Socket pin	Note
1	3.3V		
2	5V		
3	I2C1_SDA	191	GEN2_I2C_SDA (3.3V)
4	5V		
5	I2C1_SCL	189	GEN2_I2C_SCL (3.3V)
6	GND		
7	GPIO09_LS	211	OUT (3.3V), do not use, this pin is used for SD-Card enable by the system
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	GIIO07_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_SDOUT_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.
Output levels are 3.3V.
All GPIO signals are unidirectional (input or output).

5.17 U10 - Crypto chip

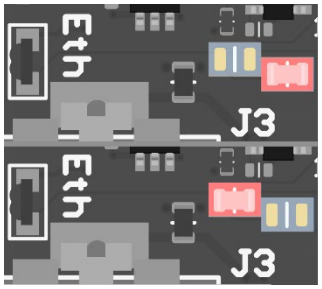
Model: ATSHA204A

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

5.18 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)

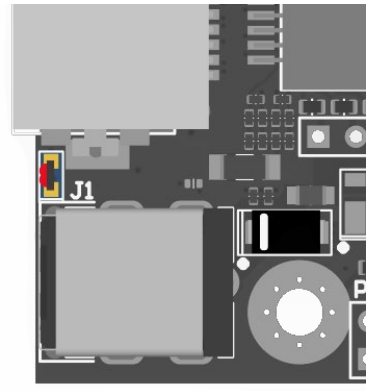


ACT-Ethernet

Control with
socket pin 188

5.19 LED - Over current

Placed between J1 (Power connector) and J3 (Ethernet).
Shows over current condition of integrated 5V 8A power supply. If 8A is exceeded the power output is disabled, and the LED is activated to red. To reset this over current condition power input must be cycled.
The integrated 5V power controller supplies mainly power the compute module, the USB ports and the 3.3V power controller for the M.2 socket.



5.20 LED - PWR

GPIO socket pin 178 on[1]/off[0], default: off[0].

5.21 Micro SD card reader

Standard pinout.
Needs device tree changes to be activated which includes enabling socket pin 211.

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 got a system with a mismatched firmware.
- Why is my system not entering the force recovery state?
  - Most of our carrier boards are design 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 bevor 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 bevor 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

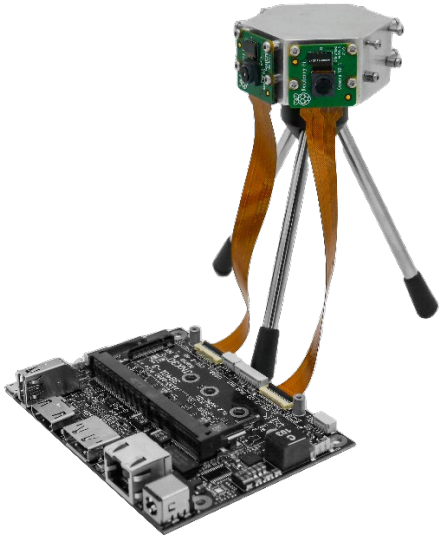
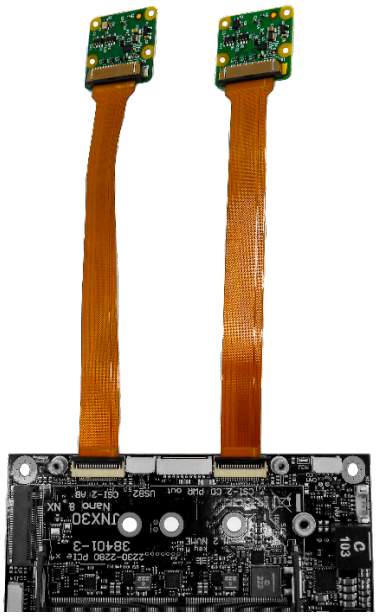
Trademarks
NVIDIA, the NVIDIA logo, CUDA, Jetson, Maxwell, Tegra, Nano and VisionWorks are registered trademarks and/or trademarks of NVIDIA Corporation in the United States and other countries. Other company and product names may be trademarks of the respective companies with which they are associated.

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.

	22 pin 0.5mm to 15 pin 1.0mm FPC cable	Using 38237 adapter + cable
		
		

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 1 Appendix B [GPIO]

This Appendix covers the basics of GPIO usage and provides a reference sheet for the socket pin to GPIOnumber correlation. This section only focuses on the GPIO capable pins. Pins that are not able to be used as GPIOs are not listed in the reference sheet. (They are most likely CSI, I2C or PCIe lanes)

1.1 GPIO control

This example shows how to set and read out GPIO 414.
For different GPIO numbers replace the number (414) accordingly.

1.1.1 Export GPIO

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

1.1.2 Change direction to in

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

1.1.3 Change direction to out

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

1.1.4 Set GPIO low

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

1.1.5 Set GPIO high

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

1.1.6 Readout GPIO value

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

1.2 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_PI.02	66	Output	GPIO3_PL.02	410	Output
127	GPIO3_PCC.01	265	Input	GPIO3_PI.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_PI.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_PJ.00	72	Bidirectional	GPIO3_PC.06	342	Bidirectional
189				GPIO3_PJ.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_PJ.06	78	Input	GPIO3_PJ.01	393	Input
195	GPIO3_PT.07	447	Not Assigned	GPIO3_PJ.05	77	Input	GPIO3_PJ.02	394	Input
197	GPIO3_PU.00	448	Not Assigned	GPIO3_PJ.04	76	Input	GPIO3_PJ.03	395	Input
199	GPIO3_PT.05	445	Not Assigned	GPIO3_PJ.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_PU.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

Please note that the direction noted is the standard direction it may be changed for your specific product. This Information is provided as is from Auvidea. It was generated automatically with the Pinmux sheet from Nvidia. Auvidea 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.

1.3 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.

1.3.1 GPIOnumber

The basic formular:

$$GPIOnumber = GPIOletter * 8 + GPIOdigit + GPIOoffset$$

1.3.2 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

1.3.3 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

1.3.4 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.

1.3.5 Example

Calculating GPIO number GPIO3_PO.01 for Jetson Xavier NX:

$$GPIOnumber = GPIOletter * 8 + GPIOdigit + GPIOoffset$$
$$GPIOnumber = 401 = 14 * 8 + 1 + 288$$

1.3.6 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 2 Appendix C [I2C]

This Appendix shows the basic usage of the I2C bus.

2.1 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	0	1		6
TX2 NX device	0	1		
Xavier NX device	1	8		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		

2.2 I2C usage of devices and registers

2.2.1 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:~$
```

2.2.2 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 ........XXXXXXXX
10: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XXXXXXXXXXXXXXXX
20: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XXXXXXXXXXXXXXXX
...
d0: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XXXXXXXXXXXXXXXX
e0: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XXXXXXXXXXXXXXXX
f0: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XXXXXXXXXXXXXXXX
test@test-desktop:~$
```

2.2.3 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:~$
```

2.2.4 Read register value:

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

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

2.2.5 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 3 Appendix D [SSD-Boot]

If you are interested at booting your system fully or partially from SSD pleas see our Software Setup Guide on our support site. https://auvidea.eu/manuals/
The information from this Appendix D has been moved to the Software Setup Guide.

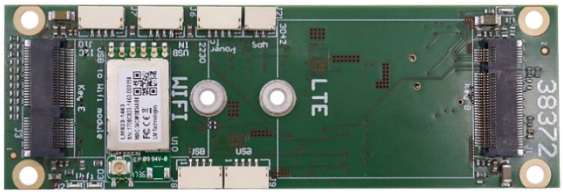
SECTION 4 Appendix E [Wi-Fi]

This appendix describes how you can bring Wi-Fi functionality to one of Auvidea 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 Auvidea for custom solutions when needed.

4.1 Options from AUVIDEA

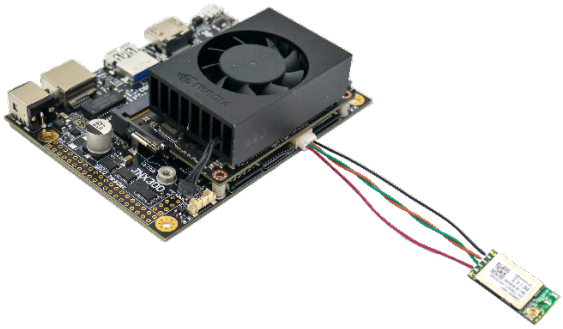
4.1.1 U100 Adapter

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 Auvidea.

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

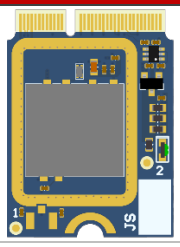
4.1.2 LM823 with cable

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

	Setup example	Kabel + LM823-module
Image		

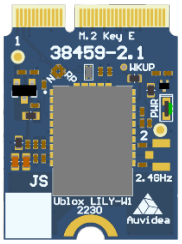
Please contact Auvidea for samples.

4.1.3 38458 Wi-Fi card

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

Please contact Auvidea for samples.

4.1.4 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 Auvidea for samples.

4.1.5 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 Auvidea for samples.

4.1.6 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 Auvidea for samples.

4.2 Options from other sources

4.2.1 ST60-2230C-UU by Laird

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

4.2.2 Further modules

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

4.3 DIY integration

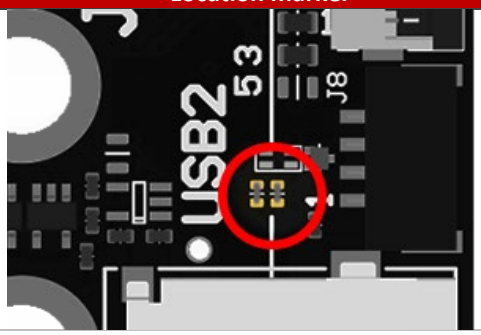
This example shows the integration of LM823 Wi-Fi module into the JN30D (38488-2). Similar steps may be applicable to your product.
Note that not all carrier boards support this modification/integration!
Please contact Auvidea for support if you have problems with different carrier boards.

You will need:

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

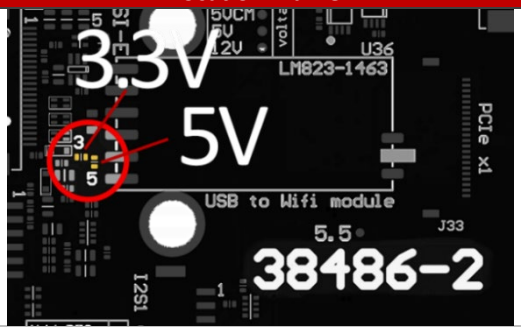
4.3.1 Enable USB interface

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!

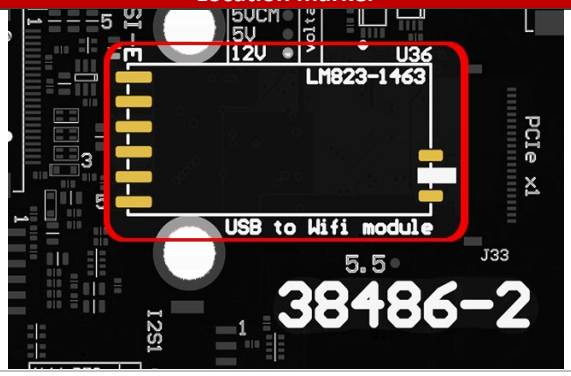
	Location marker	Note
USB-beads		Solder two beads next to the J8 USB 2.0 connector (vertical orientation) to the location marked with the red circle. This will connect J8 to the LM823 solder pins.

4.3.2 Set voltage

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

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

4.3.3 Soldering on Module

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

4.3.4 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.

4.4 Test Wi-Fi module connection

4.4.1 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.

4.4.2 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 5 END OF DOKUMENT

End of document