AUVIDEA
JNX42
TECHNICAL REFERENCE MANUAL

SCOPE OF WORK
Providing technical information and documentation to the product line JNX42 for Nvidia Jetson Orin Nano & Orin NX

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Version
1.12

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Contents

SECTION 1 Document revisions and changes

Document version	Changes
V1.0	Initial document, internal verification process
V1.1	internal verification process

SECTION 2 Product revisions and changes

Product version	Changes
38556	▪ First version
38556-2	▪ swapped CAM1_PWR and CAM2_PWR (rev 1 needs device tree change, to correct this in software) – rev 2 is now compatible to the NVIDIA device tree ▪ RXD pulldown added ▪ added coin cell holder for 6.8mm cells (MC621, V364, SC621, MS518SE, MS621FE) – optional ▪ added EEPROM ▪ changed IMU to BMI088 ▪ added Harting 3 pin power input connector (Harting 14110313002000): 1 - 24V AO 2 - 24V (GPIO) 3 – GND connect ignition controlled power to pin 2 (J37) ▪ added J30 coin cell holder for 10mm cells (CR1025) – optional ▪ added J18 coin cell holder for 20mm cells (CR2032) – default configuration ▪ added JST-SM alternative to RJ45 - optional
38556-3	▪ Change UART routing to connector (add console UART) ▪ Added 2nd USB 2.0 hub (micro USB J12) to integrate service port deluxe features (USB0 to Jetson and USB to MCU) – requires a special firmware ▪ Converted MCU to USB connection so that MCU can do USB to UART conversion (Jetson console and MCU UART) ▪ Added signals to M.2 Wifi (J24) – for GPS RTK M.2 modules - timepulse: Jetson input (pin 195 inverted) - WheelTick: Jetson output (pin 192 inverted) – W230R only (with ZED-F9R) - Dir: Jetson output (pin 199 inverted) – W230R only (with ZED-F9R)
38556-4	▪ Added MCU reset to service port USB hub ▪ Added Jetson reset (pin 206) to standard USB 2.0 hub ▪ Changed J19 from CAN to user UART (3.3V) ▪ Added USB bypass to service port USB hub ▪ M.2 Key B: connect 4 additional GPIOs (dir, wheeltick, geofence, timepulse) ▪ Changed DF12-20 pin 5 to carrier board power on (inverted with MOSFET for isolation, 0: enable 48V pushup power supply – for 38624 add on module) ▪ Added J38 (bottom side) with SPI0 1.8V and 2 CS

SECTION 3 Overview

3.1 JNX42

The JNX42 carrier board has been designed for the Jetson Orin Nano and Orin NX primarily.
(Nano, TX2NX and Xavier NX will only support one USB 3.0 port and only one CSI-2 interface.)

The JNX42 supports low level remote system management features:

- remote power cycle
- change of boot device
  Orin: primary: SSD, secondary: USB
  Nano/TX2NX/Xavier NX: primary eMMC, secondary: SSD or vice versa)
- Limited remote debugging

Please note that the JNX44/45/46 offer enhanced system management features.
The features above are implemented with the following hardware:

- UART connection between MCU and LTE module
  this requires a LTE module with USB and UART (e.g. SIMCOM 7600)
  it also requires firmware enhancement of the MCU
- Console UART connection (Jetson and MCU)

Easy integration into passively cooled systems

- Easy flashing: just connect a USB OTG cable (Auto Flash)
- High performance storage: M.2 NVME PCIe x4

3.2 JNX42 features and comparison

Description	JNX42-LC	JNX42-LM	JNX42-M2
Power	6V - 12V (barrel connector)	6V - 12V (barrel connector)	6V - 12V (barrel connector)
NX powering	5V 8A power supply	5V 8A power supply	5V 8A power supply
DP	no		
HDMI		yes	
Fan connector		Yes	
M.2 NVME Key M		yes	
Micro-SD card		no	
M.2 Key E	no	yes (PCIe)	yes (USB + PCIe)
CAN RX / TX		1x (requires external transceiver)	
USB 3.x		1x USB 3.1 (native - full performance)	
micro USB	1x Micro USB (device mode)	1x Micro USB	1x Micro USB

		(host and device mode)	(host and device mode)
Auto Flashing	yes (plug in host cable and flash)		
USB 2.0	No	1x USB 2.0 (JST-GH, J8, J23)	
Ethernet	Gigabit RJ45 (one LED)		
PoE option	yes, add-on module is required		
CSI	2x CSI-2 (4 lanes) plus camera LED (hardware sync available)		
UART	1x (UART2)	2x (UART 0+2)	
I2C	(CSI-2 only)	3x	3x
I2S	-	1x (1.8V)	
SPI	-	1x (1.8V)	

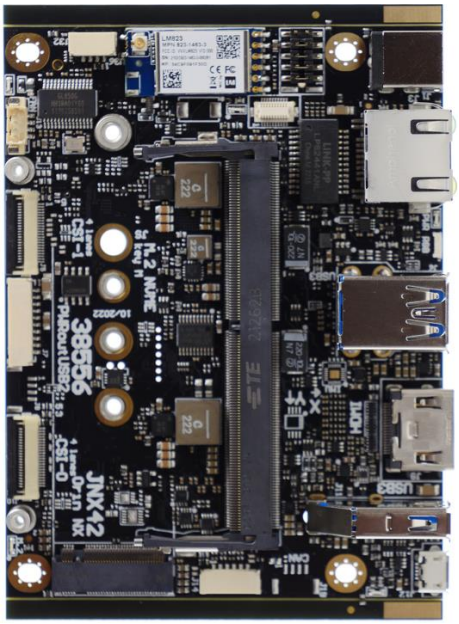
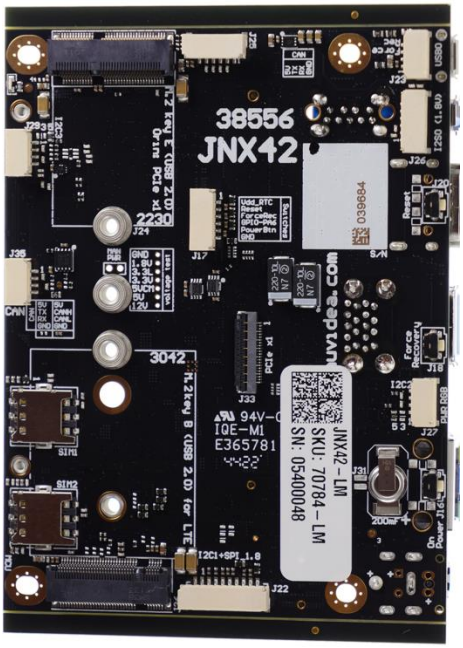
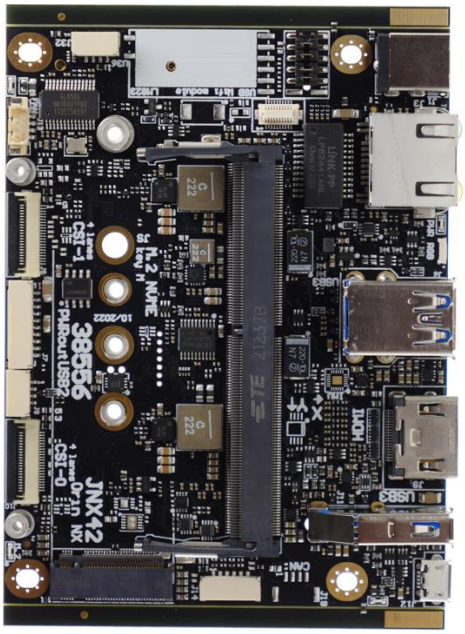
Host mode: peripheral devices like mouse and keyboard may be connected
Device mode: the USB port is in “slave” mode to support connection to host PC (e.g. flashing or remote access – virtual network connection - 192.168.55.1)

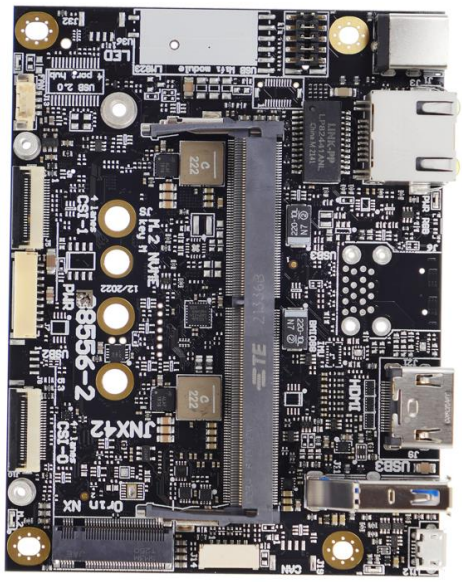
UART0: user UART port with RTS and CTS (1.8V level)
UART2: console UART port (only available with rev 3)

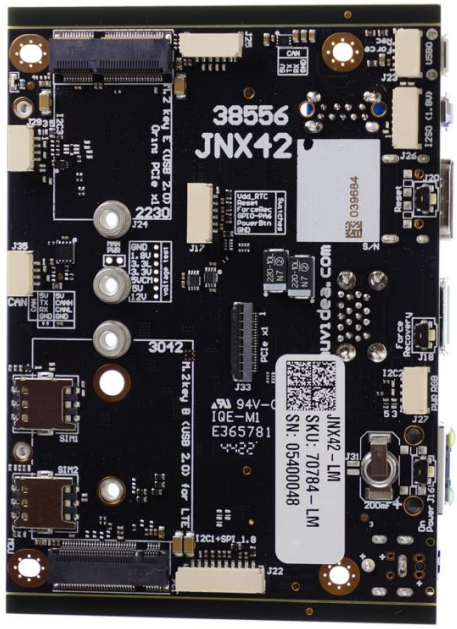
3.3 Technical specifications

Description		Note
HDMI	standard HDMI connector (2.0)	
USB 3.1	10Gb/s	
Physical size	80x 104.6mm	
Mounting holes	4x 3.2mm (for M3)	
Temperature range	0 to 70°C (extended range optional)	
Humidity	noncondensing	
Longevity	no temperature sensitive components (like electrolytic capacitors)	

3.4 Model pictures

	Top side	Bottom side
JNX42-LM		
JNX42-M2		





3.5 Power consumption

Description	JNX42
Carrier board logic	< 1 watt
3.3/5V power converter efficiency	> 90%
Power in converter efficiency	> 90%

3.6 Differentiating features

- Flexible design and manufacturing
- designed and manufactured in Germany
- in-house fully automated production line with 3D AOI
- special configuration possible with minimum purchase of 25 pcs (display port, M.2, PoE, 48V power in, super cap option, 2 RPi camera module connectors, SPI, I2C, switches and more.)
- design services: you architect your custom carrier board and Auvidea designs and produces it - please ask for a quote

SECTION 4 FEATURES

4.1 Crypto chip (optional)

The crypto chip is optional. Please check the data sheet of the manufacturer for details.
Model: ATSHA204A-MAHDA-T
https://ww1.microchip.com/downloads/en/DeviceDoc/ATSHA204A-Data-Sheet-40002025A.pdf

4.2 MCU chip

A on board MCU for watchdog and low level system management functions (via LTE). The MCU can receive text messages via an UART connection to compatible LTE M.2 cards (e.g. Simcom SIM7600). With these messages low level system management can be performed. Please note that this requires an optional MCU firmware. The source code to this firmware may be licensed.

- power cycle or reset
- change of boot order

4.3 USB 2.0 hub

The LM and M2 versions feature a 4 port USB 2.0 hub controller (GL850G).
Uplink: USB1 (115/117) of the Jetson
Port 1: USB 2.0 of dual USB 3 connector (lower port)
Port 2: USB 2.0 of dual USB 3 connector (upper port)
Port 3: M.2 key B LTE slot
Port 4: LM module (LM) or M.2 key E slot (M2) plus J8 (shared)

Compatibility issue:
Potential issues with the Xavier NX compute module. USB 2.0 hub will not be initialized. Please do a warm reboot to fix that issue.
Issue is fixed with Revision 3.1.

SECTION 5 Pinout description top side

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

5.5/2.5mm barrel jack

Pin	Description	Note
1	12V	12V nominal (absolute max. 15V) recommend power supply 12V 36W (or higher) extra features: populate optional power module
2	GND	

If no power module is plugged in the supply voltage must be bridged by inserting 5 or 6 2mm jumpers. If no jumpers are plugged then power is not applied.
Optionally the J34 Molex power connector (436500216) may be populated. Optionally power may be supplied via J7 (2 pins)
J34: Molex power connector (optional – J1 must not be populated)
To support a extended power input range (12V – 48V) please order the P10 power module.

5.2 J37 - Harting power connector (LM and M2 versions)

Harting: 3 pin power input connector (Harting 14110313002000):

Pin	Description	Note
1	12V	input power (always on)
2	12V	ignition power (Jetson: pin 228 – inverted, MCU: PB4) – weak pullup to 3.3V
3	GND	

To implement ignition controlled powering the MCU firmware must be enhanced. MCU firmware support is planned. If this pin is left open /floating) the internal pullup will iniate a power up (auto start). Connect to GND to disable auto start and to manually power up the system.

- MCU should monitor the pin to turn on power to the Jetson
- The Jetson should monitor this pin to gracefully turn off the system

5.3 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. PoE power is routed to the optional power module.

5.4 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 Auvidea embedded systems.

5.5 J5 - CSI-2 CD

22 pin 0.5mm pitch FPC connector (contacts down)

Pin	Description	Socket pin	Note
1	3.3V		Power: connected with bead to 3.3V (5V optional if bead is moved)
2	SDA	215	CAM-I2C via multiplexer (3.3V)
3	SCL	213	CAM-I2C via multiplexer (3.3V)
4	GND		
5	MCLK		IN: wired'OR to control CAM_LED
6	CAM1_PWDN	120	OUT: LC (1.8V), LM/M2: 3.3V (rev 1: pin 114)
7	GND		
8	CSI_F_D1_P	35	
9	CSI_F_D1_N	33	
10	GND		
11	CSI_F_D0_P	23	
12	CSI_F_D0_N	21	
13	GND		
14	CSI_E_CLK_P	30	
15	CSI_E_CLK_N	28	
16	GND		
17	CSI_E_D1_P	36	
18	CSI_E_D1_N	34	
19	GND		
20	CSI_E_D0_P	24	
21	CSI_E_D0_N	22	
22	GND		

Please note that on the JNX42 implements the I2C bus multiplexer. This setup is identical to the NVIDIA dev kit.
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.
Some global shutter Vision Component camera modules use the MCLK pin to synchronise multiple cameras. Optional configuration: the pin 5s of all CSI-2 connectors are OR'ed together and drive the CAM LED output.
This CSI-2 port (J5) is only supported with Orin compute modules.
Pin 5 can be alternatively connected to CAM1_MCLK (122) of the Jetson (LC: 1.8V, LM/M2: 3.3V). This is a custom configuration.

5.6 J10 - CSI-2 AB

22 pin 0.5mm pitch FPC connector (contacts down)

Pin	Description	Socket pin	Note
1	3.3V		Power: connected with bead to 3.3V (5V optional if bead is moved)
2	SDA	215	CAM-I2C via multiplexer (3.3V)
3	SCL	213	CAM-I2C via multiplexer (3.3V)
4	GND		
5	MCLK		IN: wired'OR to control CAM_LED

6	CAM0_PWDN	114	OUT: LC (1.8V), LM/M2: 3.3V (rev 1: pin 120)
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.
Pin 5 can be alternatively connected to CAM0_MCLK (116) of the Jetson (LC: 1.8V, LM/M2: 3.3V). This is a custom configuration.

5.7 J6 USB 3.0 – 3.1

USB 3.0

Pin	Description	Socket pin	Note
1	USB power		5V 1.0A (power switch enable: pin 220 – 0: enable)
2	USB2-D_N		USB 2.0 hub chip port 1
3	USB2-D_P		
4	GND		
5	USB3_RX2_N	51	
6	USB3_RX2_P	53	
7	GND		
8	USB3_TX2_N	57	
9	USB3_TX2_P	59	
10	USB power		5V 1.0A (power switch enable: pin 224 – 0: enable)
11	USB22-D_N		USB 2.0 hub chip port 2
12	USB22-D_P		
13	GND		
14	USB3_RX1_N	39	
15	USB3_RX1_P	41	
16	GND		
17	USB3_TX1_N	45	
18	USB3_TX1_P	47	
19	GND		

5.8 J7 – Power out

JST-GH 1.25mm

Pin	Description	Socket pin	Note
1	PWR_IN		connected to the power input jack (J1) and (J34)
2	PWR_IN		connected to the power input jack (J1) and (J34)
3	12V out		provided by power in or output of power module
4	12V out		provided by power in or output of power module
5	12V out		provided by power in or output of power module
6	12V out		provided by power in or output of power module
7	GND		
8	GND		
9	GND		
10	GND		

5.9 J8 - USB 2.0

JST-GH 1.25mm

Pin	Description	Socket pin	Note
1	USB power		5V 1A max (no current limiter)
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 and more). This connector is only available in selected configurations).

5.10 J9 - HDMI

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

5.11 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_03 (socket pin 126) power on[0]/off[1], default on[0], 5V 1A
See Appendix B for documentation on how to configure and use GPIOs.

USB 3.0

Pin	Description	Socket pin	Note
1	USB power		5V 1.5A (power switch enable: pin 126 – 0: enable)
2	USB2-D1_N	121	
3	USB2-D1_P	123	
4	GND		
5	USB3_RX_N	161	
6	USB3_RX_P	163	
7	GND		
8	USB3_TX_N	166	
9	USB3_TX_P	168	
10	GND		

5.12 J12 - Micro USB

Standard pinout
OTG support (to flash the compute module)
See Appendix B for documentation on how to configure and use GPIOs.

5.13 J14 – UART Connector

the UART port (J14) of the JNX42 rev 2 is not really useable - we plan to correct this with rev 3. Rev 3 will feature a 10 pin connector for J14 which allows us to add UART0 (3.3V RX/TX) and UART1 (3.3V RX/TX).

JST-GH 1.25mm

Pin	Description	Socket pin	Note
1	reserved		do not connect
2	LTE TX		UART connection between M.2 LTE card and MCU - do not drive this line - this is just for debugging purposes
3	LTE RX		UART connection between M.2 LTE card and MCU - do not drive this line - this is just for debugging purposes
4	SWCLK		programming of MCU
5	SWDIO		programming of MCU
6	GND		

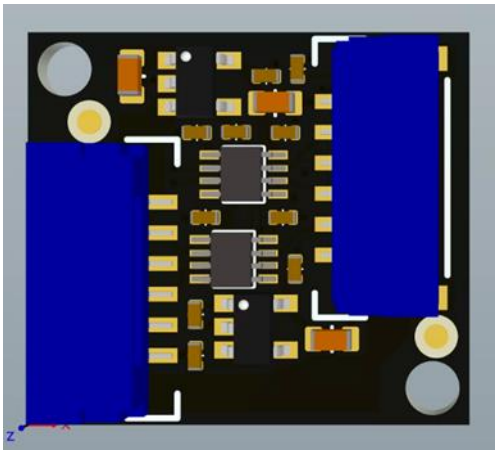
The UART connection of the MCU to the LTE modem is used for a feature to let the MCU receive text messages via LTE for low level system control (like power cycle) or system management.

In addition the UART0 (debug UART port) is connected to the MCU. So the MCU can be a watchdog to monitor the Jetson via UART0. With a second UART the MCU is connected to the LTE module and thereby it can communicate via LTE to the user.

The Jetson console port (UART2) and the Jetson user UART (UART1) are currently not accessible on rev 2. We plan to make these available with rev 3. If you need to use a user UART please use UART0 on the bottom side (J25 on the JNX42 bottom side). Note: these signals are 1.8V. We have developed a small (16x18mm) level changer module to translate the UART from 1.8V to 3.3V (38583).

	Top side	Bottom side

38583: UART level changer		



5.14 J19 – CAN

JST-GH 1.25mm (LC version only)

Pin	Description	Socket pin	Note
1	5 V		5V 1A max (no current limiter)
2	CAN_TX	145	
3	CAN_RX	143	
4	GND		

CAN_RX and CAN_TX: must not be directly connected to the CAN Bus as there is the risk to damage the Jetson compute module.
For CAN_RX and CAN_TX, an external CAN transceiver module must be used. Our carrier boards are populated with the transceiver: TJA 1051 (58V).
If you need an isolated CAN you can use the 38477 add-on module.

5.15 J20 - Reset Button

Press to reset the compute module.

5.16 J22 – SPI

JST-GH 1.25mm

Pin	Description	Socket pin	Note
1	3.3 V		3.3V 1A max (no current limiter)
2	1.8 V		1.8V (current depending on version: 100 or 500mA)
3	SPI1_SCK	106	1.8V (may be reconfigured as GPIO)
4	SPI1_MISO	108	1.8V (may be reconfigured as GPIO)
5	SPI1_MOSI	104	1.8V (may be reconfigured as GPIO)
6	SPI1_CS0	110	1.8V (may be reconfigured as GPIO)
7	SPI1_CS1	112	1.8V (may be reconfigured as GPIO)
8	GEN1_I2C_SCL	185	3.3 V (pull up on Jetson)
9	GEN1 I2C_SDA	187	3.3 V (pull up on Jetson)
10	GND		

5.17 J25 UART0

JST-GH 1.25mm???

Pin	Description	Socket pin	Note
1	5V		
2	UART0_TXD		1.8V level
3	UART0_RXD		1.8V level
4	UART0_RTS		1.8V level
5	UART0_CTS		1.8V level
6	GND		

5.18 J27 I2C

JST-GH 1.25mm

Pin	Description	Socket pin	Note
1	5V		5V 1A max (no current limiter)
2	I2C1_SCL	191	3.3V level
3	I2C1_SDA	189	3.3V level
4	GND		

5.19 J29 I2C

JST-GH 1.25mm

Pin	Description	Socket pin	Note
1	5V		5V 1A max (no current limiter)
2	CAM_I2C_SCL	213	3.3V level
3	CAM_I2C_SDA	215	3.3V level
4	GND		

5.20 J32 – CAM LED

JST-GH 1.25mm

Pin	Description	Socket pin	Note
1	12V		12V 1A (no current limiter)
2	12V		12V 1A (no current limiter)
3	CAM_LED	218	Inverted GPIO, wired OR CSI-MCLKs OUT: open drain (3.3V to 12V)
4	CAM_LED	218	Inverted GPIO, wired OR CSI-MCLKs OUT: open drain (3.3V to 12V)

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: (socket 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 CAM_LED pin and anode to 3.3V to 12V power. Maximum current 2A.

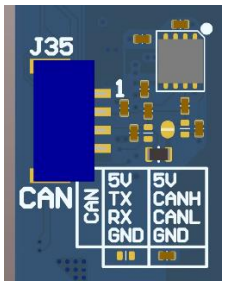
5.21 J33 PCIe X1

Pin	Description	Socket pin	Note
1	GND		
2S	GPIO_05	128	
3S	PCIE_Wake_L	179	
4	GND		
5S	PEX_L1_CRQ	182	
6S	PEX_L1_RST	183	
7	GND		
8S	PEX_RX0_N	167	
9S	PEX_RX0_P	169	
10	GND		
11S	PEX_TX0_N	172	
12S	PEX_TX0_P	174	
13	GND		
14S	PEX_CLK2_N	173	
15S	PEX_CLK2_P	175	
16	GND		
17S	3.3 V power		
18S	3.3 V power		
19	GND		
20S	5 V power		
21S	5 V power		
22	GND		

5.22 J35 CAN

JST-GH 1.25mm (LM and M2)

Pin	Description	Socket pin	Note
1	PWR		5V 1A (no current limiter)
2	CAN_H	CAN	Integrated CAN transceiver (TJA1051)
3	CAN_L	CAN	Integrated CAN transceiver (TJA1051)
4	GND		



CAN_RX/ CAN_TX output option:
CAN_RX and CAN_TX: must not be directly connected to the CAN bus as there is the risk to damage the Jetson compute module.
For CAN_RX and CAN_TX, an external CAN transceiver module must be used. Our carrier boards are populated with the transceiver: TJA1051 (58V).
If you need an isolated CAN you can use the 38477 add-on module.
To enable the output of the native RX/TX CAN signals, 4 resistors have to be moved. This is a hardware strapping option.

5.23 J13 - Fan connector

Pico blade 1.5mm

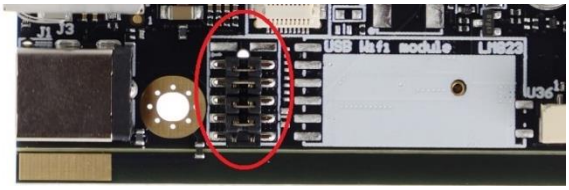
Pin	Description	Socket pin	Note
1	GND		
2	5V		1A max
3	TACH	-	Not connected
4	PWM	230	

5.24 PoE and Power module connector

These 2 connectors allow to fit the JNX42 with an optional power module, to extend the power input capabilities of the JNX42.

5.24.1 J28: PoE extension connector

For normal operation without any power module installed, 5 or 6 2mm jumpers need to be installed, to bridge the power input to the internal power rails. Please see the photo below.



Standard options:
- P10 power module for 12-24V power in or 12-48V power in (38515-x)
- P12 isolated PoE input module (25W PoE PD, 802.3at, class 4) (38568-x)
- 4PPoE on request (40-70W PoE PD, 802.3bt, class 5-8)

J28: PoE extension connector

Pin	Description	Socket pin	Note
1	VDD_RTC	235	RTC power supply for Jetson
2	I2C1_SDA	191	3.3V level
3	PFO_INT	212	1.8V level
4	I2C1_SDA	189	3.3V level
5	GPIO_04	127	1.8V level
6	nc		reserved for future use

7	1.8 V		
8	nc		reserved for future use
9	3.3 V		
10	5 V		
11	PFO		Power fail (to MCU pin PA0) – 3.3V level
12	FAN_TACH	208	
13	3.3 V_LDO		3.3V (from LDO, 50mA max)
14	FAN_PWM	230	
15	GND		
16	GND		
17	M1		Ethernet center pin of magnetics (for PoE)
18	M3		Ethernet center pin of magnetics (for PoE)
19	M2		Ethernet center pin of magnetics (for PoE)
20	M4		Ethernet center pin of magnetics (for PoE)

Optional I/O module:
The J15 and J28 can be used to create a wide variety of I/O and power modules:

- GPIO extender
- ADC or DAC converter (for analog inputs or outputs)
- PWM controller
- LED controller
- fan controller
- motion (IMU), temperature and other sensors
- RTC supply
- Special power supplies (including UPS)
- and many more
-

Auvidea offers a custom design service. Please contact us for details.

5.24.2 J15

J15: power module header (10 or 12 pin 2mm pin header - male)

Pins	Description	Note
1,3,5	DC input (2A max per pin)	
7,9,11	GND input (2A max per pin)	
2,4,6	DC supply to carrier board (2A max per pin)	
8,10,12	GND to carrier board (2A max per pin)	

5.25 U10 – IMU BMI088

The BMI088 is a high-performance 6-axis inertial sensor that allows for highly accurate measurement of orientation and detection of motion along three orthogonal axes. Consisting of a 16-bit digital, triaxial accelerometer and a 16-bit digital, triaxial gyroscope, the BMI088 is unique in the class of high-performance IMUs used in harsh environments such as those ones in drones and robotics applications.
I2C bus: I2C1 (183/185)
Accelerator: 0x18
Gyro: 0x68

Link: https://www.bosch-sensortec.com/products/motion-sensors/imus/bmi088/

5.26 LED - PWR

GPIO socket pin 178 on[1]/off[0], default: off[0]. Pinout description bottom side. This GPIO pin is supported by the NANO. Other SOMs may not be able to control this GPIO. Rev 3 will move this to a different GPIO.

5.27 LED - Eth

Green LED (Link): The green LED on the LAN port indicates that there is a connection.
Yellow LED (Activity): The yellow indicates that there is activity here, so there is data traffic

SECTION 6 FAQ

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
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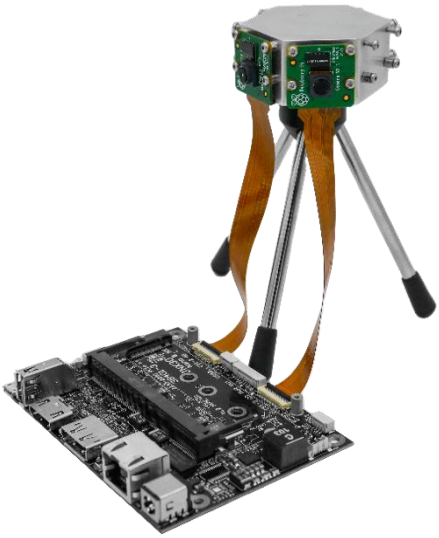
SECTION 9 Appendix A [CSI-Cameras]

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 … cable	Using 38237 adapter
		
		

SECTION 10 Appendix B [GPIO]

10.1 GPIO control

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

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

10.1.1 Change direction to in

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

10.1.2 Change direction to out

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

10.1.3 Set GPIO low

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

10.1.4 Set GPIO high

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

10.1.5 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_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

This Information is provided as is from Auvidea. 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.

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:

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

10.3.2 GPIOletter

The GPIOletter is located between [GPIO3_P] and [.*number*]

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 GPIOnumber

The GPIOnumber is easiest to get and can be extracted directly from the name.
GPIO3_PO.[GPIOnumber]

GPIOname	GPIOnumber
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:

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

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

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]

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 ........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:~$
```

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 END OF DOCUMENT

End of document