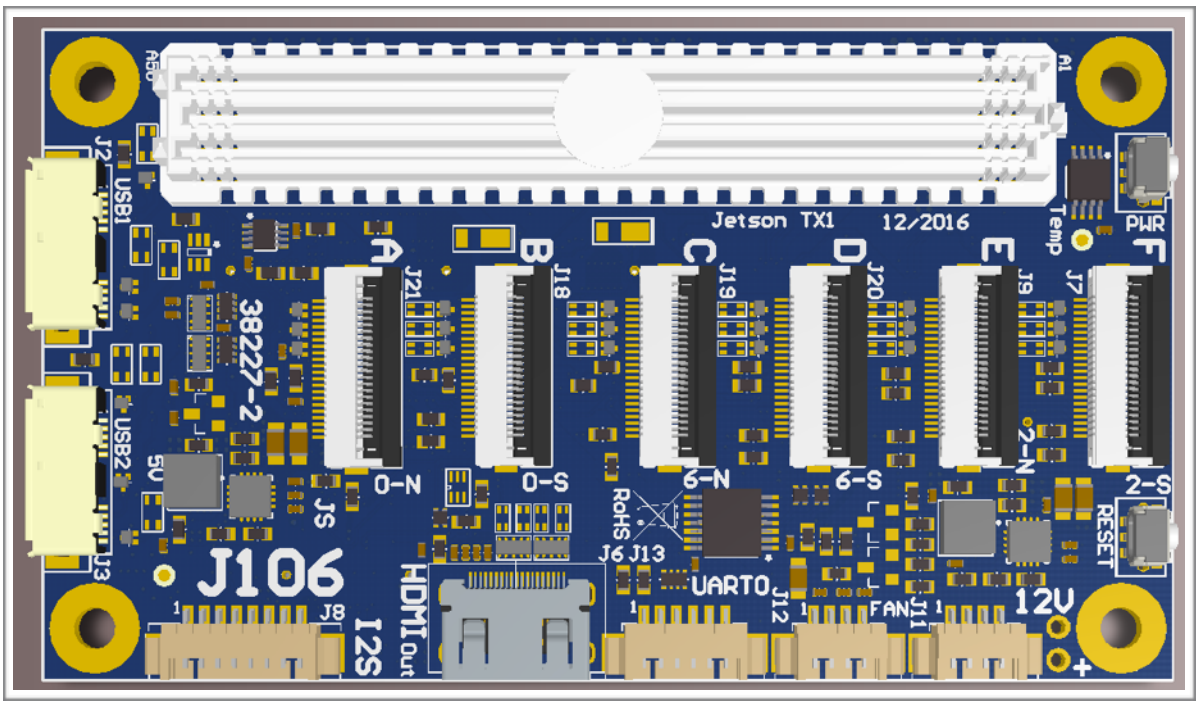
J106 Technical Reference

38227-x

Version 1.0



Preliminary

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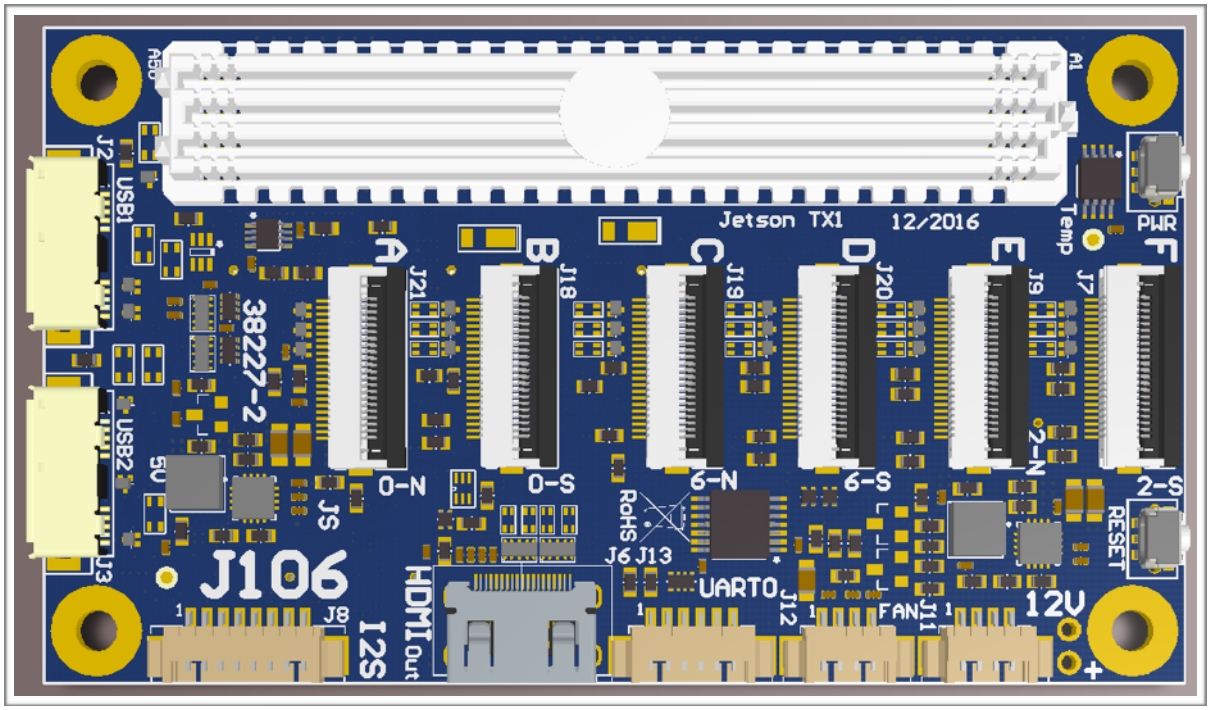
Features

J106 carrier board for the NVIDIA® Jetson™ TX1 and TX2

The J106 carrier board has the same form factor and size as the TX compute module. It is plugged in below the TX1 and brings out many interfaces on connectors. Furthermore in can be plugged in a specifically designed modular motherboard to bring out more interfaces and to integrate it with other components for UAV applications.



Technical details

- carrier board for one NVIDIA® Jetson™ TX1 or TX2 compute module
- standalone or mounted on modular motherboard (like the M90, M100 or M110)
- six 2 lane CSI-2 (15 pin FPC 1.0mm pitch) - B101/B102, Raspberry Pi camera or other cameras
- micro SD card
- 2 USB3 type A (10 pin micro USB3)
- UART 0 (3.3V TTL) (6 pin) - console access
- I2S digital audio (8 pin, up to 8 channels)
- fan connector (4 pin)
- mini HDMI out
- UART, Gb Ethernet, I2C, USB2, SATA, 4x PCIe and 1x CAN (on 3 motherboard connectors on the bottom)
- power: 12V (4 pin) - alternatively powered by motherboard (redundant), range: 7V to 17V
- size: 50 x 87 mm (same size as TX1 or TX2)
- height: 16 mm (incl. TX1 without heatsink without height of bottom side components of J106)
- height: 21 mm (incl. TX1 without heatsink including height of bottom side components of J106)
- weight: 26 grams (just the J106)
- TX1 weight: 144 grams (TX1 with heatsink), 75 grams (TX1 w/o heatsink)
- mounting: 4 M3 holes with 3.2mm each (42 x 79 mm spacing - 4 mm from each edge)
- model: 38227-2 (J106 rev 2)

Rev 1 (38227)

First revision of the J106. Very limited distribution. Bug fixes for I2C address shifter and I2C pull-ups for Raspberry Pi cameras.

Rev 2 (38227-2)

Second revision of the J106. No hardware bug fixes required.

- 3 solder jumpers (P1 to P3) to change address shift from 2 to 1

Testing of the J106

Please have a look at the test report which is included with the shipment.

Getting started

Applying power

The J106 may be either powered by the on-board power connector (J11) with a regulated 12V power supply. Alternatively it may be plugged into a modular motherboard. Power is then supplied via the connectors J15 (60 pin) and J17 (30 pin). Each of the 3 separate power inputs features a Schottky diode. These 3 diodes OR all power inputs together. So 3 independent power inputs are provided to achieve redundant powering.

Auto start

The J106 automatically powers up the TX1 or TX2 with a digital one shot which pulls the POWER-BTN input of the TX1 low for approximately 1 second after power is applied. When the TX1 raises the CARRIER_PWR (A48) line, the power supplies on the J106 are powered up. This is indicated by lighting up the green power LED below the fan connector.

The auto start logic is powered by the 12V power input. For auto start to work, please power down the TX1 for at least 2 seconds. This allows time for the 12V supply to drain and the enable auto start, when power is applied again.

Console access

The console port of the TX1 is UART 0. The J106 converts this UART port to standard 3.3V TTL levels. So a standard USB to TTL serial converter may be used to connect to the console. Just connect TXD, RXD and GND to the USB converter. Make sure that you connect TXD to the RXD input of the USB TTL converter. Standard baud rate it 115200. Settings: 8/1/N.

Firmware upgrade of the TX1

The J106 does not support a direct firmware upgrade of the TX1. There are the following alternatives:

1. plug the TX1 module into the development board to perform the upgrade there.
2. plug the J100 into a modular motherboard like the M100 or M110, which supports on-board firmware upgrade by providing three buttons (power, reset and force recovery) and the USB 2.0 OTG port.
3. use a carrier board like the J120, which supports a firmware upgrade.

Outputs (GPIOs, I2S, SPI) on the J106

The J106 converts the 1.8V level output signals to 3.3V. It uses a bidirectional level converter, which automatically detects the direction of the signal. For the level conversion to work properly, caution must be taken, if there is a pull-up resistor on any output. This applies to all outputs including GPIOs and special function outputs like SPI, I2S. If there are any pull-up resistors on these outputs, they must have more than 50 kOhm. If there is a pull-up resistor with a lower value, than the level converter may determine that the signal is driven from the outside, and that this pin should be treated as input.

Inputs (GPIOs, I2S, SPI) on the J106

The J106 converts the 1.8V level input pins to 3.3V. It uses a bidirectional level converter, which automatically determines the direction of the signal. This requires a signal driver with 2mA min.

Devices

Ethernet

There are three green network LEDs on the bottom side of the J106. The Ethernet connection is available on the motherboard connector 1. The physical Ethernet connector is provided by the motherboard which the J106 is plugged into. If you prefer an Ethernet connector right on the carrier board, please have a look at the J120.

LED	Function	Jetson TX1	Description
GBE0	GBE_LINK_ACT*	E47	Ethernet activity LED
GBE1	GBE_LINK_100	F50	100Mbit link LED
GBE2	GBE_LINK_1000	F46	1000Mbit link LED

IMU (MPU-9250)

A 9 axis sensor is connected to the SPI0 bus of the TX1. Pin 8 (VddIO) of the IMU is connected to 1.8V. Please set the INT output of the IMU by software to „totem pole“ mode as there is no pull-up on the INT output.

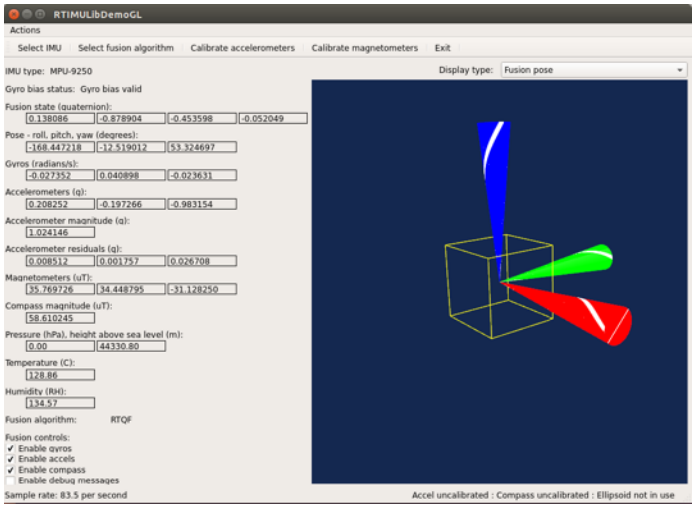
This IMU is optional. Only some J100 models are equipped with this function.

Pin	Function	Jetson TX1	Description
9	AD0/SDO	E4	SPI0_MISO (1.8V)
24	SDA/SDI	F4	SPI0_MOSI (1.8V)
23	SCL/SCLK	E3	SPI0_CLK (1.8V)
22	/CS	F3	SPI0_CS0 (1.8V)
12	INT	G14	INT is inverted and connected to GPIO9_MOTION_INT (1.8V)

Test of the IMU with the RTIMULibDemo

This demo may be downloaded from Github. Please install qtcreator first. Next please make sure that the spidev3.0 device in /dev is loaded. Edit the RTIMUlibDemo.ini file with the SPI settings for the IMU (bus 3, select 0). Start the demo as root so it gets access to the SPI bus.

The IMU chip is located on the bottom side next to the JTAG connector. The IMU is optional on the J100. Please make sure that your J100 has the IMU installed.



J106: I2C busses of the Jetson TX1

The Jetson TX1 features 7 I2C devices: I2C0 to I2C6. The table below lists how these I2C devices are mounted.

Bus	device	physical bus	Use
I2C0	0	I2C0	CSI-A and CSI-B (CSI-B is shifted by 1 or 2) - 2 is the default - change to 1 by putting solder bridge on P1
I2C1	1	I2C1	
I2C2	2	I2C_PM	CSI-E and CSI-F (CSI-F is shifted by 1 or 2) - 2 is the default - change to 1 by putting solder bridge on P3
I2C3	3	?	
I2C4	4	?	
I2C5	5	?	
I2C6	6	I2C_CAM	CSI-C and CSI-D (CSI-D is shifted by 1 or 2) - 2 is the default - change to 1 by putting solder bridge on P2

On the J106 3 I2C busses are used for the 6 CSI-2 connectors. It is allowed to use 6 identical CSI-2 devices, as the J106 incorporates a unique I2C address shifter for 3 of the 6 CSI-2 connectors.

Interface	lanes	I2C bus	device	shifted	marked	Use
CSI-A	2	I2C0	0	-	0-N	B101/B102 module or CSI-2 camera with 2 lanes
CSI-B	2	I2C0	0	yes	0-S	B101/B102 module or CSI-2 camera with 2 lanes
CSI-C	2	I2C_CAM	6	-	6-N	B101/B102 module or CSI-2 camera with 2 lanes
CSI-D	2	I2C_CAM	6	yes	6-S	B101/B102 module or CSI-2 camera with 2 lanes
CSI-E	2	I2C_PM	2	-	2-N	B101/B102 module or CSI-2 camera with 2 lanes
CSI-F	2	I2C_PM	2	yes	2-S	B101/B102 module or CSI-2 camera with 2 lanes

The address shift is programmable. The default value is 2. By installing a solder jumper (P1, P2 or P3) on the bottom side of the J106 the address shift may be changed to 1. This may be required for CSI-2 devices which have multiple I2C addresses.

Example

A B101/B102 module is connected to the CSI-E connector. The Toshiba TC358743 HDMI to CSI-2 converter chip is on the 7 bit I2C address 0x0F, as it can be seen in the terminal output below. Please use the -r option to show the device.

Cameras like the Raspberry Pi camera 2.1 (with IMX219 sensor) use pin 6 of the 22 pin camera connector as low active RESET (CAM-RST). The pin 6 of all 6 CSI-2 connectors are connected together and are driven by the TX1 pin H8 (GPIO2_CAM0_RST).

Now it needs to be determined how this GPIO pin can be controlled by software. The file gpio_names.h lists all pin names and relates them to a number.

GPIO2/CAM1_RST = GPIO 148

Please execute the instructions below at power up to configure this pin as GPIO output and to toggle it low briefly, so the cameras are reset properly at power up.

```
root@tegra-ubuntu:~# echo 148 > /sys/class/gpio/export
root@tegra-ubuntu:~# echo out > /sys/class/gpio/gpio148/direction
root@tegra-ubuntu:~# echo 1 > /sys/class/gpio/gpio148/value
root@tegra-ubuntu:~# echo 0 > /sys/class/gpio/gpio148/value
```

```
root@tegra-ubuntu:~# echo 1 > /sys/class/gpio/gpio148/value
root@tegra-ubuntu:~# sudo i2cdetect -y -r 2
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:          -- -- -- -- -- -- -- -- -- -- -- -- 0f
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
70: -- -- -- -- -- -- -- --
```

CAN

The J106 features 1 CAN interface. As the Jetson TX1 does not have native CAN interfaces, the J106 features 1 SPI based CAN controller (Microchip MCP2515). Please install the Kernel and support package with the MCP2515 driver, which is provided by Auvidea.

```
$ sudo modprobe mcp251x

$ sudo ip link set can0 up type can bitrate 1000000

$ ifconfig
can0      Link encap:UNSPEC  HWaddr 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00
          UP RUNNING NOARP  MTU:16  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:10
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

eth0      Link encap:Ethernet  HWaddr 00:04:4b:57:29:32
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:549 errors:0 dropped:0 overruns:0 frame:0
          TX packets:549 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:46707 (46.7 KB)  TX bytes:46707 (46.7 KB)
```

CAN controller (MCP2515T-I/ML)

This SPI to CAN controller adds a CAN bus interface to the TX1, as there is no internal CAN controller in the TX1. The CAN bus is available on the motherboard connector 1. The physical CAN connector is provided by the motherboard which the J106 is plugged into. If you prefer CAN connectors on the carrier board itself please have a look at the J120.

CAN controller:

Pin	Function	Jetson TX1	Description
15	SO	F14	SPI1_MISO (level shifted to 3.3V)
14	SI	F13	SPI1_MOSI (level shifted to 3.3V)
12	SCK	G13	SPI1_CLK (level shifted to 3.3V)
22	/CS	E13	SPI1_CS1 (level shifted to 3.3V)
12	/INT	H3	AUDIO_CDC_IRQ
17	/RESET	D7	GPIO5_CAM_FLASH_EN is inverted and connected to the RESET input GPIO5_CAM_FLASH_EN has a pull-down resistor. So RESET is high (inactive) if GPIO5_CAM_FLASH_EN is not configured as output.

Connectors

Auvidea supplies cable kits for the connectors with 1.25 mm pitch. Please check the website for details. These are Molex PicoBlade compatible.

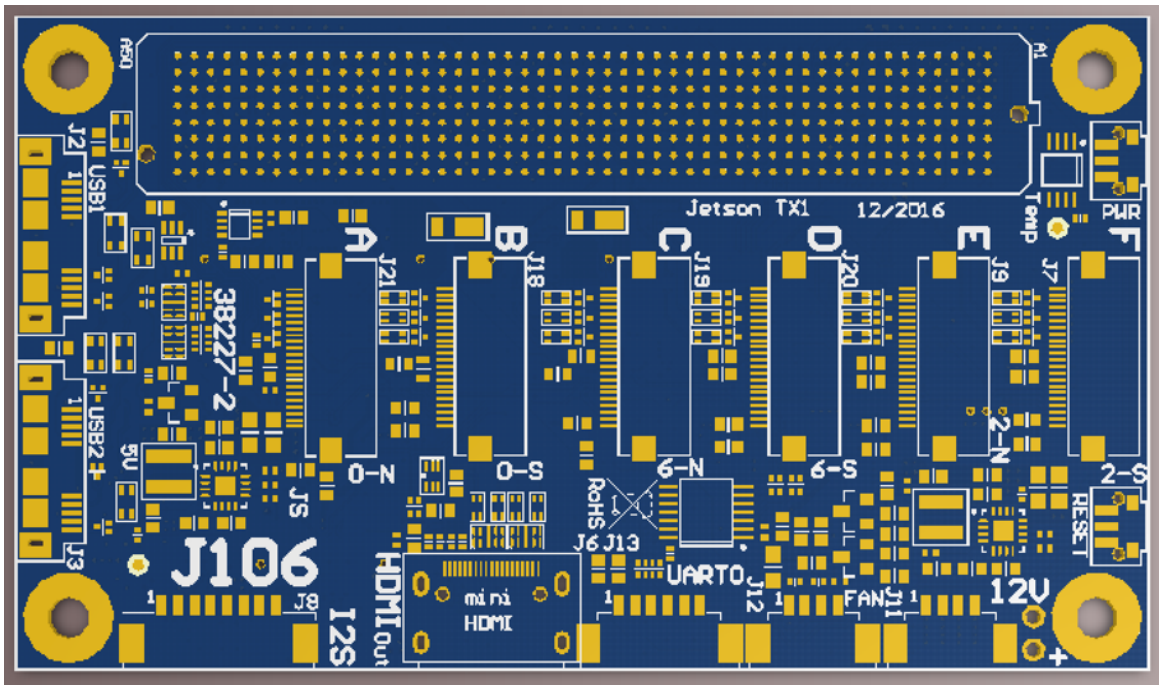


Figure 1: connectors on the top side

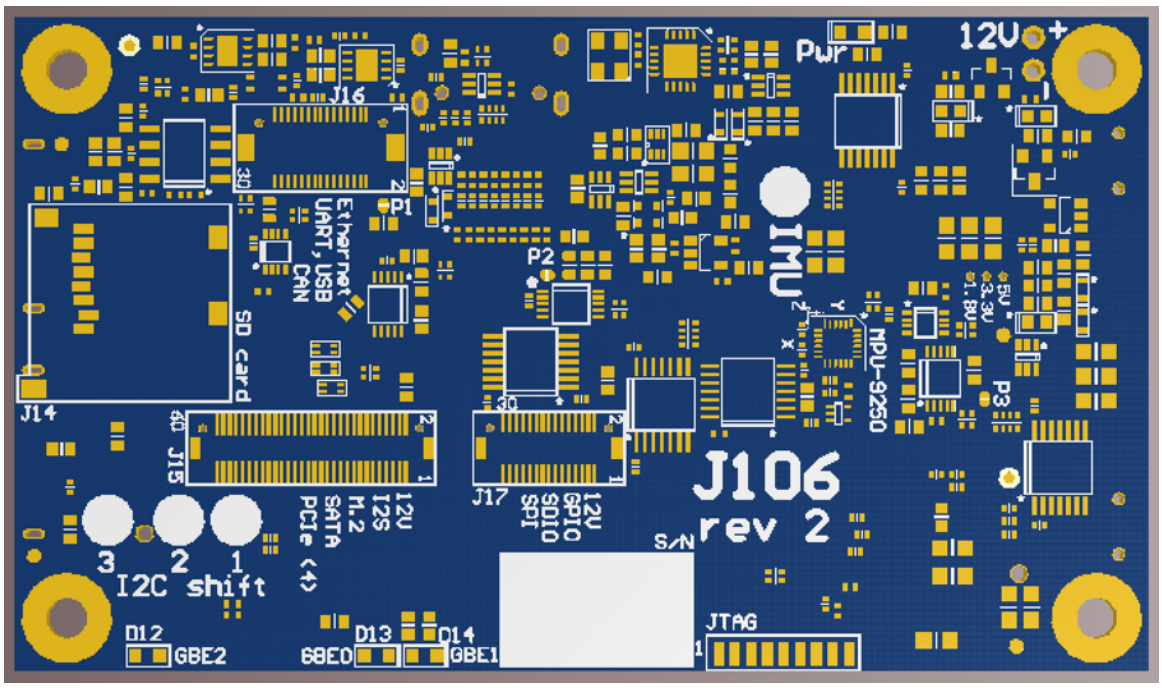


Figure 2: connectors on the bottom side

USB1 (J2)

This is a micro USB 3 connector (Amphenol GSB343K33HR). To get a standard USB 3.0 type A connector please use a cable like DeLOCK 83469 (http://www.delock.de/produkte/G_83469/merkmale.html?setLanguage=en).

Pin	Function	Jetson TX1	Description
1	5V	-	5V power controlled by USB1_EN_OC (A19) - max. 900 mA
2	USB1-D-	A39	USB 2.0 data
3	USB1-D+	A38	USB 2.0 data
4	USB ID	-	not connected
5	GND	-	Ground
6	USB3_RX1-	F44	USB 3.0 receive data
7	USB3_RX1+	F43	USB 3.0 receive data
8	GND	-	Ground
9	USB3_TX1-	C44	USB 3.0 transmit data
10	USB3_TX1+	C43	USB 3.0 transmit data

USB2 (J3)

This is a micro USB 3 connector (Amphenol GSB343K33HR). The second USB 3 port of the TX1 must be enabled in software (device tree file) as by default it is the SATA port.

Pin	Function	Jetson TX1	Description
1	5V	-	5V power controlled by USB1_EN_OC (A19) - max. 900 mA
2	USB2-D-	B43	USB 2.0 data
3	USB2-D+	B42	USB 2.0 data
4	USB ID	-	not connected
5	GND	-	Ground
6	USB3_RX2-	H42	USB 3.0 receive data
7	USB3_RX2+	H41	USB 3.0 receive data
8	GND	-	Ground
9	USB3_TX2-	E42	USB 3.0 transmit data
10	USB3_TX2+	E41	USB 3.0 transmit data

CSI-A (J21)

This is a 22 pin 2 lane CSI-2 connector with 0.5 mm pitch (Wuerth 687122149022). To open the connector and to release the cable just lift the brown lid upwards. This connector has the same pinout as the CSI-2 connector on the Raspberry Pi Zero. To connect a Pi camera with 15 pin connector a 22 to 15 adapter is required (38237 in the Auvidea online shop). The contacts are on the bottom.

Pin	Function	Jetson TX1	Description
22	GND	-	Ground
21	CSI-A_D0-	F28	CSI-2 bus A lane 0
20	CSI-A_D0+	F29	CSI-2 bus A lane 0
19	GND	-	Ground
18	CSI-A_D1-	H26	CSI-2 bus A lane 1
17	CSI-A_D1+	H27	CSI-2 bus A lane 1
16	GND	-	Ground
15	CSI-A_CLK-	G27	CSI-2 bus A clock
14	CSI-A_CLK+	G28	CSI-2 bus A clock
13	GND	-	Ground
12	-	-	optionally 5V (requires installation of 0603 size bead)
11	-	-	optionally 5V (requires installation of 0603 size bead)
10	GND	-	Ground
9	-	-	-
8	-	-	-
7	GND	-	Ground
6	CAM0_RST	H8	GPIO2/CAM1_RST = GPIO 148
5	CAM0_MCLK	F9	CAM0_MCLK
4	GND	-	Ground
3	I2C0_CLK	E15	3.3V level (converted from 1.8V of the Jetson TX1) - device 0
2	I2C0_DAT	D15	3.3V level (converted from 1.8V of the Jetson TX1) - device 0
1	3.3V	-	3.3V power supply

CSI-B (J18)

This is a 22 pin 2 lane CSI-2 connector with 0.5 mm pitch (Wuerth 687122149022). To open the connector and to release the cable just lift the brown lid upwards. This connector has the same pinout as the CSI-2 connector on the Raspberry Pi Zero. To connect a Pi camera with 15 pin connector a 22 to 15 adapter is required (38237 in the Auvidea online shop). The contacts are on the bottom.

Pin	Function	Jetson TX1	Description
22	GND	-	Ground
21	CSI-B_D0-	C28	CSI-2 bus B lane 0
20	CSI-B_D0+	C29	CSI-2 bus B lane 0
19	GND	-	Ground
18	CSI-B_D1-	E26	CSI-2 bus B lane 1
17	CSI-B_D1+	E27	CSI-2 bus B lane 1
16	GND	-	Ground
15	CSI-B_CLK-	D27	CSI-2 bus B clock
14	CSI-B_CLK+	D28	CSI-2 bus B clock
13	GND	-	Ground
12	-	-	optionally 5V (requires installation of 0603 size bead)
11	-	-	optionally 5V (requires installation of 0603 size bead)
10	GND	-	Ground
9	-	-	-
8	-	-	-
7	GND	-	Ground
6	CAM0_RST	H8	GPIO2/CAM1_RST = GPIO 148
5	CAM0_MCLK	F9	CAM0_MCLK
4	GND	-	Ground
3	I2C0_CLK	E15	3.3V level (converted from 1.8V of the Jetson TX1) and address shift by 1 or 2 (default) - device 0
2	I2C0_DAT	D15	3.3V level (converted from 1.8V of the Jetson TX1) and address shift by 1 or 2 (default) - device 0
1	3.3V	-	3.3V power supply

CSI-C (J19)

This is a 22 pin 2 lane CSI-2 connector with 0.5 mm pitch (Wuerth 687122149022). To open the connector and to release the cable just lift the brown lid upwards. This connector has the same pinout as the CSI-2 connector on the Raspberry Pi Zero. To connect a Pi camera with 15 pin connector a 22 to 15 adapter is required (38237 in the Auvidea online shop). The contacts are on the bottom.

Pin	Function	Jetson TX1	Description
22	GND	-	Ground
21	CSI-C-D0-	F25	CSI-2 bus C lane 0
20	CSI-C-D0+	F26	CSI-2 bus C lane 0
19	GND	-	Ground
18	CSI-C-D1-	H23	CSI-2 bus C lane 1
17	CSI-C-D1+	H24	CSI-2 bus C lane 1
16	GND	-	Ground
15	CSI-C_CLK-	G24	CSI-2 bus C clock
14	CSI-C_CLK+	G25	CSI-2 bus C clock
13	GND	-	Ground
12	-	-	optionally 5V (requires installation of 0603 size bead)
11	-	-	optionally 5V (requires installation of 0603 size bead)
10	GND	-	Ground
9	-	-	-
8	-	-	-
7	GND	-	Ground
6	CAM0_RST	H8	GPIO2/CAM1_RST = GPIO 148
5	CAM0_MCLK	F9	CAM0_MCLK
4	GND	-	Ground
3	I2C_CAM_CLK	E15	3.3V level (converted from 1.8V of the Jetson TX1) - device 6
2	I2C_CAM_DAT	D15	3.3V level (converted from 1.8V of the Jetson TX1) - device 6
1	3.3V	-	3.3V power supply

CSI-D (J20)

This is a 22 pin 2 lane CSI-2 connector with 0.5 mm pitch (Wuerth 687122149022). To open the connector and to release the cable just lift the brown lid upwards. This connector has the same pinout as the CSI-2 connector on the Raspberry Pi Zero. To connect a Pi camera with 15 pin connector a 22 to 15 adapter is required (38237 in the Auvidea online shop). The contacts are on the bottom.

Pin	Function	Jetson TX1	Description
22	GND	-	Ground
21	CSI-D-D0-	C26	CSI-2 bus D lane 0
20	CSI-D-D0+	C25	CSI-2 bus D lane 0
19	GND	-	Ground
18	CSI-D_D1-	E23	CSI-2 bus D lane 0
17	CSI-D_D1+	E24	CSI-2 bus D lane 1
16	GND	-	Ground
15	CSI-D_CLK-	D24	CSI-2 bus D clock
14	CSI-D_CLK+	D25	CSI-2 bus D clock
13	GND	-	Ground
12	-	-	optionally 5V (requires installation of 0603 size bead)
11	-	-	optionally 5V (requires installation of 0603 size bead)
10	GND	-	Ground
9	-	-	-
8	-	-	-
7	GND	-	Ground
6	CAM0_RST	H8	GPIO2/CAM1_RST = GPIO 148
5	CAM0_MCLK	F9	CAM0_MCLK
4	GND	-	Ground
3	I2C_CAM_CLK	E15	3.3V level (converted from 1.8V of the Jetson TX1) and address shift by 1 or 2 (default) - device 6
2	I2C_CAM_DAT	D15	3.3V level (converted from 1.8V of the Jetson TX1) and address shift by 1 or 2 (default) - device 6
1	3.3V	-	3.3V power supply

CSI-E (J9)

This is a 22 pin 2 lane CSI-2 connector with 0.5 mm pitch (Wuerth 687122149022). To open the connector and to release the cable just lift the brown lid upwards. This connector has the same pinout as the CSI-2 connector on the Raspberry Pi Zero. To connect a Pi camera with 15 pin connector a 22 to 15 adapter is required (38237 in the Auvidea online shop). The contacts are on the bottom.

Pin	Function	Jetson TX1	Description
22	GND	-	Ground
21	CSI-E-D0-	F22	CSI-2 bus E lane 0
20	CSI-E-D0+	F23	CSI-2 bus E lane 0
19	GND	-	Ground
18	CSI-E-D1-	H20	CSI-2 bus E lane 1
17	CSI-E-D1+	H21	CSI-2 bus E lane 1
16	GND	-	Ground
15	CSI-E_CLK-	G21	CSI-2 bus E clock
14	CSI-E_CLK+	G22	CSI-2 bus E clock
13	GND	-	Ground
12	-	-	optionally 5V (requires installation of 0603 size bead)
11	-	-	optionally 5V (requires installation of 0603 size bead)
10	GND	-	Ground
9	-	-	-
8	-	-	-
7	GND	-	Ground
6	CAM0_RST	H8	GPIO2/CAM1_RST = GPIO 148
5	CAM0_MCLK	F9	CAM0_MCLK
4	GND	-	Ground
3	I2C_PM_CLK	A6	3.3V level (converted from 1.8V of the Jetson TX1) - device 2
2	I2C_PM_DAT	B6	3.3V level (converted from 1.8V of the Jetson TX1) - device 2
1	3.3V	-	3.3V power supply

CSI-F (J7)

This is a 22 pin 2 lane CSI-2 connector with 0.5 mm pitch (Wuerth 687122149022). To open the connector and to release the cable just lift the brown lid upwards. This connector has the same pinout as the CSI-2 connector on the Raspberry Pi Zero. To connect a Pi camera with 15 pin connector a 22 to 15 adapter is required (38237 in the Auvidea online shop). The contacts are on the bottom.

Pin	Function	Jetson TX1	Description
22	GND	-	Ground
21	CSI-F-D0-	C22	CSI-2 bus F lane 0
20	CSI-F-D0+	C23	CSI-2 bus F lane 0
19	GND	-	Ground
18	CSI-F_D1-	E20	CSI-2 bus F lane 0
17	CSI-F_D1+	E21	CSI-2 bus F lane 1
16	GND	-	Ground
15	CSI-F_CLK-	D21	CSI-2 bus F clock
14	CSI-F_CLK+	D22	CSI-2 bus F clock
13	GND	-	Ground
12	-	-	optionally 5V (requires installation of 0603 size bead)
11	-	-	optionally 5V (requires installation of 0603 size bead)
10	GND	-	Ground
9	-	-	-
8	-	-	-
7	GND	-	Ground
6	CAM0_RST	H8	GPIO2/CAM1_RST = GPIO 148
5	CAM0_MCLK	F9	CAM0_MCLK
4	GND	-	Ground
3	I2C_PM_CLK	A6	3.3V level (converted from 1.8V of the Jetson TX1) and address shift by 1 or 2 (default) - device 2
2	I2C_PM_DAT	B6	3.3V level (converted from 1.8V of the Jetson TX1) and address shift by 1 or 2 (default) - device 2
1	3.3V	-	3.3V power supply

HDMI (J6)

This is a 19 pin mini HDMI connector. Please note that the HDMI and mini HDMI connector have different pin outs. This is the pinout for rev 2 (38188-2) and newer versions. Rev 1 (38188) had the data lanes swapped.

Pin	Function	Jetson TX1	Description
1	GND	-	Ground
2	DP1_TXD0+	E39	HDMI data lane 2
3	DP1_TXD0-	E38	HDMI data lane 2
4	GND	-	Ground
5	DP1_TXD1+	C38	HDMI data lane 1
6	DP1_TXD1-	C37	HDMI data lane 1
7	GND	-	Ground
8	DP1_TXD2+	D37	HDMI data lane 0
9	DP1_TXD2-	D36	HDMI data lane 0
10	GND	-	Ground
11	DP1_TXD3+	E36	HDMI clock
12	DP1_TXD3-	E35	HDMI clock
13	GND	-	Ground
14	CEC	B33	HDMI_CEC
15	HDMI_DDC_SCL	A35	DP1_AUX_CH
16	HDMI_DDC_SDA	A34	DP1_AUX_CH*
17	reserved	-	not connected
18	PWR	-	5V power
19	HPD	A33	inverted and connected to DP1_HPD

UART 0 (J13)

This is a 6 pin connector with 1.25 mm pitch. Please connect to USB TTL serial converter (3.3V TTL level). Normally just connect TXD, RXD, and GND. Swap data lines. Default speed: 115200 bps.

Pin	Function	Jetson TX1	Description
1	5V	-	5V power output
2	UART0_TXD	H12	UART 0 console port (3.3V TTL level): transmit data output
3	UART0_RXD	G12	UART 0 console port (3.3V TTL level): receive data input
4	UART0_CTS	H11	UART 0 console port (3.3V TTL level): clear to send
5	UART0_RTS	G11	UART 0 console port (3.3V TTL level): ready to send
6	GND	-	Ground

FAN (J12)

This is a 4 pin connector with 1.25 mm pitch. This is the same pinout as the fan connector on the Jetson TX1 development kit. With the J100 the fan is on by default. Use the „fan disable“ feature to turn off the fan.

Please note, that the „fan disable“ requires a software change when compared to the dev kit. On the dev kit „fan disable“ is controlled by an I2C port expander line. On the J100 „fan disable“ is connected to GPIO19_AUD_RST (through an inverting MOSFET). Pull the GPIO19 high to disable the fan (pin 4 becomes low). A low or floating signal on GPIO19 will not disable the fan.

Pin	Function	Jetson TX1	Description
1	GND	-	Ground
2	5V	-	5V power supply to the fan
3	FAN_TACH	B17	tachometer from the fan (open drain input with 100k pull-up to 1.8V)
4	FAN_PWM	C16	PWM control to the fan (open drain output: controlled by FAN_PWM and „disable fan“ with GPIO19)

Power (J11)

This is a 4 pin connector with 1.25 mm pitch. Power in 1 and power in 2 are shorted together.

Pin	Function	Jetson TX1	Description
1	power in 1	-	power input: typical 12V (range: 7V to 17V)
2	power in 2	-	power input: typical 12V (range: 7V to 17V)
3	GND	-	power ground
4	GND	-	power ground

I2S (J8)

This is a 8 pin connector with 1.25 mm pitch. The TX1 has 4 I2S digital interfaces with one I2S data input for 2 audio channels. On the J106 these 4 I2S busses are tied together. The I2S0 bus is the master bus. The other 3 I2S busses should be configured for slave mode where LRCLK and CLK are configured as input.

The I2S0_CLK drives via 3 series resistors of 0 Ohm the I2S1_CLK, I2S2_CLK and I2S3_CLK inputs. The I2S0_LRCLK drives via 3 series resistors of 0 Ohm the I2S1_LRCLK, I2S2_LRCLK and I2S3_LRCLK inputs.

Pin	Function	Jetson TX1	Description
1	I2S0_SIN	G1	digital audio interface: audio input 0 (3.3V)
2	I2S1_SIN	C14	digital audio interface: audio input 1 (3.3V)
3	I2S2_SIN	G6	digital audio interface: audio input 2 (3.3V)
4	I2S3_SIN	E5	digital audio interface: audio input 3 (3.3V)
5	I2S_MCLK	F1	digital audio interface: master clock (3.3V)
6	I2S_CLK	G2, C15, G5, E6	digital audio interface: bit clock (3.3V) - all four interfaces tied together - I2S0 should be master, the other slaves
7	I2S_LRCLK	H1, D13, H5, F5	digital audio interface: word clock (3.3V)
8	GND	-	Ground

Motherboard connector 1 (J16)

This is a 30 pin female DF17 motherboard connector (DF17(2.0)-30DP-0.5V(57)). All signals on the three motherboard connectors must be protected with TVS diodes externally. Also please pay attention to the I/O voltage. Some signals are directly connected to the TX1 and have an I/O voltages of 1.8V.

Pin	Function	Jetson TX1	Description
1	5V -2	-	not connected (normally 5V power input)
2	3.3V	-	3.3V power output to power the motherboard
3	FORCE_REC	E1	force recovery button (open drain, 1.8V)
4	GBE_MDI3-	H48	Gigabit Ethernet (lane 3)
5	POWER_BTN	(B50)	power button (open drain, Vdd_RTC - 2.5V)
6	GBE_MDI3+	H47	Gigabit Ethernet (lane 3)
7	GND	-	Ground
8	GBE_MDI2-	G49	Gigabit Ethernet (lane 2)
9	USB0-D+	B39	USB 2.0: for firmware upgrade
10	GBE_MDI2+	G48	Gigabit Ethernet (lane 2)
11	USB0-D-	B40	USB 2.0: for firmware upgrade
12	GBE_MDI1-	F48	Gigabit Ethernet (lane 1): RX for 100BT
13	GND	-	Ground
14	GBE_MDI1+	F47	Gigabit Ethernet (lane 1): RX for 100BT
15	UART1_RXD	D10	UART 1 receive data input (3.3V TTL level)
16	GBE_MDI0-	E49	Gigabit Ethernet (lane 0): TX for 100BT
17	UART1_TXD	D9	UART 1 transmit data output (3.3V TTL level)
18	GBE_MDI0+	E48	Gigabit Ethernet (lane 3): TX for 100BT
19	CAN2_L	-	CAN_L of CAN bus 2
20	GND	-	Ground
21	CAN2_H	-	CAN_H of CAN bus 2
22	reserved	-	not connected
23	CAN1_L	-	CAN_L of CAN bus 1
24	RESET-IN	(A47)	reset button (open drain input, 1.8V)
25	CAN1_H	-	CAN_H of CAN bus 1
26	USB0_VBUS	B37	connect to VBUS voltage of USB 0 port (5V)
27	USB0_EN	(A17)	inverted (so it is active low) open drain output with 10k pullup to 3.3V
28	GBE_CTREF	(H50)	reserved (connected to GND on 38188-2)
29	3.3V	-	3.3V power output to power the motherboard
30	5V -1	-	not connected (normally 5V power input)

Motherboard connector 2 (J17)

This is a 30 pin female DF12 motherboard connector (DF12(5.0)-30DP-0.5V(86)).

Pin	Function	Jetson TX1	Description
1	CAN_WAKE	C20	CAN_WAKE
2	power input 3	-	power input 3 (typical 12V, range: 7V to 17V)
3	CAN1_ERR	C19	CAN1_ERR
4	power input 3	-	power input 3 (typical 12V, range: 7V to 17V)
5	WIFI2_WAKE	B20	GPIO10_WIFI_WAKE_AP
6	power input 3	-	power input 3 (typical 12V, range: 7V to 17V)
7	BT2_EN	B21	GPIO12_BT_EN
8	power input 3	-	power input 3 (typical 12V, range: 7V to 17V)
9	GNSS_PPS	B18	GNSS_PPS
10	power input 3	-	power input 3 (typical 12V, range: 7V to 17V)
11	AP_WAKE_BT	B19	GPIO11_AP_WAKE_BT
12	power input 3	-	power input 3 (typical 12V, range: 7V to 17V)
13	WIFI_EN	A29	SDIO_RST*
14	GND	-	Ground
15	GND	-	Ground
16	SPI2_CLK	H14	SPI 2 port (1.8V level)
17	SDIO_CMD	B29	SDIO port
18	SPI2_MISO	H15	SPI 2 port (1.8V level)
19	SDIO_CLK	B30	SDIO port
20	SPI_MOSI	G15	SPI 2 port (1.8V level)
21	SDIO_D3	A30	SDIO port
22	SPI2_CS1	F16	SPI 2 port (1.8V level)
23	SDIO_D2	A31	SDIO port
24	SPI_CS0	G16	SPI 2 port (1.8V level)
25	SDIO_D1	A32	SDIO port
26	UART2_TXD	B16	UART 2 transmit data output (3.3V TTL level)
27	SDIO_D0	B32	SDIO port
28	UART2_RXD	B15	UART 2 receive data input (3.3V TTL level)
29	GND	-	Ground
30	GND	-	Ground

Motherboard connector 3 (J15)

This is a 60 pin female DF12 motherboard connector (DF12(5.0)-60DP-0.5V(86)). The PCIe TX lines do not have a series cap. Therefore add one on the motherboard close to the J15 connector.

Pin	Function	Jetson TX1	Description
1	power input 4	-	power input 4 (typical 12V, range: 7V to 17V)
2	power input 4	-	power input 4 (typical 12V, range: 7V to 17V)
3	power input 4	-	power input 4 (typical 12V, range: 7V to 17V)
4	power input 4	-	power input 4 (typical 12V, range: 7V to 17V)
5	power input 4	-	power input 4 (typical 12V, range: 7V to 17V)
6	power input 4	-	power input 4 (typical 12V, range: 7V to 17V)
7	GND	-	Ground
8	reserved	-	not connected
9	PEX_RX2+	F40	PCIe lane 2 (receive)
10	SATA_DEV_SLP	D47	
11	PEX_RX2-	F41	PCIe lane 2 (receive)
12	GND	-	Ground
13	GND	-	Ground
14	SATA_RX+	G45	
15	PEX_TX2+	C40	PCIe lane 2 (transmit)
16	SATA_RX-	G46	
17	PEX_TX2-	C41	PCIe lane 2 (transmit)
18	GND	-	Ground
19	GND	-	Ground
20	SATA_TX+	D45	
21	PEX_RX1+	G39	PCIe lane 1 (receive)
22	SATA_TX-	D46	
23	PEX_RX1-	G40	PCIe lane 1 (receive)
24	GND	-	Ground
25	GND	-	Ground
26	I2S0_SOUT	H2	I2S digital audio data out (1.8V)
27	PEX_TX1+	D39	PCIe lane 1 (transmit)
28	I2S0_CLK	G2	I2S digital audio bit clock (1.8V)
29	PEX_TX1-	D40	PCIe lane 1 (transmit)
30	I2S0_LRCLK	H1	I2S digital audio word clock (1.8V)
31	GND	-	Ground
32	I2S0_SIN	G1	I2S digital audio data in (1.8V)

Pin	Function	Jetson TX1	Description
33	PEX_RX3+	G42	PCIe lane 3 (receive)
34	reserved	-	do not connect
35	PEX_RX3-	G43	PCIe lane 3 (receive)
36	reserved	-	do not connect
37	GND	-	Ground
38	reserved	-	do not connect
39	PEX_TX3+	D42	PCIe lane 3 (transmit)
40	reserved	-	do not connect
41	PEX_TX3-	D43	PCIe lane 3 (transmit)
42	I2C1_CLK_3V3	A21	I2C1 bus (3.3V)
43	GND	-	Ground
44	I2C1_DAT_3V3	A20	I2C1 bus (3.3V)
45	PEX_CLK0+	A44	PCIe clock
46	GPIO_EXP0	A23	
47	PEX_CLK0-	A45	PCIe clock
48	I2C0_CLK_3V3	(E15)	I2C0 bus with level shifter to 3.3V
49	GND	-	Ground
50	I2C0_DAT_3V3	(D15)	I2C0 bus with level shifter to 3.3V
51	PEX_RX4+	H44	PCIe lane 4 (receive)
52	BT2_WAKE_AP	B22	
53	PEX_RX4-	H45	PCIe lane 4 (receive)
54	PCIE_L1_RQ	C47	
55	GND	-	Ground
56	PCIE_WAKE_L	D48	
57	PEX_TX4+	E44	PCIe lane 4 (transmit)
58	PCIE0_L0_RST	C49	
59	PEX_TX4-	E45	PCIe lane 4 (transmit)
60	PCIE0_L0_RQ	C48	

FAQ

1. to be added

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