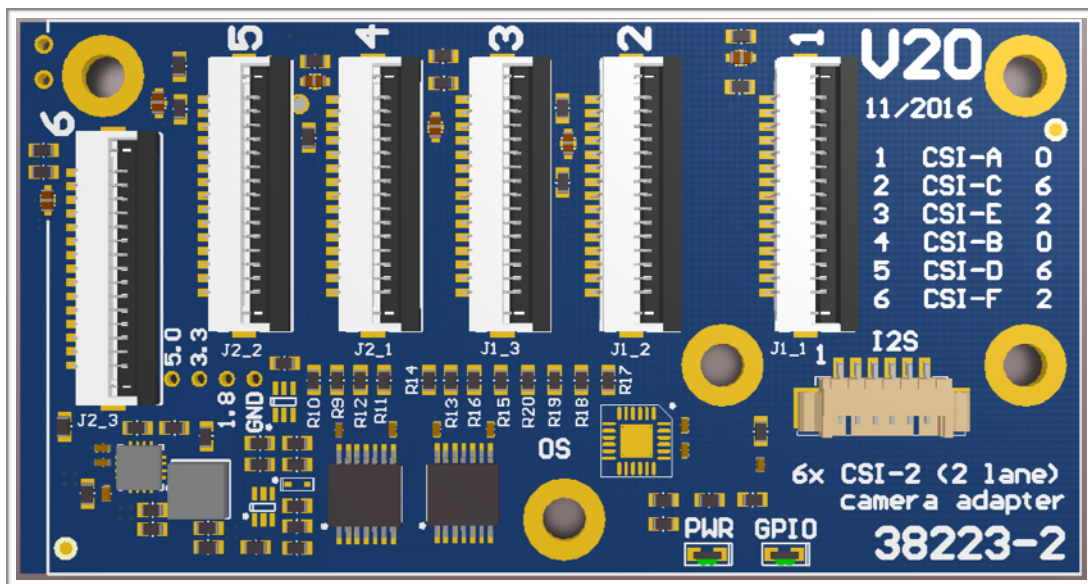


J20

technical reference manual

38223

Version 1.0



Preliminary

November 2016

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Features

J20 six camera adapter module for the NVIDIA® Jetson™ TX1 dev kit

The J20 adapter module is specifically designed for the TX1 dev kit. It plugs into the 120 pin CSI-2 camera socket. Six 2 lane CSI-2 interfaces are provided. The 15 pin CSI-2 connector is compatible to the Raspberry Pi camera connector. Up to six identical camera modules may be plugged in. To access all 6 cameras individually 3 I2C busses are used. Each bus connects to 2 connectors. To separate the 2 cameras on a single I2C bus, the 2nd connector (J2_x) is connected through an I2C address translation device. This changes the I2C address of the camera so that 2 cameras can coexist on the same I2C bus.

Software drivers

The J20 is intended for software developers who wish to develop a software driver for setups with multiple cameras.

- Ridgerun (ridgerun.com) is developing drivers for multiple Raspberry Pi camera setups. Please contact Ridgerun for details.
- Raytrix (raytrix.de) is developing a driver for their C41 4k CSI-2 camera module. Please contact Raytrix for details.

Status

- Rev 1: 38223
very limited supply
patch for power up reset of GPIO port expander
- Rev 2: 38223-2
first samples end of November 2016

I2C configuration

#	port	I2C device	CSI-2 bus	address translation	Pi camera 1.3	Pi camera 2.1	B101
1	J1_1	0	CSI-A	-	0x36	0x64	0x0F
2	J1_2	6	CSI-C	-	0x36	0x64	0x0F
3	J1_3	2	CSI-E	-	0x36	0x64	0x0F
4	J2_1	0	CSI-B	✓	0x34	0x12	0x0D
5	J2_2	6	CSI-D	✓	0x34	0x12	0x0D
6	J2_3	2	CSI-F	✓	0x34	0x12	0x0D

Example: Pi Camera 1.3 plugged into port J1_1 (I2C device 0)

```
$ i2cdetect -y -r 0
   0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
10:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
20:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
30:  --  --  --  --  --  --  36  --  --  --  --  --  --  --  --
40:  --  --  --  --  --  --  --  --  --  --  --  --  UU  --  --
50:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
60:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
70:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
```

The „36“ is the hex address 0x36 and indicates that no driver is loaded yet. If a driver would have been loaded it would show as „UU“ in location „36“.

Connecting the cable for the cameras or B101 modules

The cameras are connected with the standard 15 pin FFC cable with 1.0mm pitch. To plug in the cable just lift the brown hatch of the connector, insert the cable the press the hatch down.

Note: please make sure that the contacts of the FFC cable face down. They have to be on the opposite side of the brown hatch.

The cable is now safely locked in place. Some cables may have lengthy stiffeners on the opposite side of the contacts. So it may be difficult to slide the cable in, as the connectors are placed close to each other. In this case please use scissors to shorten the FFC cable. So contact length of 2mm is fine for the connectors on the J20 module.

Auvideo supplies FFC cables with contact on the same side in various lengths.

Note: The Pi cameras and the B101 require FFC cables with contacts on the same side.

Initialization

The J20 rev1 requires a supply of 1.8V from the dev kit board. This has to be enabled first by writing to the GPIO port expander on the dev kit board. Rev 2 of the J20 features an on-board 1.8V LDO, so the enabling of the 1.8V supply is not required. Please run the following commands every time after powering up the system, so that the J20 is initialized.

```
i2cset -f -y 1 0x77 3 0xfb - enable 1.8V power to the J20 (rev 1 only)
i2cset -f -y 6 0x20 6 0x3e - configure the outputs of the I2C port expander
                             (low byte) - clock lines remain input, so there
                             is no data collision
i2cset -f -y 6 0x20 7 0x33 - configure the outputs of the I2C port expander
                             (high byte)
i2cset -f -y 6 0x20 2 0xfe - write ones to all GPIO outputs and turn on LED
                             (low byte)
i2cset -f -y 6 0x20 3 0xff - write ones to all GPIO outputs (high byte)
```

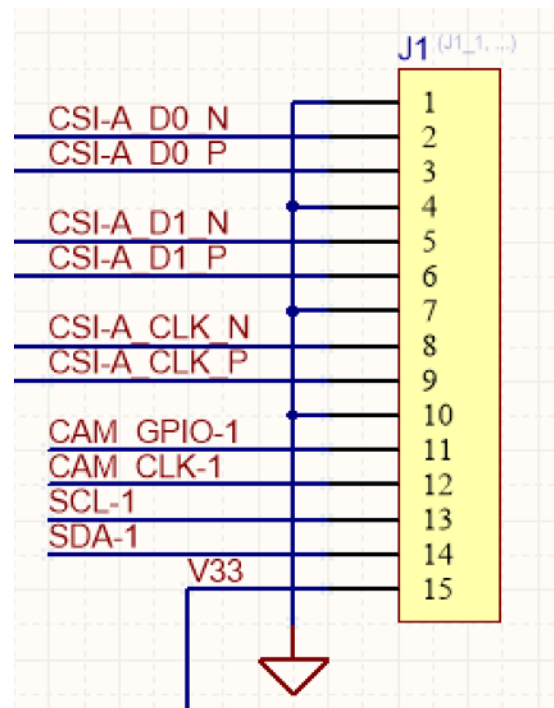
If the initialization commands above have been executed successfully the GPIO LED should be lighted up. The power (PWR) LED should be always on. A Pi camera connected should respond to I2C accesses. We have tested the port detection with `i2cdetect`. After init the GPIO port expander should show up on address 0x20 (device 6).

In the default configuration the J20 is configured that the GPIO port expander only supplies the CAM_GPIO signal to the CSI-2 connectors.

With the Raspberry Pi cameras the CAM_GPIO is the reset to the camera. It must be inactive to allow the camera to work.

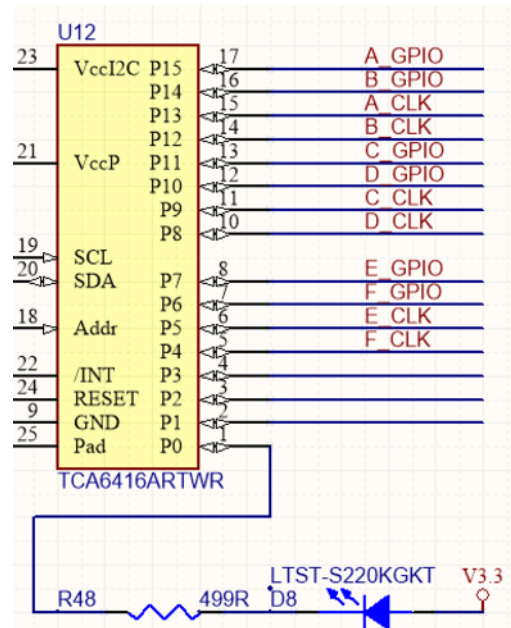
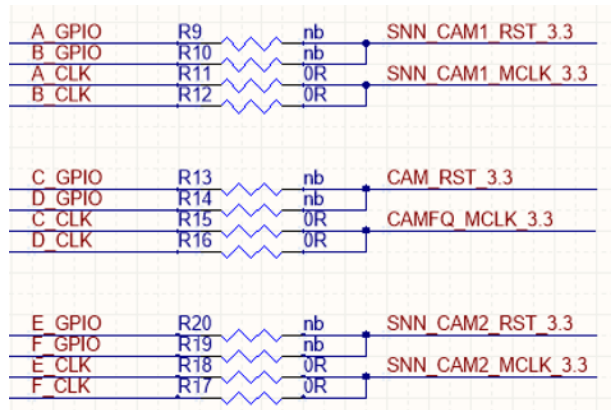
The CAM_CLK by default is connected to the CAM_CLK signals of the 120 pin dev kit connector. So R11, R12, R15, R16, R17, and R18 are installed. 0R resistors (0603 size) or solder jumpers.

Please make sure that the on-board GPIO expander is configured correctly with the `i2cset` commands as listed above. The clock pins must be configured as inputs. If not then the port expander will drive against the clock signals of the dev kit board. This potentially could cause a hardware damage.



Default configuration of the resistors:

CLK provided by the dev kit, GPIO by the GPIO board expander.



If you want to modify the settings of the GPIOs to the 6 connectors just change the data in the following 2 commands:

GPIOs all 1:

```
i2cset -f -y 6 0x20 2 0xfe
i2cset -f -y 6 0x20 3 0xff
```

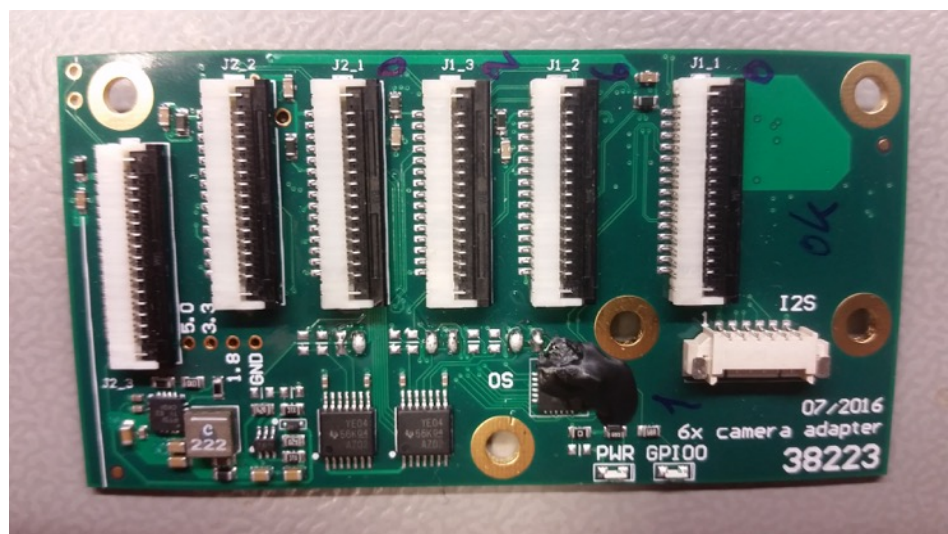
GPIOs all 0:

```
i2cset -f -y 6 0x20 2 0x00
i2cset -f -y 6 0x20 3 0x00
```

J20 rev 1

The „clock“ resistors are equipped with solder jumpers.

The black rubber covers the power on reset patch for the GPIO port expander.

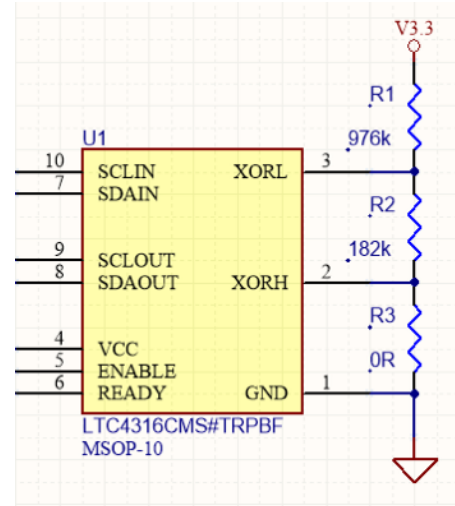


I2C address translation

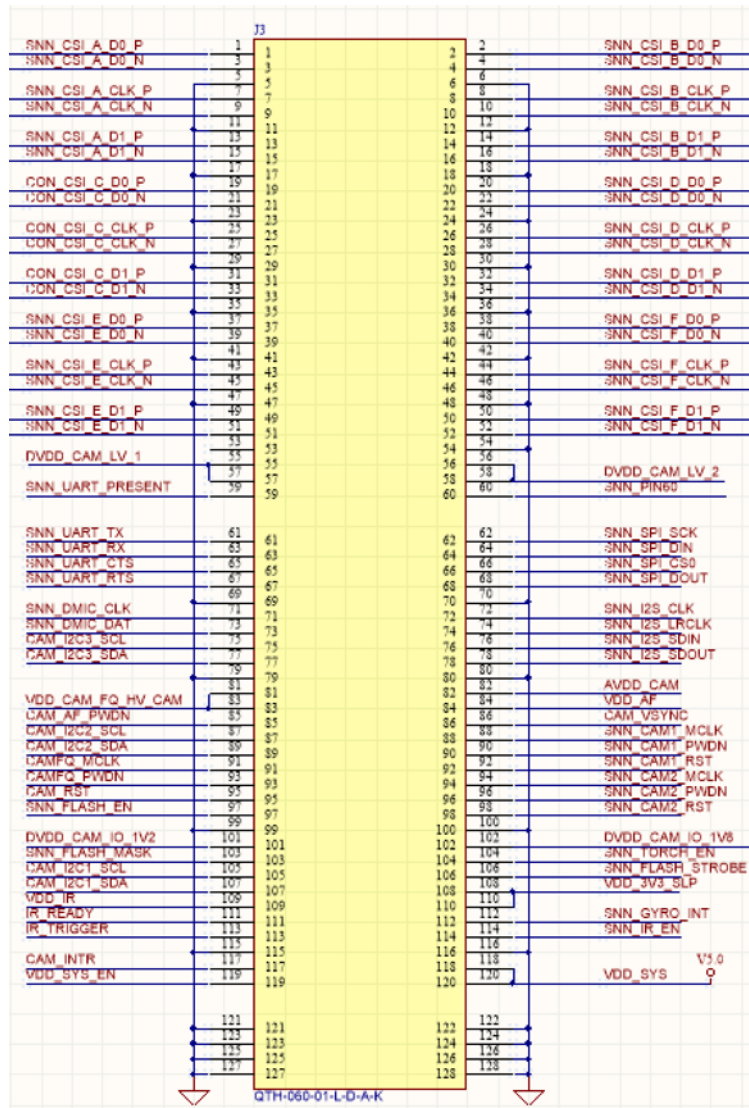
Configuration resistors for the address translation

The J20 employs an address translation device to change the I2C address for the 2nd connector (J2). This device is configured by 3 resistors (R1, R2 and R3).

By default the address translation is configured for cameras which have a single I2C address. Cameras with multiple I2C addresses may require a custom configuration of the three resistors (R1, R2, and R3).



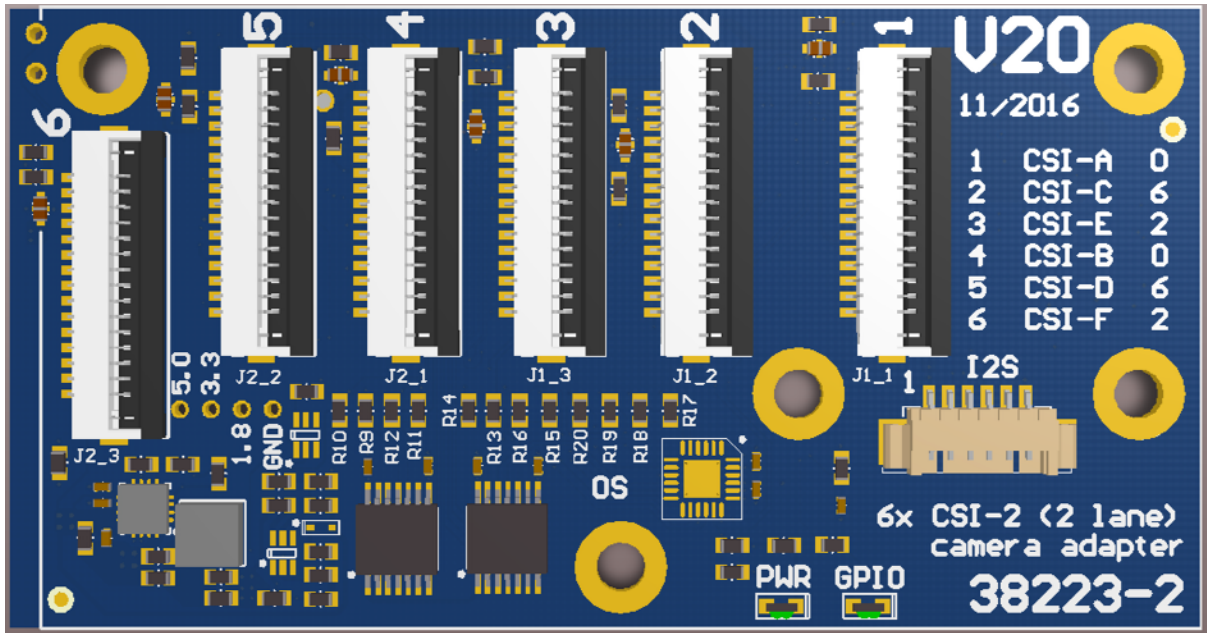
120 pin SAMTEC connector to the TX1 dev kit



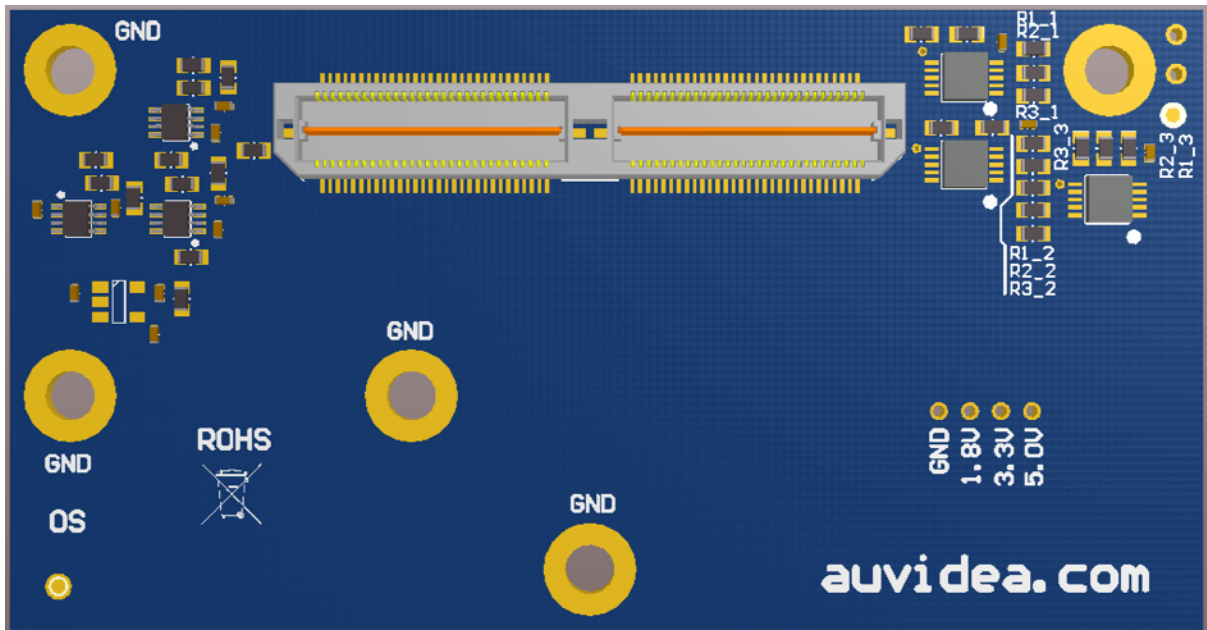
J20 rev 2

Rev 2 adds the power on reset circuitry and the 1.8V LDO. Also the silkscreen on top on bottom has been extended.

top view:



bottom view:



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.

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