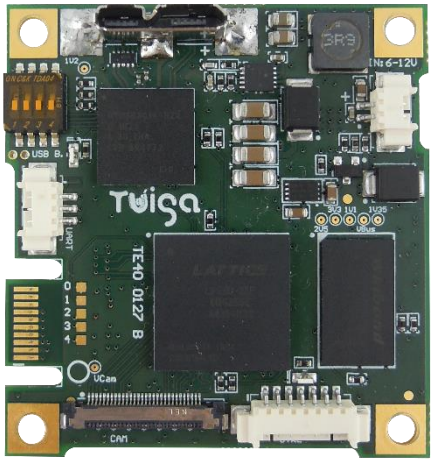
Technical Manual

4K to USB3 interface board



P/N – TV20 0008: 4K to USB3 interface board for Sony FCB-4K camera range

P/N – TV50 0027: Mounting kit for TV20 0008 - 4K to USB3 I/F board
Includes: 30-way micro-coax camera cable, 2-way cable (power supply), 3-way cable (UART TTL), 7-way cable (GPIOs), right angle black anodized bracket, screws and spacers

P/N – TV50 0026: Cable kit for TV20 0008 - 4K to USB3 I/F board
Includes: 30-way micro-coax camera cable, 2-way cable (power supply)

	Writing	Approval
Date	07/04/2023	10/04/2023
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Signature		

Revision History

Date	Revision	Description	Modified by	Note
17/02/2022	A	Creation of the document	CBO	
28/04/2022	B	Update latency and USB cable length	CBO	
07/04/2023	C	Update board and kit references	CBO	

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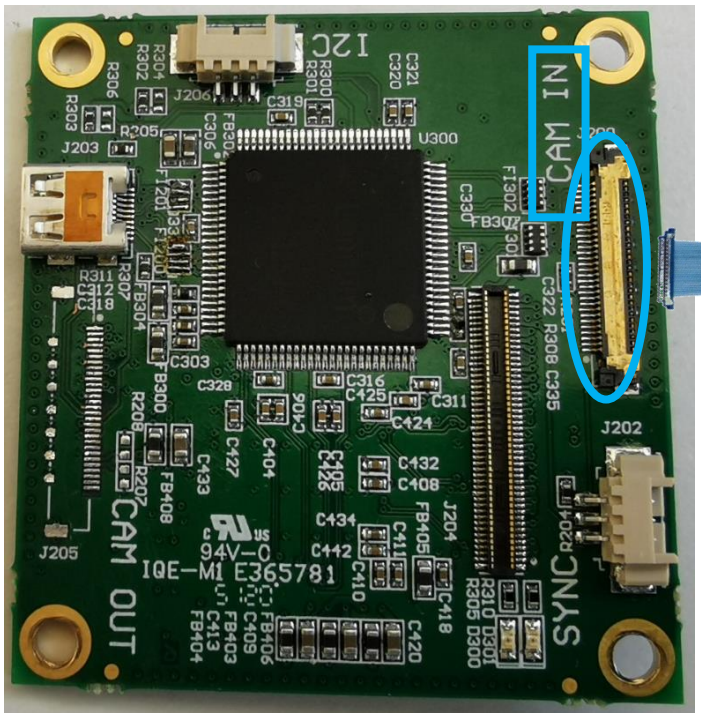
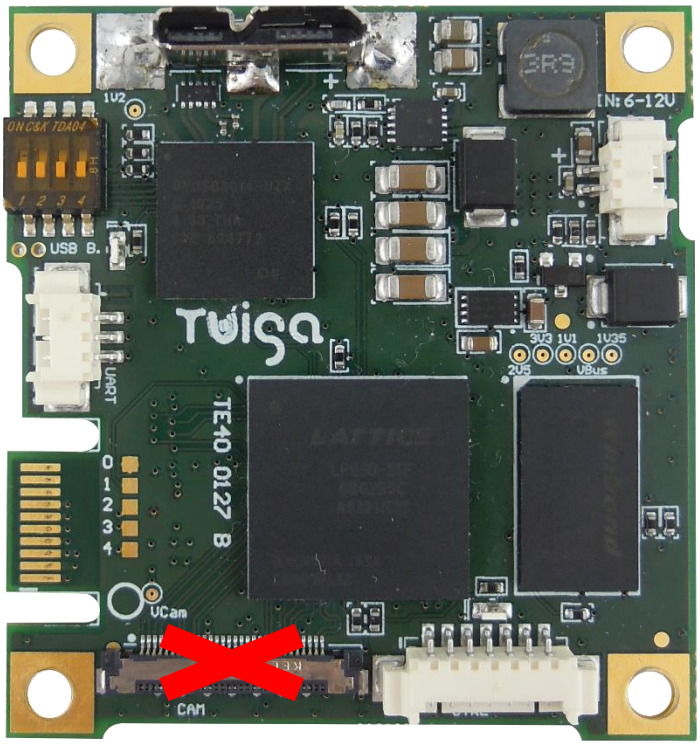
1. Warning

4K camera input is J200 available on the add-on board (P/N TS10 0089). If you connect the 4K camera block to another connector, you will break the camera.



Here connect your 4K camera block



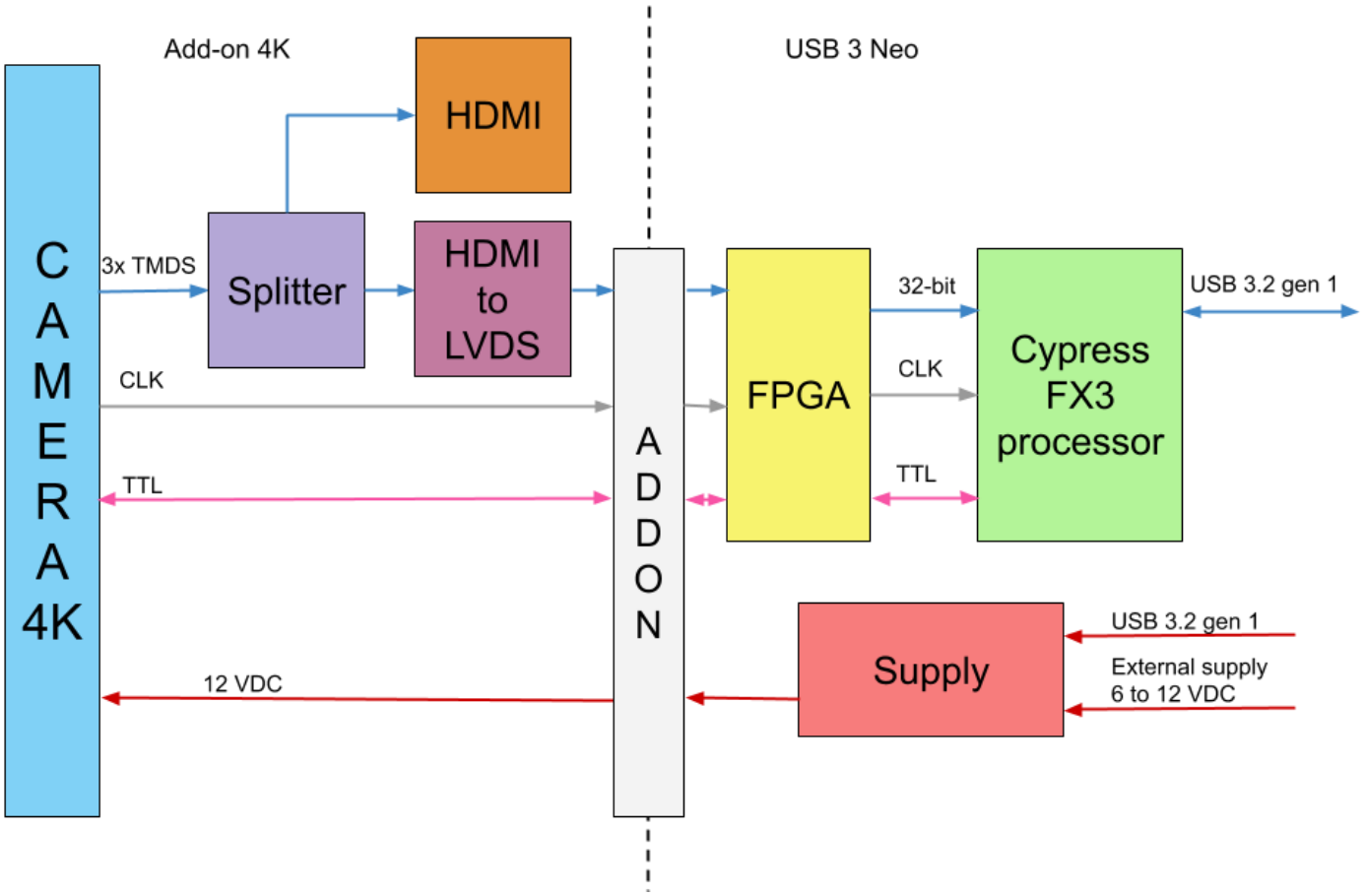
2. Presentation

The Twiga HDMI 4K to USB3 module provides a dual USB3 and HDMI output for Sony FCB-ER 4K camera blocks. The board automatically detects the model and format of the camera and adapts its video processing consequently. The camera control is done through the USB3 port in CDC or via UART TTL.

The module integrates a board-to-board connector that gives the possibility to customers to connect the 4K to USB3 module to their own system. The communication with the camera goes also through this connector.

You can consult our support website to find all information about USB3 Neo: https://www.twiga-support.com/ Documentation, latest software, 3D file can be downloaded and a wiki will guide you through your first steps with the USB3 Neo. Feel free to contact us for further information.

2.1. Synoptic



2.2. Features

2.2.1. Main functions

- Receiving and convert HDMI 4K signal to LVDS
- Formatting 32-bit (FPGA)
- Serialization and conversion to USB 3.2 gen 1 standard
- Camera power 12 V
- Camera communication in VISCA via a COM port
- Local GPIOs
- Local UART TTL
- Flash FPGA via USB
- External camera power input (6-12V)
- Local HDMI output
- Protected Golden sector for backup software
- Downscaling and FPS change via UVC protocol

2.2.2. Formats and resolutions

2.2.2.1. Input

- Video RAW data format:
  - YUY2 for resolutions up to 1920x1080p60
  - I420 for resolution 3840x2160

- Video input resolutions supported:

	25	*29.97*	*30*	*50*	*59.94*	*60*
1920x1080	√	√	√	√	√	√
3840x2160	√	√	√			

2.2.2.2. Output

- Video output resolutions supported:

	25	*29.97*	*30*	*50*	*59.94*	*60*
1920x1080	√	√	√	√	√	√
3840x2160	√	√	√			

- HDMI 2.0 output

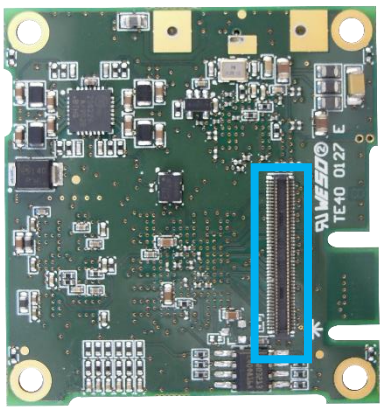
Note: Please refer to the camera documentation to know which format you can use.

2.3. System assembling

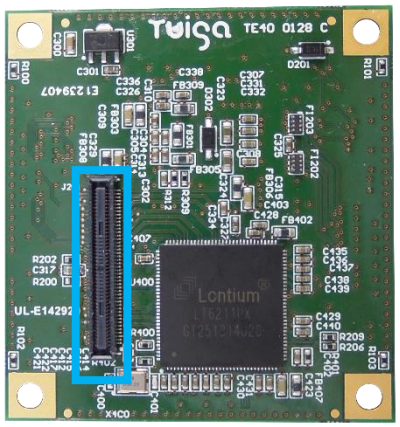
The system is a combination of two boards:

- TV10 0083: USB3 Neo
- TS10 0089: Add-on 4K

To be able to process the 4K video you need to plug both boards through the board-to-board connector.



TV10 0083 USB3 Neo



TS10 0089 Add-on 4K

2.4. Consumption

The system is powered by USB 5V and the camera can be powered by the 2pts external connector (6V-12V).

- USB 5V consumption for complete 4K system = 720mA, power = 3.6W
- 4K camera block with 12V external power consumption ≈ 240mA, power ≈ 2.9W

2.5. OS support

- Windows 7 / Windows 8 / Windows 8.1 / Windows 10
- Linux (tested on Ubuntu 16.04)

2.6. Supported software

- VLC
- Gstreamer
- OBS
- Debut from NCH Software
- Camera application on Windows
- Virtual Dub

2.7. USB3 cable length

The system supports a USB3 cable length up to 7m. Adding a boost, it can go up to 15m. In both cases you need to use the external camera power supply.

We recommend this USB3 cable reference: Ugreen Micro USB 3.0 to USB-A Hard Drive Cable

https://www.ugreen.com/products/micro-usb-3-0-to-usb-a-hard-drive-cable

2.8. KEL cable length

- The system works with a KEL cable length up to 200mm

2.9. Latency measure

- The **maximum** latency involved by the board itself is 2 frames: for 25 FPS the latency is 80ms, for 60 FPS the latency is 33ms.

2.10. Thermal specifications

The HDMI 4K to USB3 interface board supports temperature between 0°C and +60°C. Over this temperature range the system can work but it is not guaranteed by Twiga. For more details, please consult our thermal tests report.

3. Connections

3.1. Power supply

There are two ways to power supply the board and camera:

1. Via USB3 cable

   J204: USB3 connector 

2. External camera power supply (6V-12V): it can be useful if the USB power (1A) is not enough. You could need this external power if you are using a laptop.

   J300: 2 ways external power supply connector 

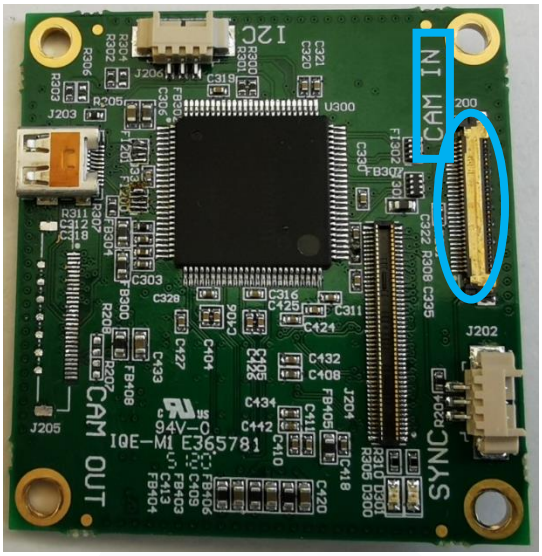
2	V+
1	GND

Note: If you use the external power supply, USB power will be bypassed.

3.2. HDMI 4K camera block connection

The HDMI 4K camera block is connected to the add-on 4K board via 30 ways KEL type USL20-30SS-xxx-C cable. The camera is powered by the system in 12V.

You must connect the 4K camera block only on J200 connector. If you connect the camera 4K on another connector it will destroy it.



Here connect your 4K camera block

J200: 30 ways KEL connector 

Note: the connector pinout is compliant with Sony ER 4K camera blocks.

1	DC_IN
2	DC_IN
3	DC_IN
4	DC_IN
5	RESET
6	UART_TX
7	UART_RX
8	GND
9	USB_D +
10	USB_D -
11	GND
12	USB_VBUS
13	D_5.0V_OUT
14	HDP
15	SDA
16	SCL
17	GND
18	GND
19	TX2OUT +
20	TX2OUT -
21	GND
22	TX1OUT +
23	TX1OUT -
24	GND
25	TX0OUT +
26	TX0OUT -
27	GND
28	TXCLKOUT +
29	TXCLKOUT -
30	GND

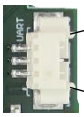
3.3. Camera communication

Two ways are available to communicate with the camera:

1. **CDC protocol**: it allows you to send commands (VISCA) to the camera through the USB3 cable. You can change video format, zoom, manage camera parameters such as focus, iris, shutter… You can use basic communication software (Termite) or specific software according to the camera block you use.

   J204: USB3 connector 

2. **UART TTL**: you can also use the J202 connector to send VISCA commands to the camera.

   J202: 3 ways UART TTL connector 

3	Tx
2	Rx
1	GND

Note: For custom application, you can also communicate via the board-to-board connector (J204 of the TS10 0089). These different communication ways have the same priority level.

3.4. HDMI output

Twiga 4K to USB3 module features an HDMI output through J203 Micro HDMI connector. You can get a 4K video stream over any 4K compliant devices. HDMI 2.0 standard cable is recommended.

J203: micro-HDMI connector 

3.5. External synchro input

An external synchro input is available on J202 connector. You will be able to connect an external sync signal.

J202: 3 ways external synchro connector 

3	VID SYNC
2	SYNC LOCK
1	GND

3.6. GPIOs

For each GPIO corresponds a VISCA command to send to the camera.

J200: 7 ways GPIOs connector 

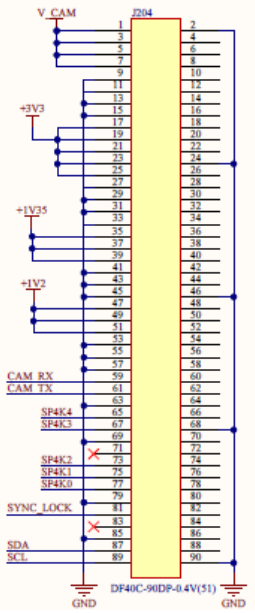
7	Freeze On/Off
6	Focus Far
5	Focus Near
4	Focus Auto/Manual
3	Zoom -
2	Zoom +
1	GND

Note: To active the GPIO you must connect it to GND (0V).

3.7. Board to board connector

A 90 pins Hirose board to board connector is available on the bottom of the add-on board (J204) to allow custom developments for custom applications.

J204: 90pts Hirose connector



3.8. Tests points

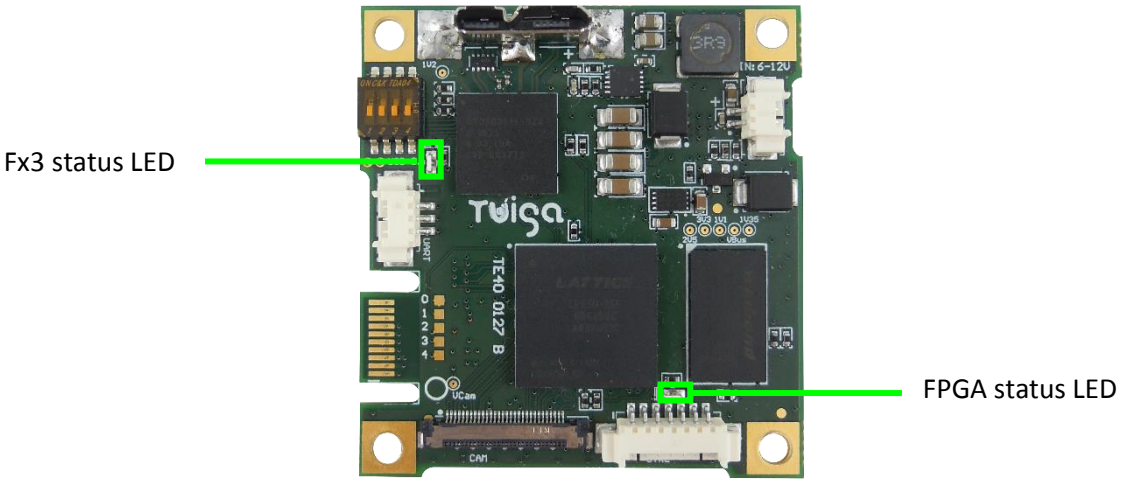
On the board you can find two types of tests points:

1. Power supply tests points: 
   You can test different tension levels: 2.5V, 3.3V, 1.1V, 5V and 1.35V.
2. Control signals: 

0	GND
1	Vblank
2	Hblank
3	FX3_Tx
4	FX3_Rx

4. LED signalization

Two Leds are used to signalize the status of the board.

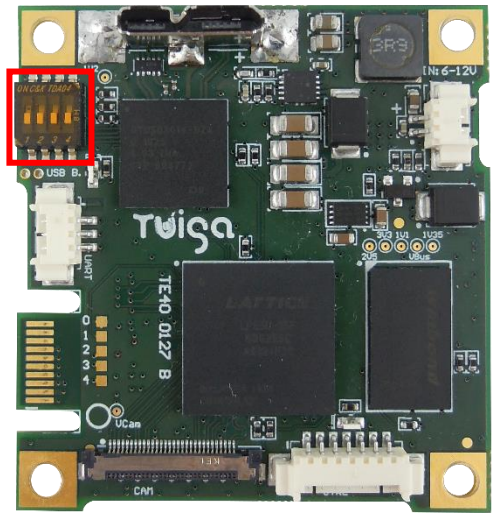


Number of Fx3 Status LED blink per 2 seconds	Meaning
1	Error
2	Communication error
3	Format error
4	Configuration ok

Number of FPGA Status LED blink per 3 seconds	Meaning
2	FX3 not detected
4	Video error
6	Configuration Ok

5. Multi switch

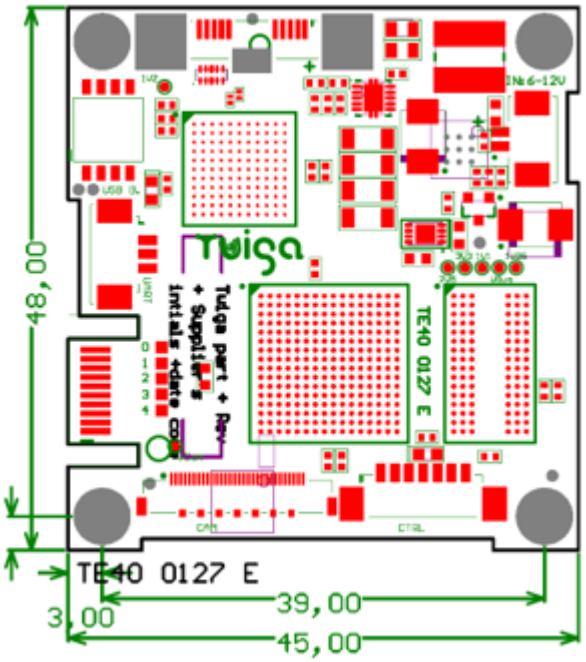
SW800



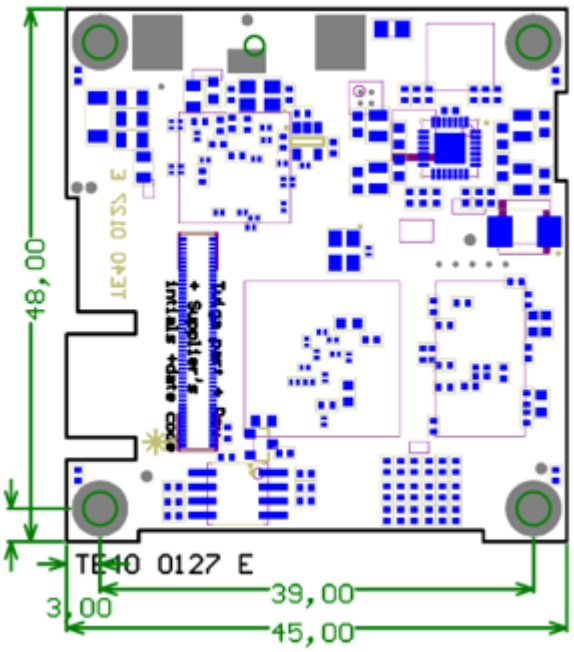
Switch number	Meaning
1	Unused
2	Unused
3	Unused
4	Unused

6. Form factor

6.1. 4K to USB3 MODULE

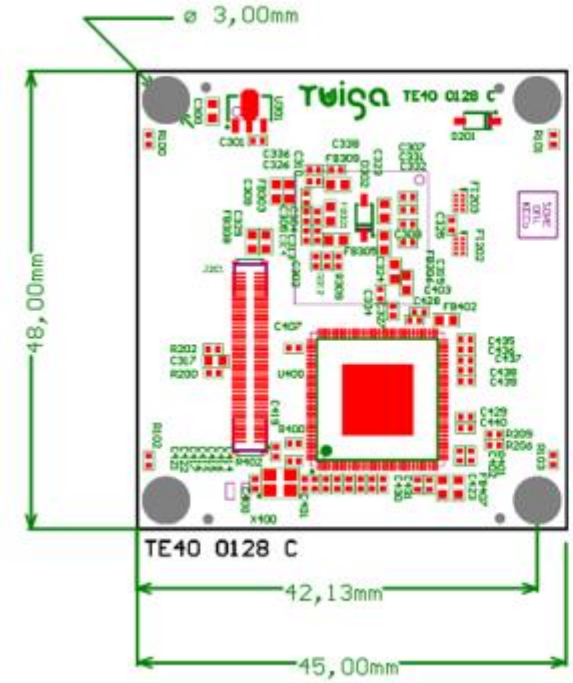


TOP



BOTTOM

6.2. Add-on 4K board



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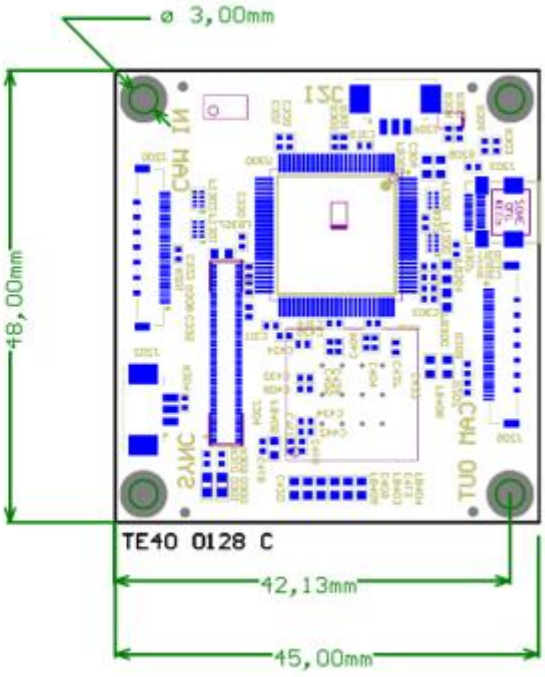
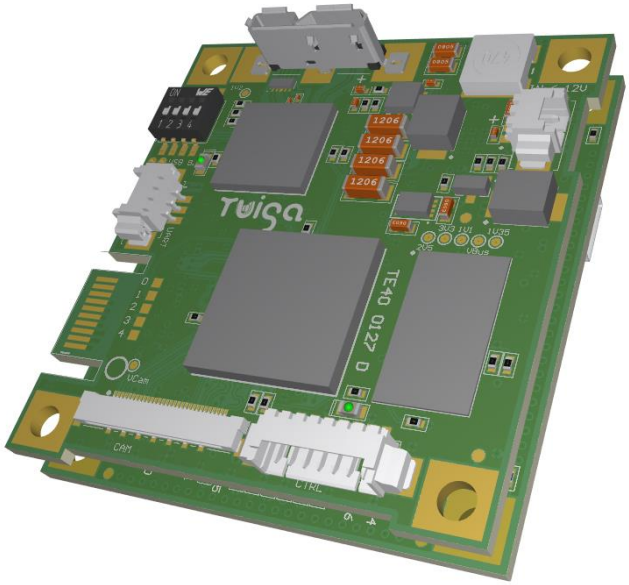
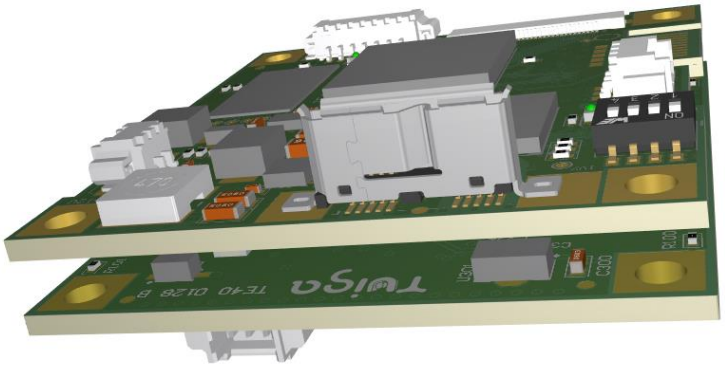


BOTTOM

6.3. Assembling: Twiga HDMI 4K to USB3 module





48mm (L) x 45mm (W) x 18mm (H)

4 holes Ø 3mm

24g