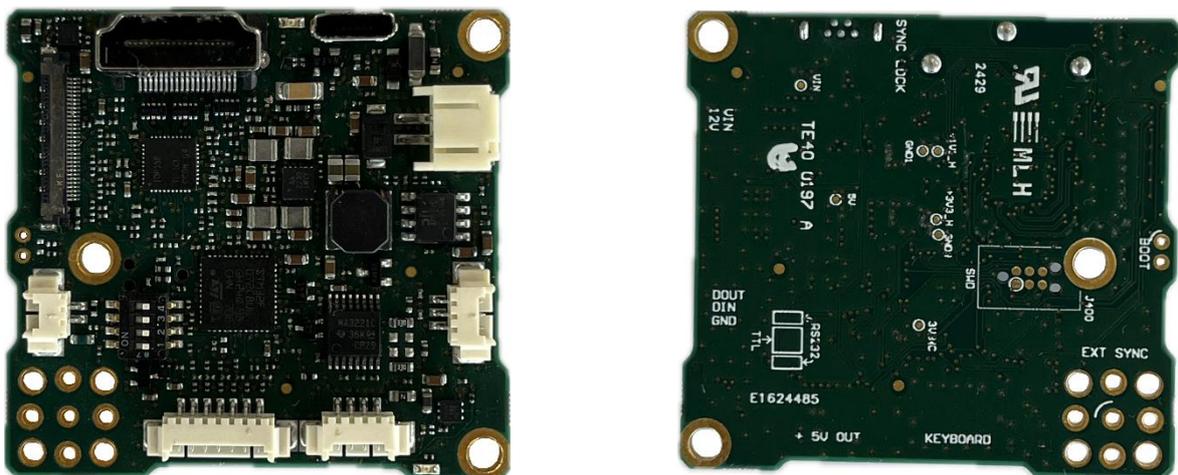




# HDMI 4K60

## Technical Manual



**P/N – TV10 0097:** HDMI 4K60 interface board for Sony FCB-4K camera range

**P/N – TV50 0029:** Mounting kit for TV10 0097 – HDMI 4K60 I/F board

**Includes:** 30-way micro-coax camera cable, 2-way cable (power supply), 3-way cable (RS232/TTL), 7-way cable (GPIOs), right angle black anodized bracket, screws and spacers

**P/N – TV50 0008:** Cable kit for TV10 0097 – HDMI 4K60 I/F board

**Includes:** 30-way micro-coax camera cable, 2-way cable (power supply), 3-way cable (RS232/TTL)

**Available connectors:** VOPTM37 (Add external sync connector)

# Table of content

Revision History .....	3
Key features.....	4
General description.....	4
Benefits of this solution.....	4
Block diagram.....	5
Video acquisition.....	5
Communication.....	5
Power supply .....	6
Accessing the video.....	6
Quick setup.....	6
Video characteristics .....	7
TMDS video input supported resolutions .....	7
HDMI video output.....	7
System configuration.....	7
Communication.....	7
To the camera .....	8
To the internal features .....	10
Control camera video format.....	11
Camera GPIOs.....	11
External synchronization .....	12
Board status.....	12
Connectors.....	13
Form factor .....	14
Troubleshooting.....	15
Get hardware and software version.....	15
Update via micro-USB .....	15
Common issues .....	16

## Revision History

Date	Revision	Description	Modified by	Note
<b>10/07/25</b>	A	Creation of the document	CBO	

## Key features

- HDMI 2.0b video output
- Video resolution up to 2160p60
- Support the latest Sony ER9500 in 4K60
- Communication UART – RS232/TTL using VISCA
- Video mode selection by DIP switches
- USB micro-B communication & update
- Power supply 6V-12VDC
- Auxiliary power output 5VDC, 1A
- Drive HDMI cable up to 10m
- Operating temperature [0°C; 60°C]

## General description

HDMI technology is an internationally recognized standard able to transmit uncompressed ultra-high-definition video signals from camera to screen.

This standard is compatible with most of the existing displays, it gives a lot of flexibility. This is ideal for short distance applications.

The HDMI 4K board provides video signal from 4K camera blocks to HDMI output. Go to the next level with the full compatibility with the latest Sony FCB-ER9500 which provides 4K60.

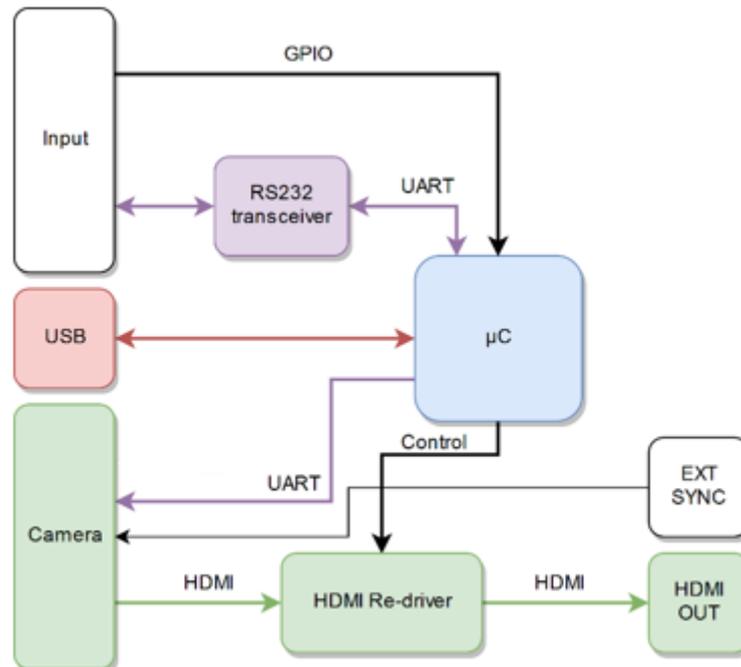
This compact solution is very easy to connect and can be rear mounted on Sony 4K range of cameras without hampering the mechanical integration.

The HDMI 4K supports the external synchronization input from Sony FCB ER-8550 camera. It provides benefits to users in a multi-camera environment: broadcast application, image stitching, pulsed lighting sync or thermal/visible image overlapping.

## Benefits of this solution

- Standard and reliable HDMI video transmission
- Video format supported from HD to Ultra HD up to 2160p60
- Latency involved by the board is negligible
- Designed to be mounted on 4K Sony camera
- RS232 / TTL serial communication easy switch by moving two resistors
- Supports external synchronisation input for the ER8550 camera
- GPIOs connector to easily send basic VISCA commands (zoom in / out, freeze on / off, focus)
- Can control external device via 5V manageable output

## Block diagram



## Video acquisition

The board acquires the HDMI video from the 4K camera, transmits it and provides uncompressed HDMI video on the output connector. Video output keeps the same format as the camera and can go from HD to Ultra HD in 4K60.

## Communication

By default, the board is configured in RS232. It is possible to switch to UART TTL 3V3 communication but that requires hardware modifications. For more information, please contact us at [info@i2s.fr](mailto:info@i2s.fr) and we will ensure that you are able to do the changes. The board can be ordered in UART TTL 3V3 configuration if requested.

A micro-USB connector allows when plugged in a computer, to communicate via a virtual COM port. This port can be used to perform a software update, to send commands to the camera or to manage internal features of the board.

A green blinking LED helps to know in which state the board is, it is quick feedback to be sure no error happened.

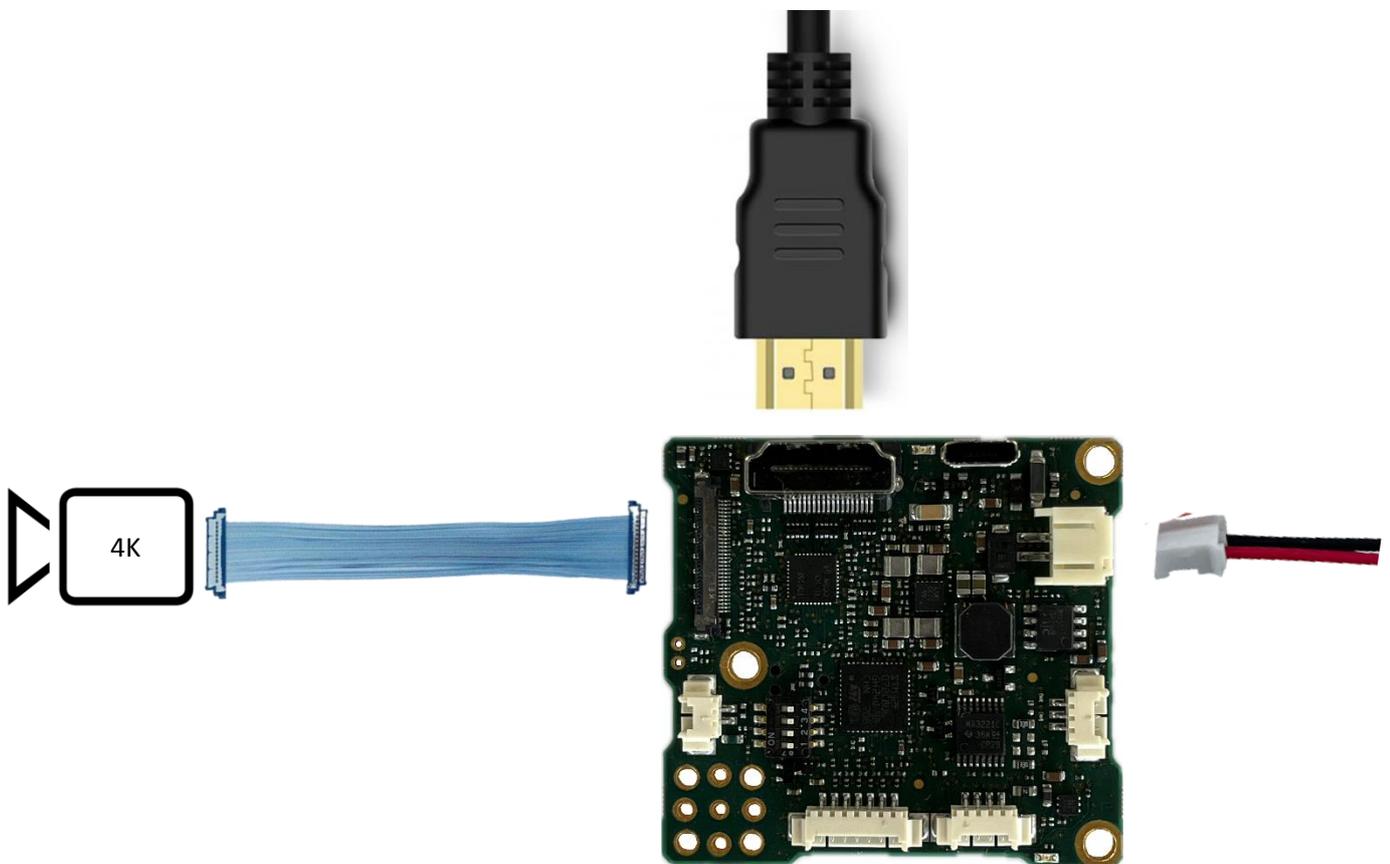
## Power supply

The power input through the 2 ways connector J800 supports from 6V to 12V (1,5A). The camera is powered by the board.

You can notice that a 5V output is available on the connector J801 and can be managed via an internal register.

## Accessing the video

### Quick setup



### Installation steps:

1. Connect the KEL cable between the board J200 and the 4K camera.
2. Connect the HDMI cable to the output connector of the board J700 and to the HDMI monitor.
3. Connect the 2-way power supply cable on J800 connector. Power input of the board is 6V to 12V (1,5A), red wire is for V+ and black wire is for the ground.
4. Now you can power the board.

## Video characteristics

### TMDS video input supported resolutions

	25	29.97	30	50	59.94	60
1280x720p	✓	✓	✓	✓	✓	✓
1920x1080p	✓	✓	✓	✓	✓	✓
3840x2160p	✓	✓	✓	✓	✓	✓

The video format from the 4K camera can be configured by sending VISCA command using register 72.

### HDMI video output

The output is compliant to HDMI 2.0b, available on the HDMI connector J700. The output video format is the same as the camera (see TMDS video input resolutions supported upper).

## System configuration

### Communication

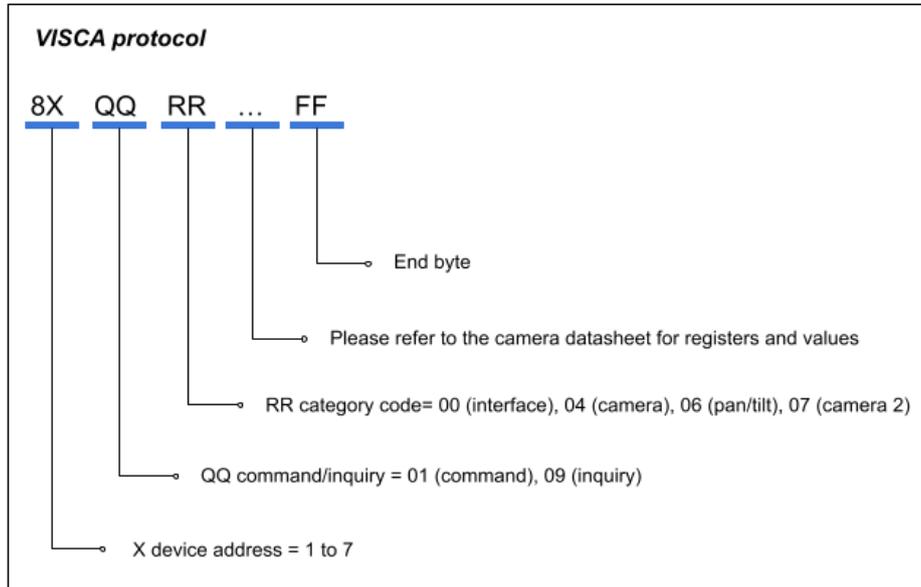
Communication with the camera can be done through 2 connectors:

1. RS232 / UART TTL 3V3 connector (J501): it allows you to send VISCA commands to the camera or to configure internal features. To switch from RS232 to TTL configuration some hardware modifications are needed. Please contact us at [info@i2s.fr](mailto:info@i2s.fr) for more information.
2. Micro-USB connector (J900): using CDC protocol to communicate with the camera or configure internal features. When plugged in a computer, a virtual COM port will be created.

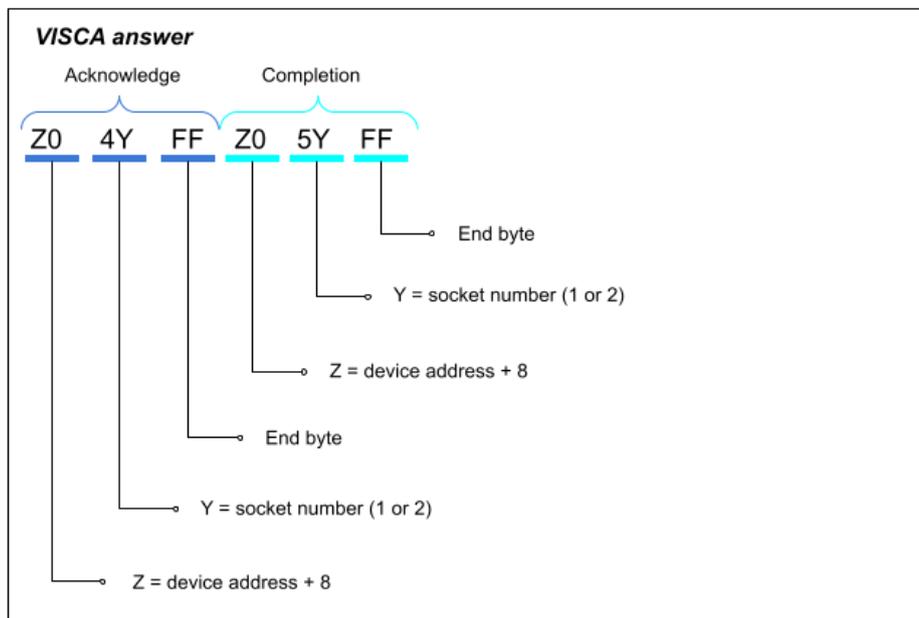
The baud rate of the serial interface will follow the baud rate configured in the camera.

## To the camera

The camera communication uses VISCA protocol and will follow camera specifications. It is a standard protocol for camera blocks following this structure:

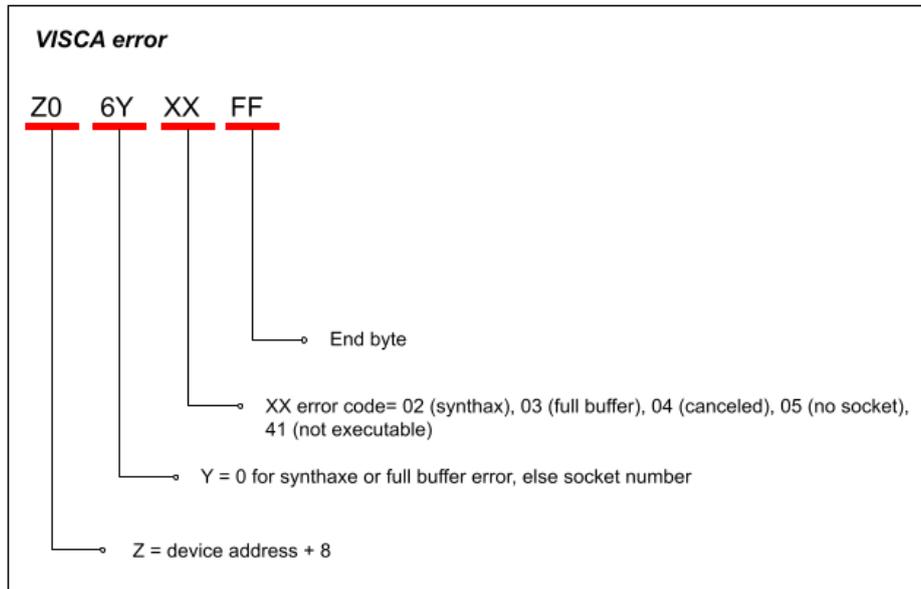


The camera answer follows this structure:



The time between the acknowledgement and the completion packet depends on the command. The answer for an inquiry is Z0 5Y followed by the information requested with FF as end byte.

If an error occurs, here the answer structure:



*Example:* Zoom In command with a speed of 7 is 0x81 01 04 07 27 FF and the expected answer is 0x90 41 FF followed by 0x90 51 FF.

You can communicate using communication software like Termite or the camera brand communication tool like Sony FCB Control software.

## To the internal features

The board internal features are accessible from the connector J501 and J900 using custom VISCA commands specifically targeted at the board itself and are not transferred to the camera:

Register name	Addr	Set command	Comments	Inquiry command	Inquiry answer
<b>REG_SOFT_VERSION_H</b>	0x01	NA	Software version MSB	0x82 09 06 01 FF	0xA0 50 01 00 0y FF
<b>REG_SOFT_VERSION_L</b>	0x02	NA	Software version LSB	0x82 09 06 02 FF	0xA0 50 02 00 0y FF
<b>REG_BOARD_REBOOT</b>	0x05	0x82 01 06 05 00 01 FF	Reboot the board	NA	NA
<b>REG_BOARD_RUNTIME_H</b>	0x0A	NA	Runtime High	0x82 09 06 0A FF	0xA0 50 0A 0y 0y FF
<b>REG_BOARD_RUNTIME_MH</b>	0x0B	NA	Runtime Middle High	0x82 09 06 0B FF	0xA0 50 0B 0y 0y FF
<b>REG_BOARD_RUNTIME_ML</b>	0x0C	NA	Runtime Middle Low	0x82 09 06 0C FF	0xA0 50 0C 0y 0y FF
<b>REG_BOARD_RUNTIME_L</b>	0x0D	NA	Runtime Low	0x82 09 06 0D FF	0xA0 50 0D 0y 0y FF
<b>REG_DBG_LED</b>	0x12	0x82 01 06 12 0y 0y FF	0x00: LED OFF 0x01: LED ON	0x82 09 06 12 FF	0xA0 50 12 00 0y FF
<b>REG_PATTERN_ENABLE</b>	0x20	0x82 01 06 20 00 0y FF	0x00: Disabled 0x01: Enabled <sup>1</sup>	0x82 09 06 20 FF	0xA0 50 20 00 0y FF
<b>REG_VIDEO_DETECTED</b>	0x28	NA	0x01: video detected 0x00: video not detected	0x82 09 06 28 FF	0xA0 50 28 00 0y FF
<b>REG_HDMI_DETECTED</b>	0x29	NA	0x01: HDMI detected 0x00: HDMI not detected	0x82 09 06 29 FF	0xA0 50 29 00 0y FF
<b>REG_CAM_VENDOR_ID_H</b>	0x30	NA	Camera vendor ID MSB (default: 0xFF)	0x82 09 06 30 FF	0xA0 50 30 0y 0y FF
<b>REG_CAM_VENDOR_ID_L</b>	0x31	NA	Camera vendor ID LSB (default: 0xFF)	0x82 09 06 31 FF	0xA0 50 31 0y 0y FF
<b>REG_CAM_MODEL_ID_H</b>	0x32	NA	Camera model ID MSB (default: 0xFF)	0x82 09 06 32 FF	0xA0 50 32 0y 0y FF
<b>REG_CAM_MODEL_ID_L</b>	0x33	NA	Camera model ID LSB (default: 0xFF)	0x82 09 06 33 FF	0xA0 50 33 0y 0y FF
<b>REG_5V_OUTPUT_ENABLE</b>	0x40	0x82 01 06 40 0y 0y FF	0x00: disable 5V output 0x01: enable 5V output	0x82 09 06 40 FF	0xA0 50 40 0y 0y FF
<b>REG_CAMERA_POWER_ENABLE</b>	0x41	0x82 01 06 41 0y 0y FF	0x00: disable camera power 0x01: enable camera power	0x82 09 06 41 FF	0xA0 50 41 0y 0y FF

<sup>1</sup>: Pattern is not available on all cameras, please make sure that your camera supports it.

## Control camera video format

Four DIP switches are used to select the video format of the camera. The value is checked each time power is issued to the camera and the camera format is automatically set accordingly. Please refer to the table below to change format:

1	2	3	4	Configuration
OFF	OFF	OFF	OFF	Default camera format
OFF	OFF	OFF	ON	3840×2160p60
OFF	OFF	ON	OFF	3480×2160p50
OFF	OFF	ON	ON	3840×2160p30/29.97
OFF	ON	OFF	OFF	3840×2160p25
OFF	ON	OFF	ON	1920×1080p60/59.94
OFF	ON	ON	OFF	1920×1080p50
OFF	ON	ON	ON	1920×1080 p30/29.97
ON	OFF	OFF	OFF	1920×1080p25
ON	OFF	OFF	ON	1280×720p60/59.94
ON	OFF	ON	OFF	1280×720p50
ON	OFF	ON	ON	1280×720p30/29.97
ON	ON	OFF	OFF	1280×720p25
ON	ON	OFF	ON	1920x1080i60/59.94
ON	ON	ON	OFF	1920x1080i50
ON	ON	ON	ON	480p60/59.94

Please note that video formats can depend on the camera model used.

## Camera GPIOs

Six GPIOs are available on J500 connector, each one is dedicated to a specific camera function:

Pin	Action	Control	VISCA command sent
<b>Ctrl1</b>	Press Release	Zoom + Zoom stop	0x81 01 04 07 23 FF 0x81 01 04 07 00 FF
<b>Ctrl2</b>	Press Release	Zoom – Zoom stop	0x81 01 04 07 33 FF 0x81 01 04 07 00 FF
<b>Ctrl3</b>	Press Release	Focus Auto / Manual	0x81 01 04 38 10 FF
<b>Ctrl4</b>	Press Release	Focus near Focus stop	0x81 01 04 08 33 FF 0x81 01 04 08 00 FF
<b>Ctrl5</b>	Press Release	Focus far Focus stop	0x81 01 04 08 23 FF 0x81 01 04 08 00 FF
<b>Ctrl6</b>	Press Release	Image freeze toggle	0x81 01 04 62 02 FF 0x81 01 04 62 03 FF

To activate it you need to connect the pin to the ground. ESD filters and anti-bounce have been added. You can use existing keyboard to easily control them.

## External synchronization

An input for an external synchronization signal is available on a simple 2-way connector (J202) or on a coaxial connector (J201). The synchronization signal is directly forwarded to the camera. The *Sync Lock* LED turns on when the camera is locked on the synchronization signal.

**Note:** The external synchronization feature is **only** available with the **ER8550 camera**. The external synchronization signal format must match the camera's format.

## Board status

The status LED displays the state of the system, depending on its blinking rate and the number of blinks.

Board status	Blink state	Description
<b>Initialization</b>	Regular blinking, every 200ms	The board is collecting data from the camera
<b>Ready</b>	Regular blinking, every second	Video output working and communication available
<b>Camera disabled</b>	Regular blinking, every 5 seconds	No video, camera power is disable, see register 0x41
<b>Re-driver error</b>	Irregular blinking, 1 pulse per second	Communication error with the HDMI re-driver
<b>Camera error</b>	Irregular blinking, 2 pulses per second	Communication error with the camera

# Connectors

## J700 HDMI connector

## J200 4K TMDs camera input

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	+5.0V OUT
14	Hot Plug Detect
15	EXT_SYNC_LOCK
16	EXT_SYNC
17	XSD0_ACC_LED
18	GND
19	TMDS Data 2 +
20	TMDS Data 2 -
21	GND
22	TMDS Data 1 +
23	TMDS Data 1 -
24	GND
25	TMDS Data 0 +
26	TMDS Data 0 -
27	GND
28	TMDS Clock +
29	TMDS Clock -
30	GND

## J202 External sync connector

1	GND
2	Ext Sync

## J201 External sync connector

**VOPTM37** OR

## J900 Micro-USB connector

## J800 Power supply

1	6 to 12 VDC
2	GND

## J501 Communication

1	GND
2	Tx
3	Rx

## J801 5V output

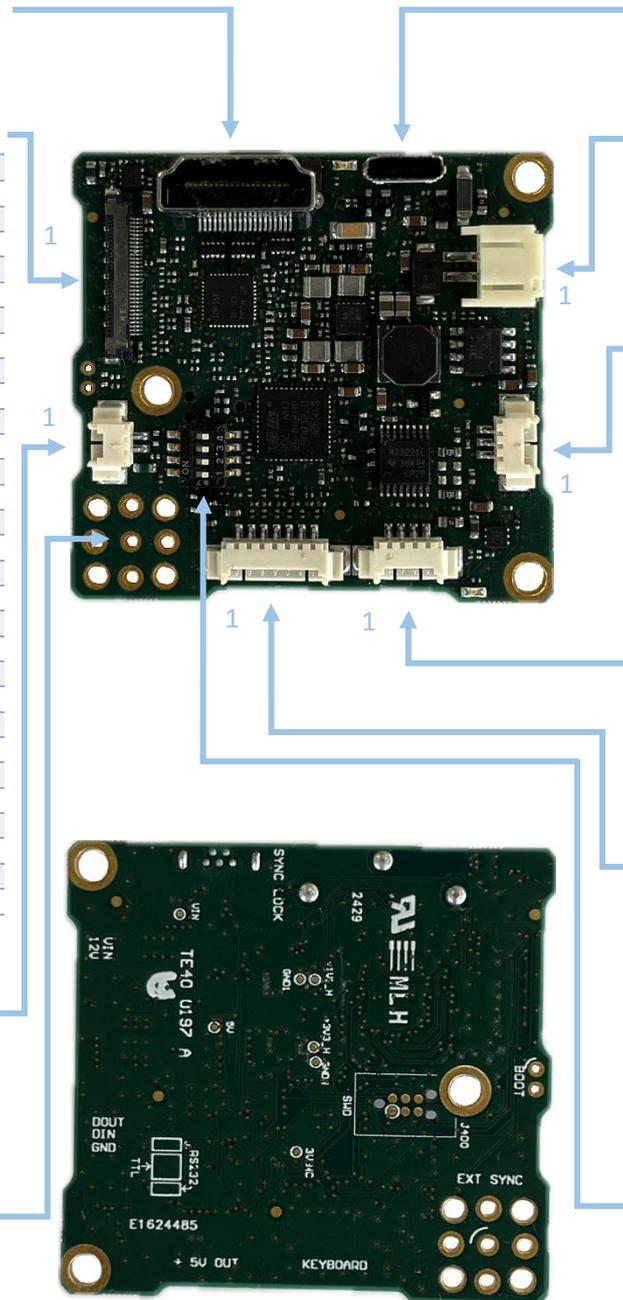
1	+5V
2	+5V
3	GND
4	GND

## J500 Camera GPIOs

1	GND
2	Zoom Tele
3	Zoom Wide
4	Auto/Manual Focus
5	Focus Near
6	Focus Far
7	Freeze

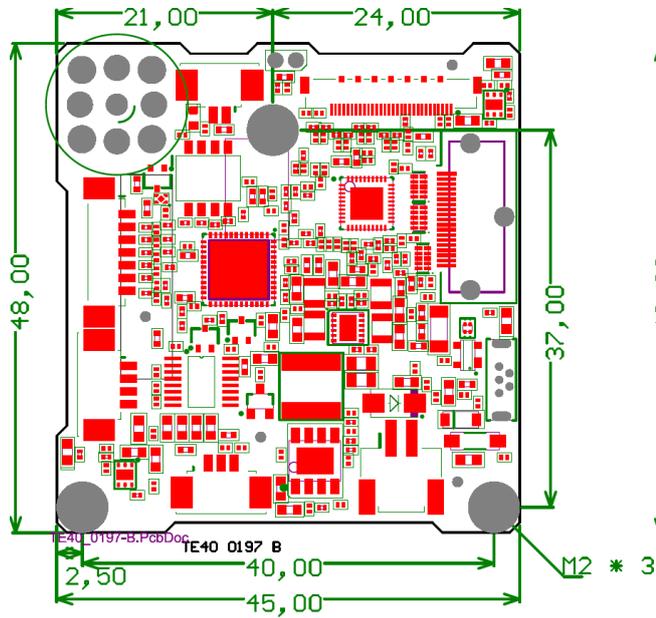
## DIP switches Configuration

1	2	3	4	Configuration
OFF	OFF	OFF	OFF	External format
OFF	OFF	OFF	ON	2160p60
OFF	OFF	ON	OFF	2160p50
OFF	OFF	ON	ON	2160p30/29.97
OFF	ON	OFF	OFF	2160p25
OFF	ON	OFF	ON	1080p60/59.94
OFF	ON	ON	OFF	1080p50
OFF	ON	ON	ON	1080 p30/29.97
ON	OFF	OFF	OFF	1080p25
ON	OFF	OFF	ON	720p60/59.94
ON	OFF	ON	OFF	720p50
ON	OFF	ON	ON	720p30/29.97
ON	ON	OFF	OFF	720p25
ON	ON	OFF	ON	1080i60/59.94
ON	ON	ON	OFF	1080i50
ON	ON	ON	ON	480p60/59.94

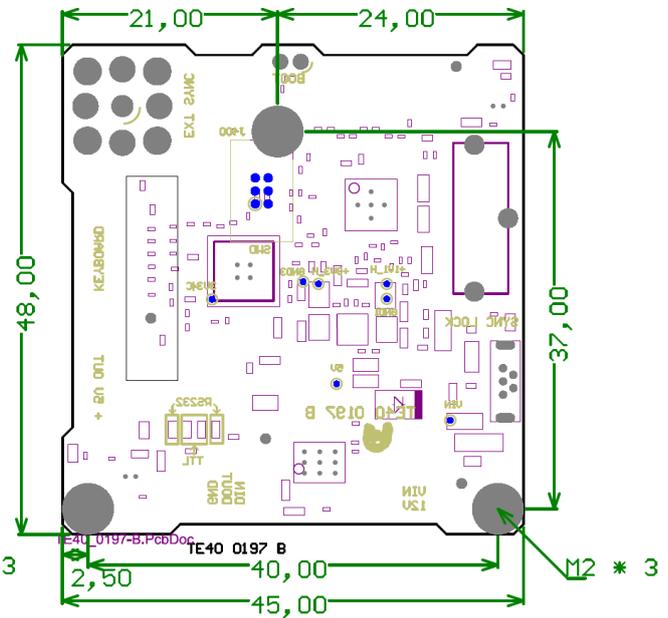


## Form factor

**TOP**



**BOTTOM**



48mm (H) x 45mm (W) x 13mm (D)

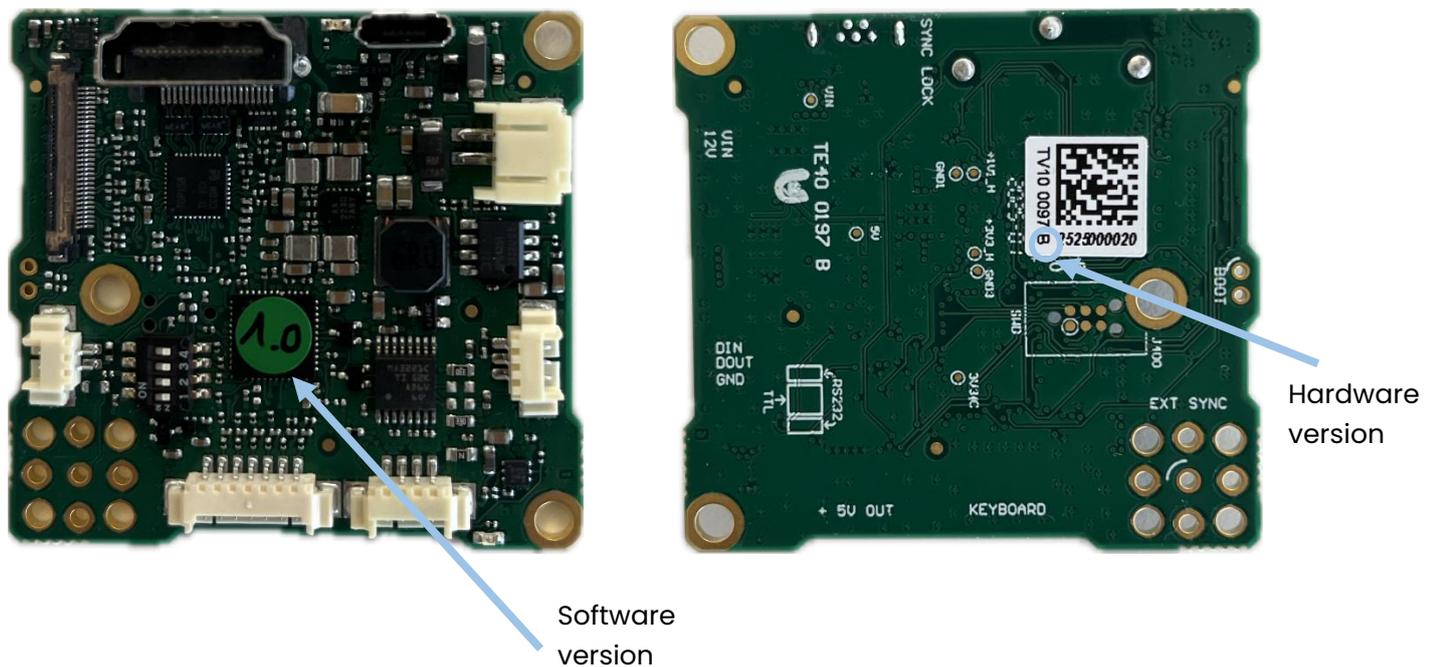
3 holes Ø 3mm

13g

## Troubleshooting

### Get hardware and software version

The hardware version is a letter written close to the reference of the board TV10 0097 on the bottom side of the board. The software version is written on a green sticker stuck on the top side of the board. Be careful, the HDMI 4K60 can be updated by the customer, in this case the green sticker can be not at the correct version.



### Update via micro-USB

An update of the board is possible by distance, you need a Micro-USB cable to connect a computer with the board. A specific driver and "Dfu-util" are needed for the update. If you need to update the board, please send us a mail at [info@i2s.fr](mailto:info@i2s.fr) and we will provide you support and the tools.

## Common issues

If you have any problem getting the video, here are some points you need to check:

- Power supply is correctly connected to the board, no consuming issue or overheating of the board.
- No damaged cable, you can check using other 30-way Kel cable, if possible, check the output cable used to get the video
- Check your display compatibility with the video format you want to read
- The video format of the camera is correct and supported by the board
- Try with another HDMI 4K compatible camera to be sure the issue is not coming from the camera
- Make sure to turn on the board with the 6-12V power supply before connecting the USB cable

If you are not able to find the cause of the issue, please contact us at [info@i2s.fr](mailto:info@i2s.fr) and we will give you support. Explain us the problem you are facing with as much details as possible and please add the hardware and software version of your board.