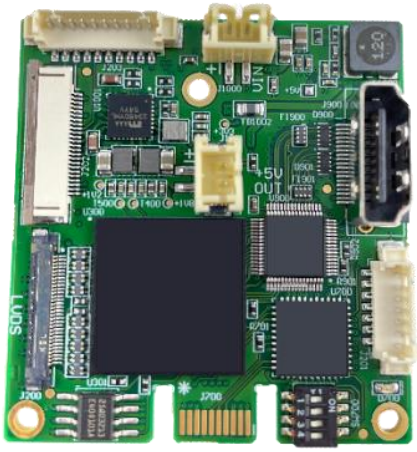
Vision & Innovation

HDMI

Technical Manual



P/N – TV10 0032: HDMI interface board for LVDS zoom cameras

P/N – TV50 0022: Mounting kit for TV10 0032 – HDMI I/F board
***Includes*:** 30-way micro-coax camera cable, 2-way cable (power supply), 10-way cable (RS232/TTL/Analog output), 7-way cable (GPIOs), 24-way FFC cable, right angle black anodized bracket, screws and spacers

P/N – TV50 0017: Cable kit for TV10 0032 – HDMI I/F board
***Includes*:** 30-way micro-coax camera cable, 2-way cable (power supply), 10-way cable (RS232/TTL/Analog output)

Table of content

Revision History

Date	Revision	Description	Modified by	Note
08/03/17	A	Creation of the document	NMA	
10/01/20	B	Add 3V3 for TTL level voltage	NMA	
12/02/20	C	Add Visca command for camera and 5V MOS	TLE	
28/09/20	D	Update RS232/TTL part	CBO	
07/04/23	E	Update board and kit references	CBO	
03/03/25	F	Change document organization and graphical chart	CBO	

Key features

- HDMI 1.3 output
- Uncompressed full HD video stream
- Video resolution up to 1080p60
- Automatic LVDS camera video format detection
- Analog video output: Component video (YPbPr) from the camera
- Communication UART – RS232/TTL using VISCA
- Camera output video format configuration by DIP switches
- Power supply 6V-12VDC
- Auxiliary power output 5VDC, 1A
- Operating temperature [0°C; 60°C]

General description

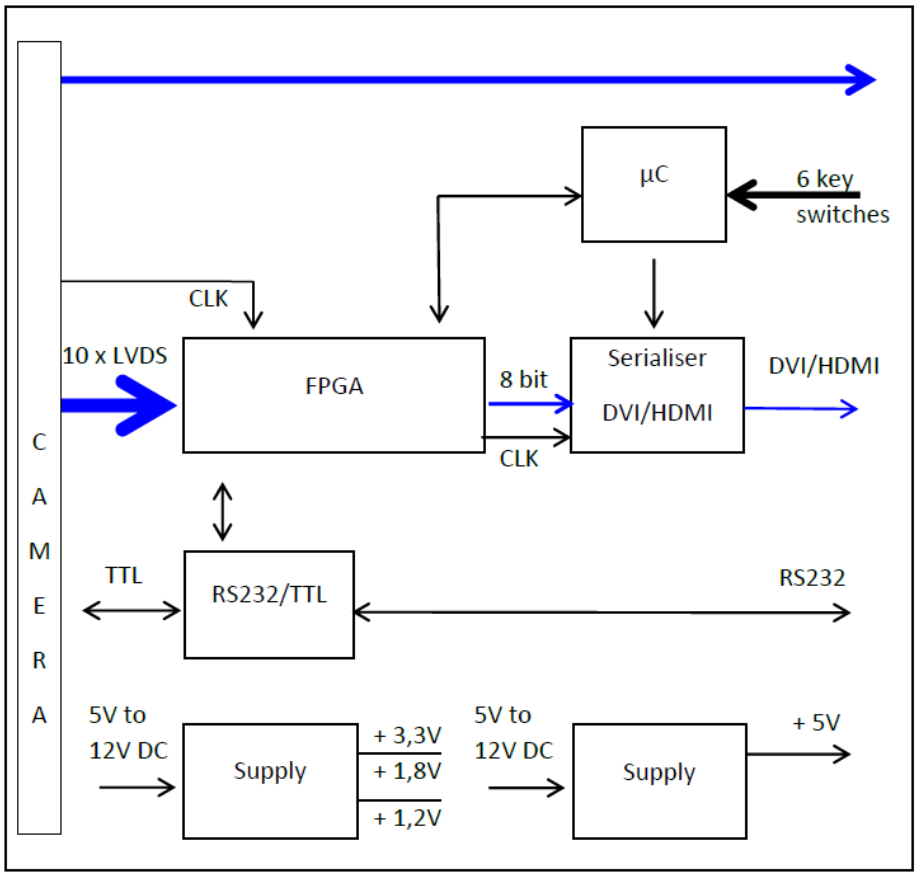
HDMI technology is an internationally recognized standard able to transmit uncompressed high-definition video signals from camera to screen.
This standard is compatible with most of the existing displays, it gives a lot of flexibility. This is ideal for short distance applications.

The HDMI Neo converts the native LVDS video signal from camera blocks to HDMI. It takes advantage of a low consumption, a high quality, and an uncompressed video stream.
The HDMI module is based on a FPGA associated, combined with i2S's expertise, complex image processing functions can be embedded on real time video to fit your applications.

Benefits of this solution

- Standard and reliable HDMI video transmission
- Video format supported up to 1080p60
- Latency involved by the board is negligible
- GPIOs connector to easily send basic VISCA commands (zoom in / out, focus)
- Can control external device via 5V manageable output

Block diagram



Video acquisition

The main component is the FPGA for video acquisition.
The board acquires LVDS video from the camera block with no latency deserialization to provide uncompressed HDMI video output.

Communication

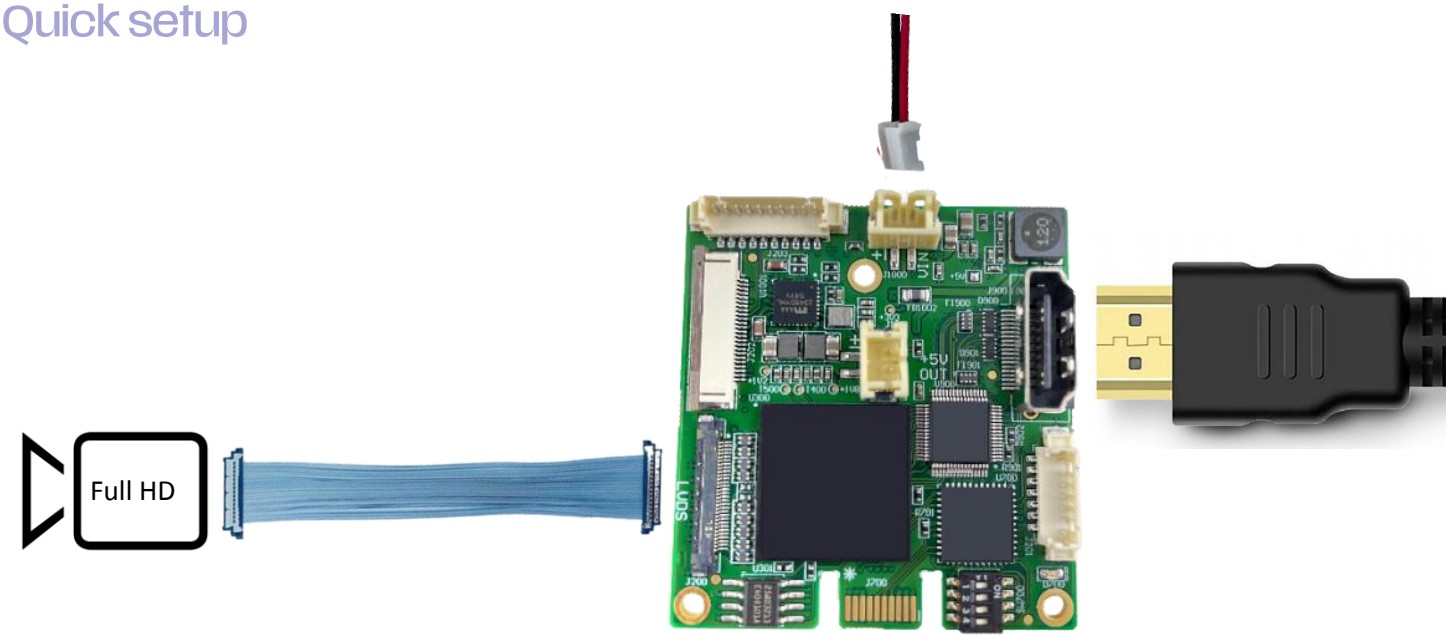
By default, the board is configured in RS232. It is possible to switch to UART TTL 3V3 communication but that requires hardware modifications. For more information, please contact us at info@i2s.fr and we will ensure that you are able to do the changes. The board can be ordered in UART TTL 3V3 configuration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

Power supply

The power input through the 2 ways connector J4 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 J7 and can be managed via the internal command “5V output”.

Accessing the video

Quick setup



Installation steps:

1. Connect the KEL cable between the board J2 and the camera.
2. Connect the HDMI cable to the output connector of the board J900 and to the HDMI monitor.
3. Connect the 2-way power supply cable on J4 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

Introduction on video formats

You have two video format types:

- Progressive: displays both the even and odd scan lines (the entire video frame) at the same time. The video formats are listed with the letter 'p'.
- Interlaced: displays even and odd scan lines as separate fields. The even scan lines are drawn on the screen, then the odd scan lines are drawn on the screen. Two of these even and odd scan line fields make up one video frame. The video formats are listed with the letter 'i'.

Notion of LVDS mode:

- It is controlled by the register 74 of the camera (0x00: Single mode, 0x01: Dual mode).
- It is used to increase the video output from 4x LVDS data lines to 8x LVDS data lines. The output clock frequency is still 74,25MHz but with twice more date lanes.
- It is needed to process video formats 1080p50, 1080p59.94 and 1080p60. If the camera itself does not have 4x additional LVDS data lanes, it will output data at 148,5MHz for video formats 1080p50, 1080p59.94 and 1080p60.

On LVDS Full HD cameras blocks you can have several video formats available:

- Full HD Interlaced 1920x1080i: it can be at 50, 59.94 or 60 FPS, the camera must be in Single mode.
- Full HD Progressive 1920x1080p: it can be at 25, 29.97 or 30 FPS, the camera must be in Single mode. It can also be at 50, 59.94 or 60 FPS, with these video formats only, the camera must be in Dual mode to be able to send more data.
- HD Progressive 1280x720p: it can be at 25, 29.97, 30, 50, 59.94 or 60 FPS, the camera must be in single mode.

LVDS video input supported resolutions

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

	25	29.97	30	50	59.94	60
1280x720p	✓	✓	✓	✓	✓	✓
1920x1080p	✓	✓	✓	✓*	✓*	✓*
1920x1080i				✓	✓	✓

* The video formats 1080p50, 1080p59.94 and 1080p60 require the camera configured in dual lane: register 74 set to 0x01. The others video formats require the register 74 set to 0x00 for single lane.

HDMI video output

The output is compliant to HDMI 1.3 available on the HDMI connector J900. The output video format is the same as the camera (see LVDS video input resolutions supported upper).

System configuration

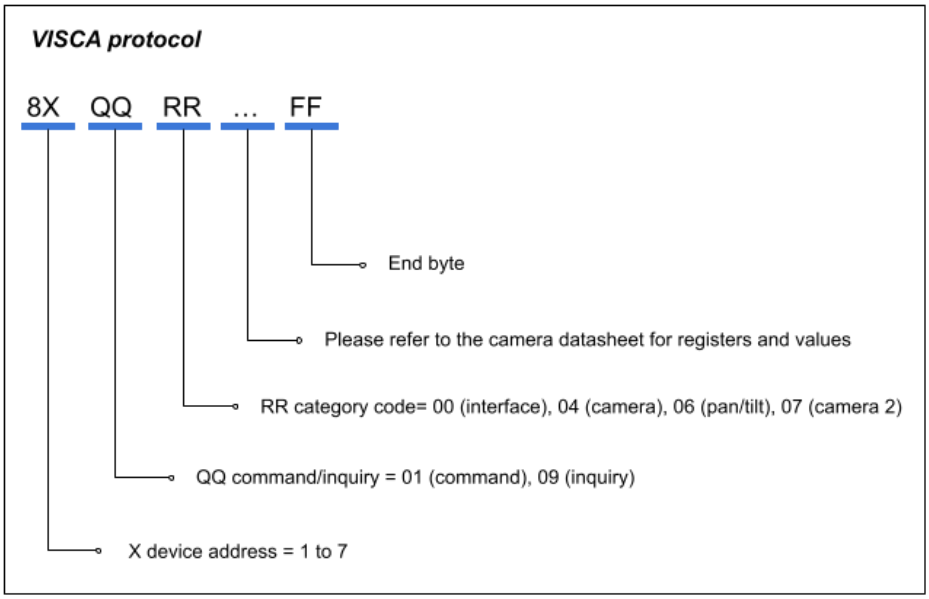
Communication

Communication with the camera can be done through J5 connector. Communication can be set to either RS232 mode (default) or TTL mode (UART with 3.3V compatibility). It allows you to send VISCA commands to the camera. To switch from RS232 to TTL configuration some hardware modifications are needed. Please contact us at info@i2s.fr for more information.

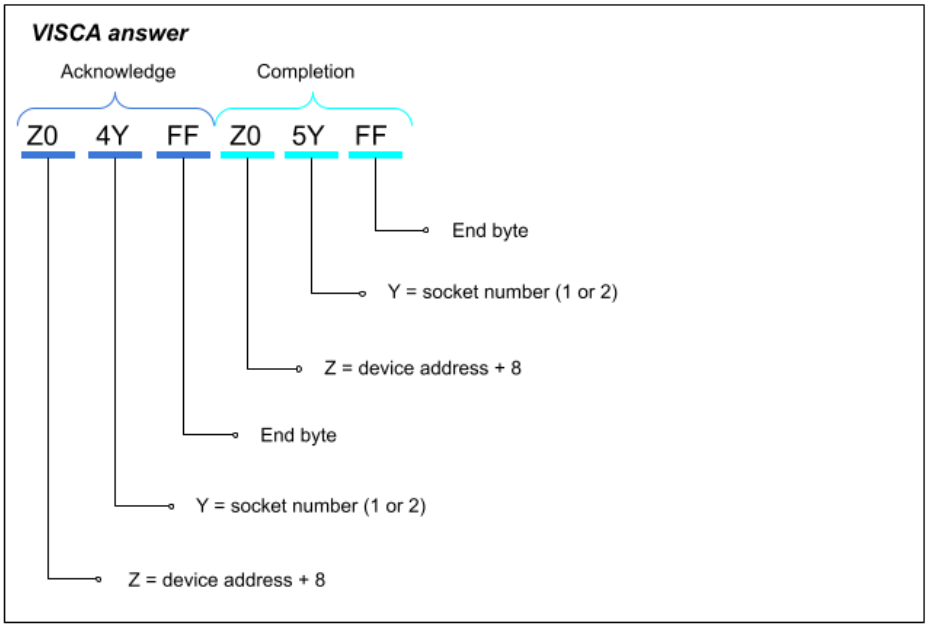
The baud rate of the serial interface will follow the baud rate configured in the camera.

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:

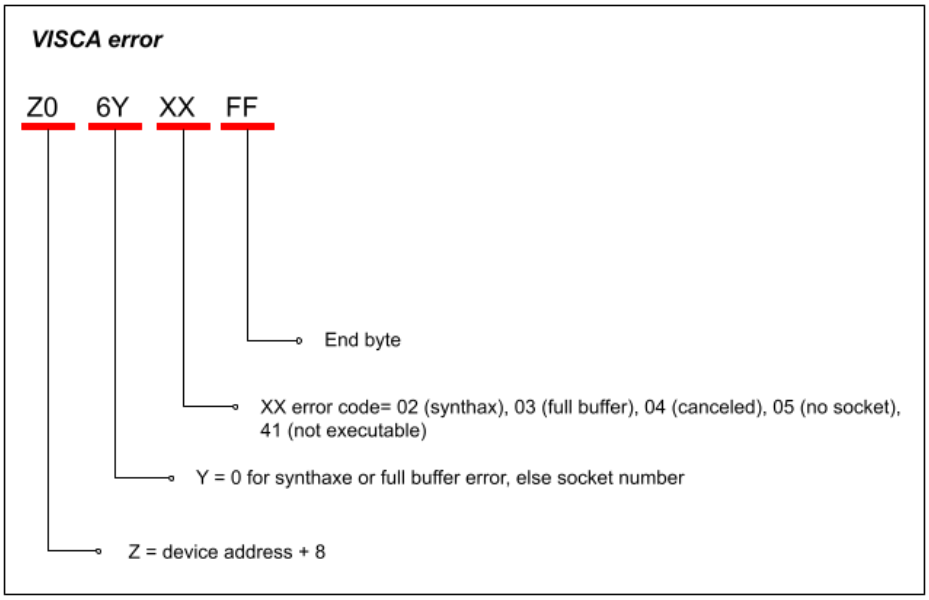


The camera answer follows this structure:



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 registers

You can access to internal commands via the serial communications.
Both the camera and the 5V output can be turned ON and OFF by VISCA commands:

Utility	Command	Answer	Comment
5V MOSFET status	87 09 04 00 FF	90 50 0x FF	x = 0x02: 5V MOSFET ON x = 0x03: 5V MOSFET OFF
Camera MOSFET status	81 09 04 00 FF	90 50 0x FF	x = 0x02: Camera MOSFET ON x = 0x03: Camera MOSFET OFF
5V output ON	87 01 04 00 02 FF	90 41 FF 90 51 FF	Turn on the 5V output
5V output OFF	87 01 04 00 03 FF	90 41 FF 90 51 FF	Turn OFF the 5V output
Camera ON	81 01 04 00 02 FF	90 41 FF 90 51 FF	Turn ON the camera
Camera OFF	81 01 04 00 03 FF	90 41 FF 90 51 FF	Turn OFF the camera

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.

Because not all supported cameras have the same formats available, please refer to the table below to change format:

1	2	3	4	Configuration
OFF	OFF	OFF	OFF	Default camera format
OFF	OFF	ON	ON	1080p60
ON	ON	OFF	ON	1080P50
ON	OFF	OFF	OFF	1080p30
OFF	ON	OFF	OFF	1080p25
ON	ON	OFF	OFF	1080i60
OFF	OFF	ON	OFF	1080i50
ON	OFF	ON	OFF	720p60
OFF	ON	ON	OFF	720p50
ON	ON	ON	OFF	720P30
OFF	OFF	OFF	ON	720P25

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

GPIOs

Six GPIOs are available on J6 connector, each one is dedicated to a specific camera function:

Pin	Functions	Description
CDE0	Zoom Tele	Zoom tele while button is activated, and stop zoom when released
CDE1	Zoom Wide	Zoom wide while button is activated, and stop zoom when released
CDE2	Freeze On/Off	Freeze toggle while button is activated
CDE3	Preset recall	Cam memory recall when the button is released
CDE4	Auto-focus	One push auto focus
CDE5	Color bar	Toggle between camera live output, camera colorbar and reticle

Each associated function is triggered when the GPIO is pulled to ground.

Board status

The status LED displays the system state every 2 seconds. The number of blinks indicates the current state.

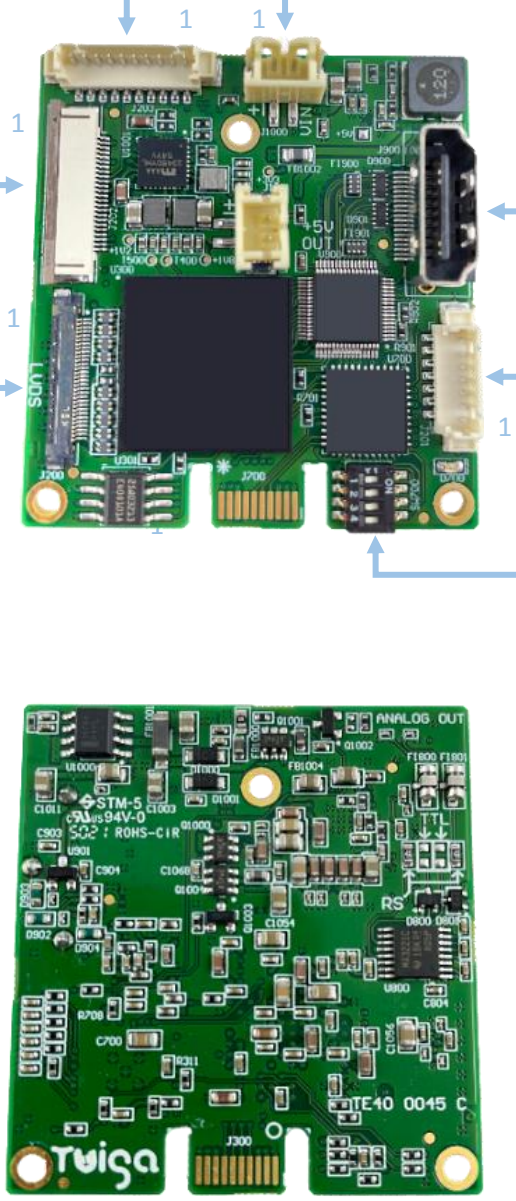
Status	Blinks number
Module firmware boot	1
Decoder initialization	2
FPGA loading ok	3
Visca dialog with the camera	4
Camera video format ok	5
FPGA video configuration ok	6
Demand of video format change by DIP switch	7

Connectors

J5	Communication & Analog video
1	Y
2	GND
3	Pb
4	GND
5	Pr
6	GND
7	Tx
8	Rx
9	GND
10	CVBS

J3	FFC connector

J2	LVDS input
1	TX4-
2	TX4+
3	TX5-
4	TX5+
5	Reset
6	NC
7	TX6-
8	TX6+
9	TX7-
10	TX7+
11	GND
12	GND
13	VCAM
14	VCAM
15	VCAM
16	VCAM
17	VCAM
18	RxD (TTL camera input)
19	TxD (TTL camera input)
20	GND
21	TX0-
22	TX0+
23	TX1-
24	TX1+
25	TX2-
26	TX2+
27	TXCLKOUT-
28	TXCLKOUT+
29	TX3-
30	TX3+



J4	Power supply
1	6 to 12 VDC
2	GND

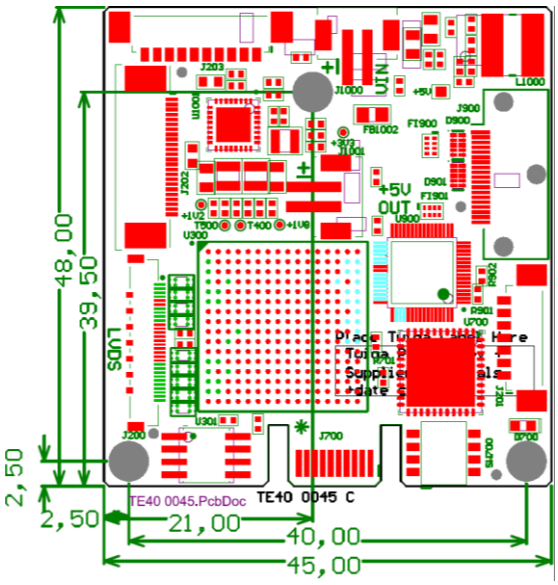
J900	HDMI connector

J6	Camera GPIOs
1	GND
2	Zoom +
3	Zoom -
4	Freeze On/Off
5	Preset Recall
6	One push autofocus
7	Color bar

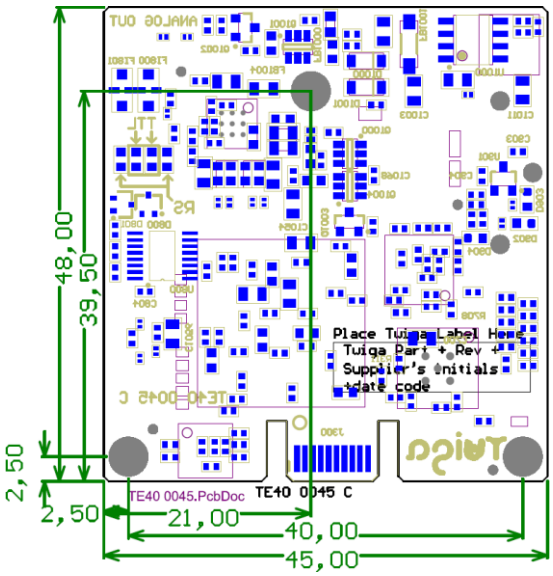
DIP switches				Configuration
1	2	3	4	
OFF	OFF	OFF	OFF	External
OFF	OFF	ON	ON	1080p60
ON	ON	OFF	ON	1080P50
ON	OFF	OFF	OFF	1080p30
OFF	ON	OFF	OFF	1080p25
ON	ON	OFF	OFF	1080i60
OFF	OFF	ON	OFF	1080i50
ON	OFF	ON	OFF	720p60
OFF	ON	ON	OFF	720p50
ON	ON	ON	OFF	720P30
OFF	OFF	OFF	ON	720P25

Form factor

TOP



BOTTOM



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

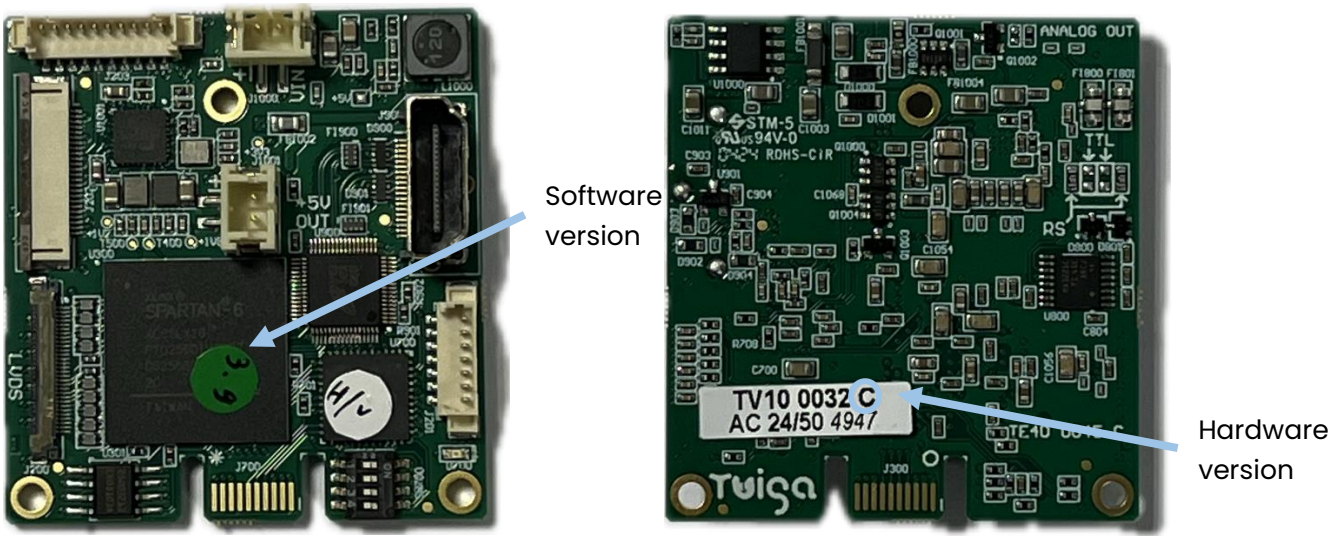
3 holes Ø 3mm

14g

Troubleshooting

Get hardware and software version

The hardware version is a letter written close to the reference of the board TV10 0032 on the bottom side of the board. The software version is written on a green sticker stuck on the top side of the board.



Common issues

If you have any problem getting the video, here 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
- The LVDS mode of the camera (register 74) is adapted to your video format: dual mode (value 0x01) for 1080p50, 1080p59.94 and 1080p60, or single mode (value 0x00) for other video formats.
- Try with another LVDS compatible camera to be sure the issue is not coming from the camera

If you are not able to find the cause of the issue, please contact us at 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.