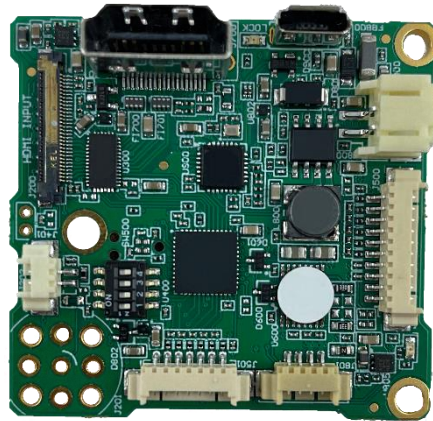




# Technical Manual

## HDMI 4K Interface for ER series





**P/N – TV10 0077:** 4K HDMI interface board for Sony FCB 4K camera range

**P/N – TV50 0024:** Mounting kit for TV10 0077- 4K HDMI I/F board

**Includes:** 30-way micro-coax camera cable, 2-way cable (power supply), 10-way cable (RS232/TTL), 7-way cable (GPIOs), right angle black anodized bracket, screws and spacers

**P/N – TV50 0017:** Cable kit for TV10 0077 - 4K HDMI I/F board

**Includes:** 30-way micro-coax camera cable, 2-way cable (power supply), 10-way cable (RS232/TTL)

	Writing	Approval
Date	07/04/2023	10/04/2023
Name	Cédric BOULANGER	Cédric BOULANGER
Signature		

## Revision History

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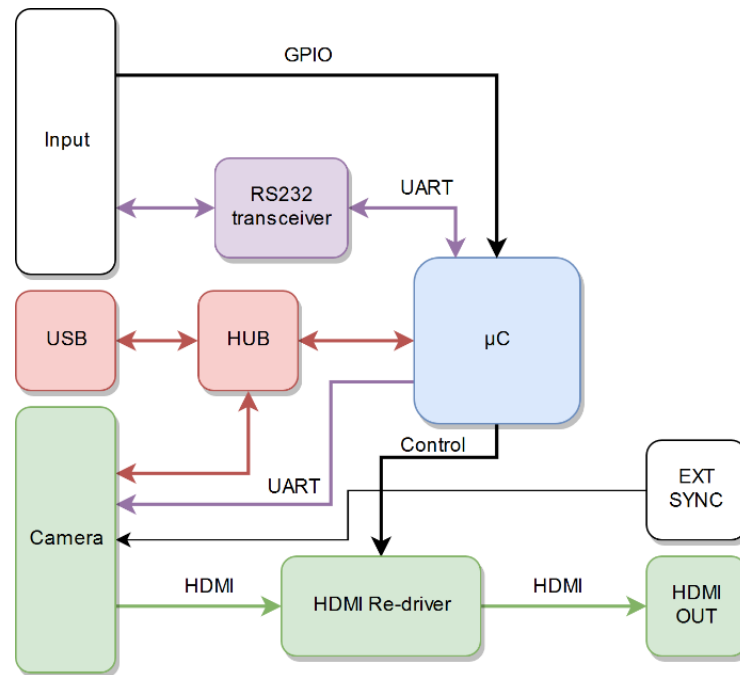
Date	Revision	Description	Modified by	Note
26/11/2018	A	Creation of the document	TLE	
28/09/2020	B	Update Communication part	CBO	<a href="#">2.1</a>
21/10/2021	C	<b>v1.3 release note</b> Update DIP switch information for new camera support Remove RS232 automatic baud rate detection	TLE	<a href="#">2.1</a> <a href="#">2.5</a>
18/05/2022	D	<b>v1.4 release note</b> Add distinct command to power off camera Add inquiry for 5V and camera power status	TLE	<a href="#">2.1.3</a>
07/04/2023	E	Update board and kit references	CBO	

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## 1. Presentation

### 1.1. Synoptic



TV10 0077 architecture

### 1.2. Characteristics summary

The TV10 0077 board features the following functionalities:

- Compatible with SONY ER8300, ER8530, ER8550, ES8230 & EW9500H 4K camera bloc
- Support external synchronisation input (for ER8550)
- Drive HDMI cable up to **20m**.
- Serial communication **RS232 or TTL**
- USB micro-B for communication & update
- **5V 1A** switchable power output
- System control through **VISCA** protocol and GPIO
- Low power mode

## 1.3. HDMI Output

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The HDMI output of the TV10 0077 board can be adjusted to manage different use case and optimize power consumption. Those settings can be controlled through VISCA command ([2.1.3](#)) or GPIO ([2.3](#)).

The table below indicates the recommended settings for different cable length:

Cable length	HDMI Gain	HDMI Eco mode
Short	LOW	ON
Long	HIGH	OFF

*HDMI output settings*

The default settings at start-up are gain low and Eco Mode Off.

## 2. Features

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### 2.1. Communication

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The system can be controlled through the VISCA protocol on two interfaces: USB (CDC class) and serial.

#### 2.1.1. Serial

The serial interface is mapped on the connector J500 (see section [3.3.6](#) for pinout). This interface supports either RS232 (default) or TTL voltage level.

To switch from RS232 to TTL configuration some hardware modifications are needed. Please contact us at: [info@twiga-web.com](mailto:info@twiga-web.com) for more information.

The baud rate of the RS232 interface will follow the baud rate configured in the camera. If no camera is detected, the interface will use a default baud rate of 9600.

#### 2.1.2. USB

When plugged in a computer, a virtual COM port will be created. This port can be used to access the system without the baud rate limitation of the serial interface.

### 2.1.3. System VISCA command

Several VISCA command are specifically targeted at the board itself, and are not transferred to the camera:

Inquiry	Packet	Reply message	Description
Board Software version	81 09 01 02 FF	09 50 0x 0y FF	where x is the major version and y the minor version
Camera UART baud rate	81 09 01 04 FF	09 05 0x FF	x: visca baud rate code of the baud rate used by the board to communicate with the camera.
5V output status	81 09 01 EE FF	09 05 0x FF	x : 0x02 if the 5V output is ON 0x03 if the 5V output if OFF
Camera power status	81 09 01 00 FF	09 05 0x FF	x : 0x02 if the camera power is ON 0x03 if the camera power if OFF
Command	Packet	Reply message	Description
5V output ON	81 01 01 EE 02 FF	90 41 FF 90 51 FF	Turn on the 5V output.
5V output OFF	81 01 01 EE 03 FF	90 41 FF 90 51 FF	Turn off the 5V output.
HDMI Eco ON	81 01 01 1C 02 FF	90 41 FF 90 51 FF	Disable the HDMI signal boost to save power.
HDMI Eco OFF	81 01 01 1C 03 FF	90 41 FF 90 51 FF	Enable the HDMI signal boost.
HDMI Gain High	81 01 01 1A 02 FF	90 41 FF 90 51 FF	Set the HDMI signal gain to maximum value.
HDMI Gain Low	81 01 01 1A 03 FF	90 41 FF 90 51 FF	Set the HDMI signal gain to lowest value.
Standby Mode ON	81 01 01 1E 02 FF	90 41 FF 90 51 FF	Disable the video output.
Standby Mode OFF	81 01 01 1E 03 FF	90 41 FF 90 51 FF	Enable the video output.
Sleep Mode OFF	81 01 01 00 02 FF	90 41 FF 90 51 FF	Turn ON the camera power.
Sleep Mode ON	81 01 01 00 03 FF	90 41 FF 90 51 FF	Turn OFF the camera power.
System reset	81 01 01 DE DE FF	n/a	Reset the whole system ( $\mu$ C, camera)

For commands that are available through GPIO and VISCA protocol, the priority is given to the GPIO.

## 2.2. Keyboard GPIO commands

On **J501**, 6 GPIO allows to control basic features of the camera without using the VISCA protocol. Each associated function is triggered when the GPIO is pulled to ground.

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	Freeze/unfreeze the camera output
CDE3	Memory Preset	- 1s activation: Camera preset save - 5s activation: Camera preset recall
CDE4	Auto-focus	One push auto focus
CDE5	Color bar	Toggle between camera live output and camera colorbar

See section [3.3.8](#) for connector pinout.

### 2.3. System GPIO commands

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On **J500**, GPIOs allow to manage the system without using the VISCA protocol. Each associated function is triggered when the GPIO is pulled to ground.

Pin	Functions	Description
CDE6	Video output enable	Each activation toggles the HDMI output (enable/disable)
CDE7	Low power mode	- 1s activation: Toggle standby mode - 5s activation: Toggle sleep mode
CDE8	Activate Eco mode	Decrease power consumption, but also signal strength
CDE9	Activate HDMI Gain	Increase the HDMI signal gain
CDE10	Active 5V output	Turn ON the 5V output when activated.
CDE11	Reserved	

For commands that are available through GPIO and VISCA protocol, the priority is given to the GPIO order.

See section [3.3.6](#) for pinout.

### 2.4. External synchronisation (with ER8550 only)

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

**Note:**

- The external synchronisation feature is only available with the **ER8550**
- The external synchronisation signal format must match the camera's format.

## 2.5. DIP switch format selection

The camera format can be changed using the SW500 DIP switch. Its 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 refers to the table below to change format:

ER8300	ER85xx/ES8230	EW9500H	MC-S185U	1	2	3	4
EXTERNAL	EXTERNAL	EXTERNAL	EXTERNAL	OFF	OFF	OFF	OFF
3840×2160 29.97p	3840×2160 29.97p	2688×1512 30p framed	3840×2160 30p	ON	OFF	OFF	OFF
3480×2160 25p	3480×2160 25p	2688×1512 29.97p framed	3480×2160 25p	ON	ON	OFF	OFF
EXTERNAL	3840×2160 23.98p	2688×1512 25p framed	EXTERNAL	OFF	ON	OFF	OFF
1920×1080 59.94p	1920×1080 59.94p	1920×1080 59.94p	1920×1080 60p	ON	ON	ON	OFF
1920×1080 50p	1920×1080 50p	1920×1080 50p	1920×1080 50p	OFF	ON	ON	OFF
1920×1080 59.94i	1920×1080 59.94i	2560×1440 30p framed	2560×1440 30p	ON	OFF	ON	OFF
1920×1080 50i	1920×1080 50i	2560×1440 25p framed	2560×1440 25p	OFF	OFF	ON	OFF
1920×1080 29.97p	1920×1080 29.97p	1920×1080 29.97p	1920×1080 30p	OFF	OFF	ON	ON
1920×1080 25p	1920×1080 25p	1920×1080 25p	1920×1080 25p	ON	ON	OFF	ON
EXTERNAL	1920×1080 23.98p	1920×1080 60i	EXTERNAL	OFF	ON	OFF	ON
1280×720 59.94p	1280×720 59.94p	1280×720 59.94p	1280×720 60p	ON	OFF	OFF	ON
1280×720 50p	1280×720 50p	1280×720 50p	1280×720 50p	OFF	OFF	OFF	ON
720×480 59.94p	720×480 59.94p	1280×720 29.97p	1280×720 30p	ON	OFF	ON	ON
720×576 50p	720×576 50p	1280×720 25p	1280×720 25p	OFF	ON	ON	ON
EXTERNAL	EXTERNAL	720×480 60p	EXTERNAL	ON	ON	ON	ON

*DIP switch format selection from v1.3*

*Note: EXTERNAL means the camera will keep its current video format.*

## 2.6. LED signalization

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

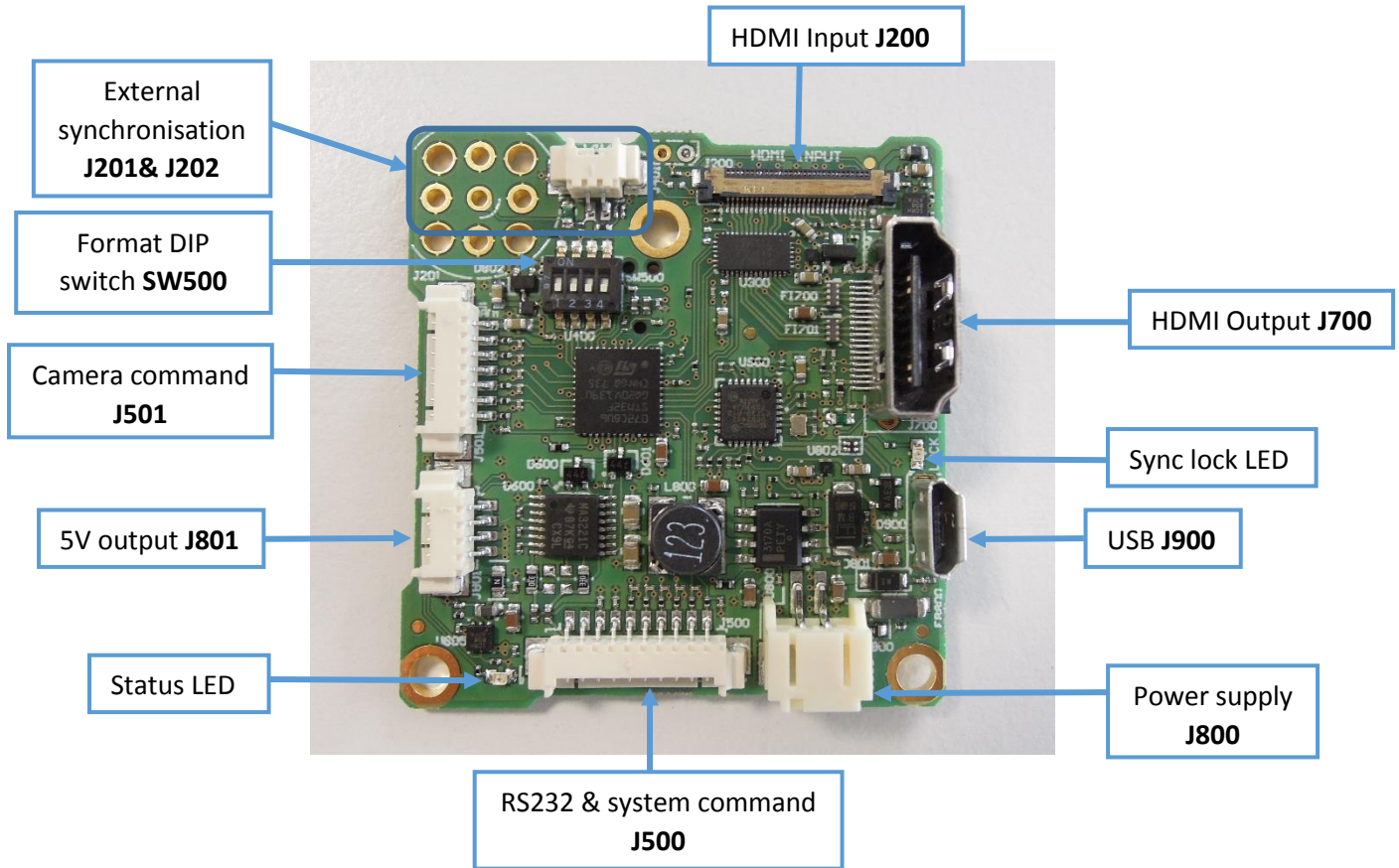
Status	Number of blinks	Description
Sleep Mode	0	Camera shutdown
Standby Mode	1	HDMI output shutdown, camera ON
Searching camera	2	The system tries to detect camera
Format change ongoing	3	The format update procedure is running
Running mode	4	Camera is detected and format is correct

*LED signalization meaning*



## 3. Hardware

### 3.1. Board layout



### 3.2. Power Supply

The board is powered through J800. The camera is also directly powered from this connector. The supported input voltage range is **6-12V**.

System power consumption in different mode is given below:

Mode	Power*
Sleep mode	0.2W
Standby mode	2.9W
Running mode	4.1W

\*with ER8530 camera in 4k30p

### 3.3. Connectors description

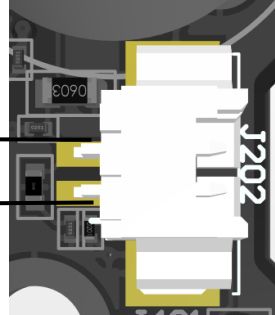
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#### 3.3.1. External Synchronisation input J201 and J202

**J201:** Standard BNC (not mounted by default)

**J202:** Molex 2pts 1.25mm 53261-0271 (Mating 51021-0200)

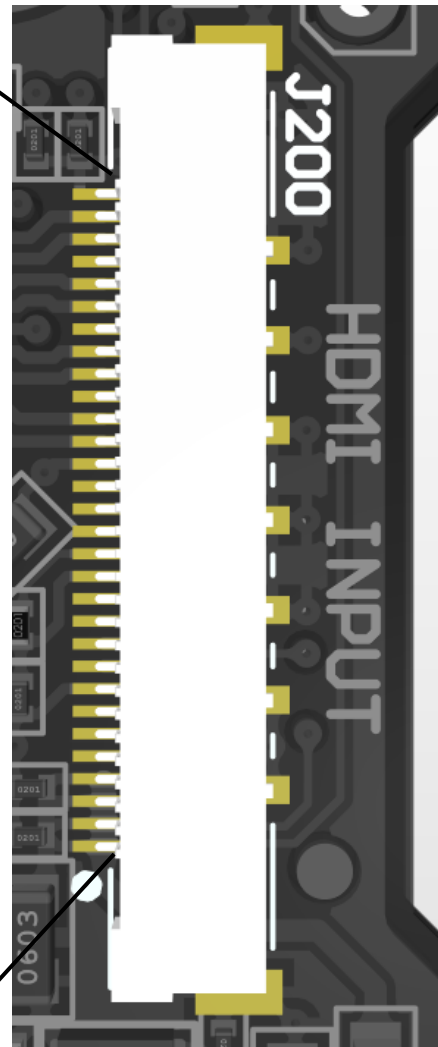
Pin	Signal
2	GND
1	Sync



### 3.3.2. Camera Input J200

**J200:** KEL USL00-30L (Mating cable USL20-30SS-012-C)

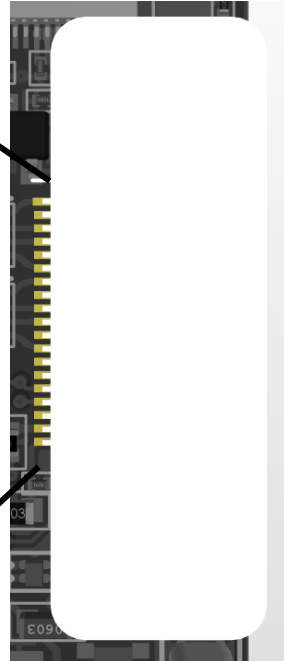
Pin	Signal
30	GND
29	TXCLKOUT-
28	TXCLKOUT+
27	GND
26	TX0OUT-
25	TX0OUT+
24	GND
23	TX1OUT-
22	TX1OUT+
21	GND
20	TX2OUT-
19	TX2OUT+
18	GND
17	GND
16	SCL
15	SDA
14	HDP
13	D_5.0V_OUT
12	USB_VBUS
11	GND
10	USB_D-
9	USB_D+
8	GND
7	UART_RX
6	UART_TX
5	RESET
4	DC_IN
3	DC_IN
2	DC_IN
1	DC_IN



### 3.3.3. HDMI Output J700

**J700:** Female standard HDMI vertical header.

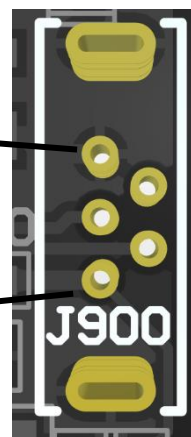
Pin	Signal
1	Data2+
2	Shield
3	Data2-
4	Data1+
5	Shield
6	Data1-
7	Data0+
8	Shield
9	Data0-
10	CLK+
11	Shield
12	CLK-
13	N/C
14	N/C
15	SCL
16	SDA
17	GND
18	+5V
19	HPD



### 3.3.4. USB J900

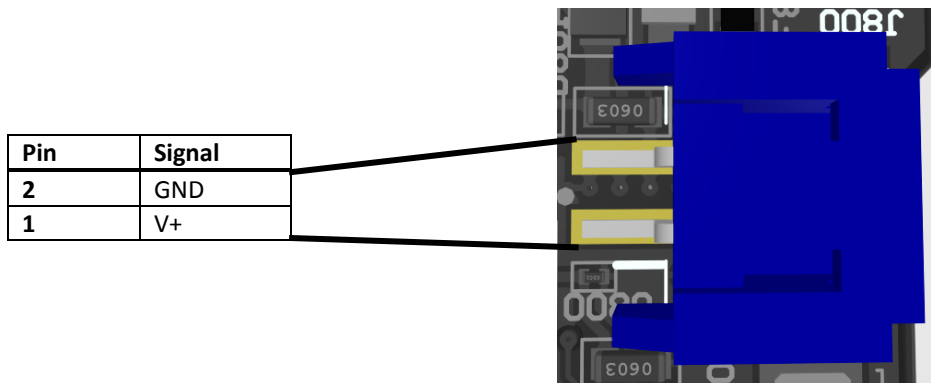
**J900:** USB Micro B receptacle

Pin	Signal
5	GND
4	N/C
3	D+
2	D-
1	VBUS



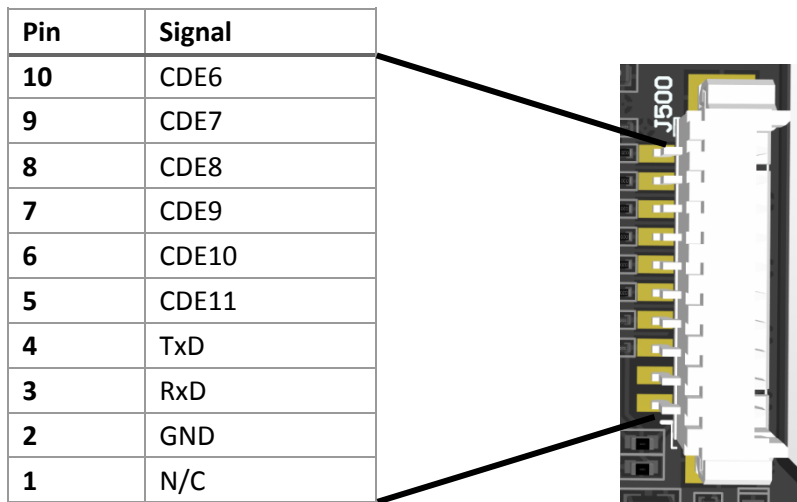
### 3.3.5. Power Supply J800

**J800:** JST 2pts 2mm S2B-PH-SM4-TB (Mating PHR-2)



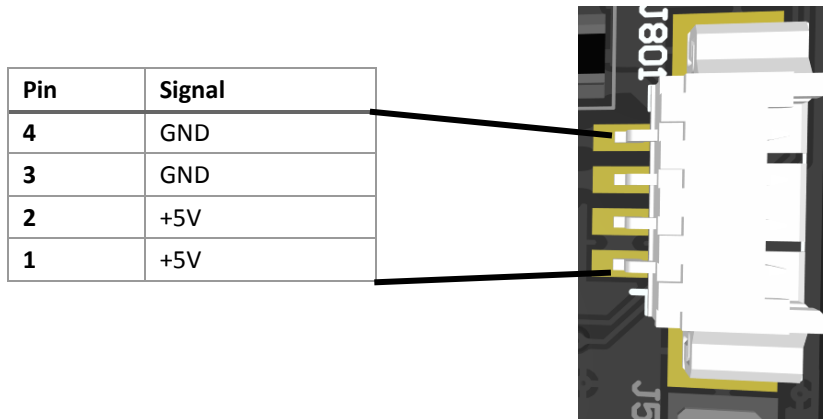
### 3.3.6. System Management J500

**J500:** Molex 10pts 1.25mm 53261-1071 (Mating 51021-1000)



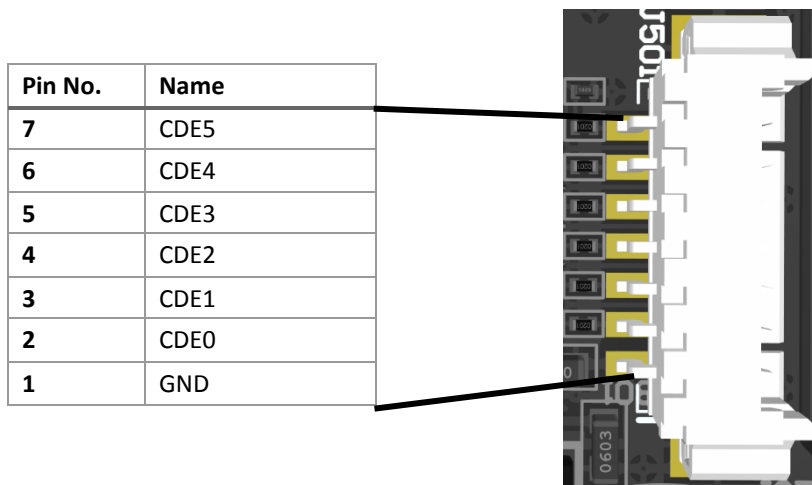
### 3.3.7. 5V Output J801

**J801:** Molex 4pts 1.25mm 53261-0471 (Mating 51021-0400)

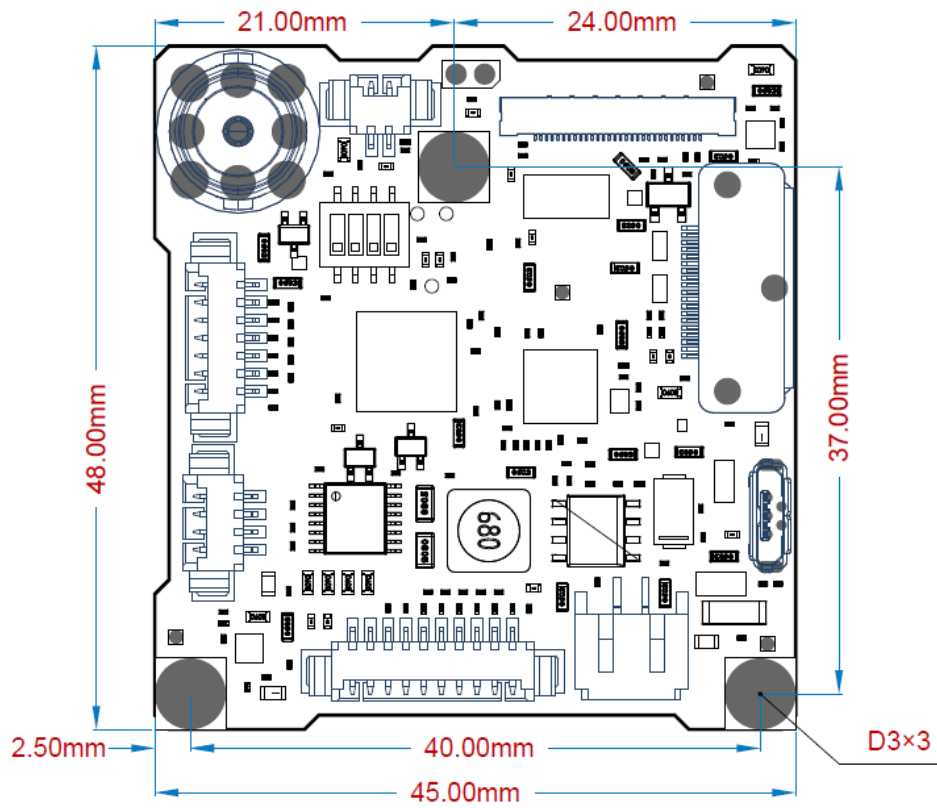


### 3.3.8. Keyboard J501

**J501:** Molex 7pts 1.25mm 53261-0771 (Mating 51021-0700)



### 3.4. Dimensions

**Board height:**

- 11mm without BNC
- 17mm with BNC

## 4. Environmental

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<b>Constraint</b>	<b>Value</b>
Operating Temperature	-10 to 50°C
Storage Temperature	-20 to 60°C
Humidity	20% to 80%
Lifetime Availability	>5 years
UL	UL60601-1
FCC	FCC Part 15
MDD	IEC 60601-4-2 level 4
RoHS	2002/95/EC