

HDMI to CSI Adapter



Introduction

This is a Raspberry Pi expansion module that converts HDMI signals to CSI signals. It supports HDMI input up to 1080p 30fps and is backward compatible. It allows you to use HDMI cameras just as the standard Raspberry Pi CSI cameras, all versions of Raspberry Pi series boards are supported.

Specifications

- Controller: TC358743XBG
- Input signal:
 - Video: HDMI1.4, RGB888, up to 1080p@30fps support
 - Audio: HDMI
- Output signal:
 - Video: 2-lane MIP CSI-2
 - Audio: I2S audio output, LPCM audio stream format

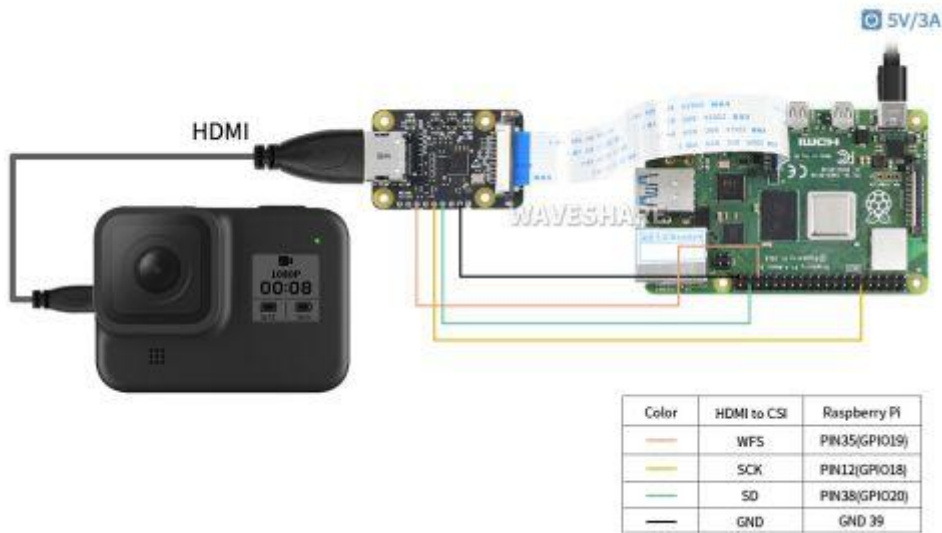
OS: Raspberry Pi OS

- Operating voltage: 3.3V
- Operating temperature: -30° ~ 70° C

Hardware Connection

- Video:

Insert the FPC cable of the adapter into the CSI port. If it is a Pi 2B, 3B, or 3B+, the CSI port is located between the network port and the HDMI interface. If it is a Pi 4B, the CSI port is located between the HDMI 1 interface and the audio interface. If it is a Pi Zero, the CSI port is located on the side of the power port. Note that the silver side (metal side) of the cable should face the HDMI port. Unfasten the black button of the cable slot and insert the cable. The cable needs to be fully inserted into the slot, be careful to avoid bending the cable while ensuring it is plugged in tightly, and then fasten the black button.



- Audio

To connect the audio, the user needs to prepare the cable separately and do the soldering. Connect the pad reserved on the HDMI to CSI side to the I2S pin of Raspberry Pi as shown in the following diagram.

HDMI to CSI	Raspberry Pi
WFS	(PIN35)GPIO19
SCK	(PIN12)GPIO18
SD	(PIN38)GPIO20
GND	GND

Software Settings

Note: HDMI to CSI camera does not support libcamera driver.

- modify config.txt file

```
sudo nano /boot/config.txt
```

Add the following statement to the file

```
dtoverlay=tc358743
```

```
dtoverlay=tc358743-audio
```

Save the file

- Modify the cmdline.txt file

```
sudo nano /boot/cmdline.txt
```

Add the following content to the file

```
cma=96M
```

- Download and install the driver demo

```
cd
```

```
wget https://files.waveshare.com/upload/8/89/TC358743-Driver.zip
```

```
unzip TC358743-Driver.zip
```

```
cd ~/TC358743-Driver
```

```
sudo sh set_edid.sh
```

- Reboot the system after successful installation

```
sudo reboot
```

Test Video

Capture video with yavta

- Connect the device
- Enter the demo directory and run it

```
cd ~/TC358743-Driver/yavta/yavta/
```

```
sudo make clean
```

```
make
```

```
./yavta --capture=1000 -n 3 --encode-to=file.h264 -f UYVY -m -T /dev/video0
```

The demo will capture 1000 frames of images and save them as a file.h264 file

Capture video with gstreamer

- Install gstreamer tool

```
sudo apt install gstreamer1.0-tools -y
```

- Capture video:

```
gst-launch-1.0 -vvv v4l2src ! "video/x-raw,framerate=30/1,format=UYVY" ! v4l2h264enc extra-controls="controls,h264_profile=4,h264_level=13,video_bitrate=256000;" ! "video/x-h264,profile=high, level=(string)4.2" ! h264parse ! queue ! matroskamux name=mux ! filesink location=file.mkv
```

Extend Computer Screen to Raspberry Pi

If you use this feature, you need to delete `dtoverlay=tc358743` and `dtoverlay=tc358743-audio` configurations. Only the following configuration should be done. Currently, it only supports 720p

- Modify the `cmdline.txt` file

```
sudo nano /boot/cmdline.txt
```

Add the following content to the file

```
cma=96M
```

Save it

- Then do the following to open legacy camera

```
sudo raspi-config
```

Select Interface Options -> Legacy Camera -> Yes, exit, and then reboot.

- Boot the terminal to run

```
raspivid -t 0
```

Test Audio

- Run the `arecord-l` command to check, and the `tc358743` device will be recognized normally, for example:

```
**** List of CAPTURE Hardware Devices ****
```

card 2: tc358743 [tc358743], device 0: bcm2835-i2s-dir-hifi dir-hifi-0

[bcm2835-i2s-dir-hifi dir-hifi-0]

Subdevices: 1/1

Subdevice #0: subdevice #0

Note: Here, card 2 is the ID of the sound card, which will be used in subsequent audio recording.

- Record the audio and save it as a wav file.

```
arecord -D hw:2 -d 25 -f cd test1.wav
```

Note: Where hw:2 is to set the sound card device, it needs to match the actual sound card ID, otherwise the audio information cannot be collected normally.

Capture Video with Raspberry Pi 5

Note: Due to system version limitations, there is currently a frame drop problem in the collection

Hardware Connection

Plug the FPC cable of the HDMI to CSI module into the CSI Camera 1 port of the Raspberry Pi 5, and insert the metal contacts in the direction of the network port when plugging in the cable. The HDMI interface needs to be connected to an HDMI-connected device to capture normally. In addition, the HDMI output device needs to support the corresponding resolution in order to work properly.

Operation Steps

- Turn on the computer, open the terminal, input the command to edit the configuration file

```
sudo nano /boot/firmware/config.txt
```

- Add the following content at the end of the file, press Ctrl + Y and then Enter to save:

```
dtoverlay=tc358743
```

- Download the EDID file and unzip it:

```
wget https://files.waveshare.com/wiki/HDMI_to_CSI_Adapter/Hdmi_to_csi_driver.zip
```

```
unzip Hdmi_to_csi_driver.zip
```

- Reboot the system

```
sudo reboot
```

- Use the following commands to capture video:

```
cd hdmi_to_csi_driver/
```

```
v4l2-ctl --list-devices
```

Note: The device node for "rp1-cfe" in the above output is "/dev/media0". If you encounter a different ID, you need to make corresponding modifications.

```

pi@raspberrypi:~/hdmi_to_csi_driver $ v4l2-ctl --list-devices
pispbe (platform:1000880000.pisp_be):
/dev/video20
/dev/video21
/dev/video22
/dev/video23
/dev/video24
/dev/video25
/dev/video26
/dev/video27
/dev/video28
/dev/video29
/dev/video30
/dev/video31
/dev/video32
/dev/video33
/dev/video34
/dev/video35
/dev/media2
/dev/media3

rp1-cfe (platform:1f00128000.csi):
/dev/video0
/dev/video1
/dev/video2
/dev/video3
/dev/video4
/dev/video5
/dev/video6
/dev/video7
/dev/media0

rpiivid (platform:rpiivid):
/dev/video19
/dev/media1

pi@raspberrypi:~/hdmi_to_csi_driver $

```

- The following takes 1280x720p60 as an example to configure (currently supports 720P60 and 1080P30)

```
v4l2-ctl -d /dev/v4l-subdev2 --set-edid=file=720p60edid
```

```
v4l2-ctl -d /dev/v4l-subdev2 --set-dv-bt-timings query
```

```

pi@raspberrypi:~/hdmi_to_csi_driver $ v4l2-ctl -d /dev/v4l-subdev2 --set-edid=file=720p60edid
pi@raspberrypi:~/hdmi_to_csi_driver $ v4l2-ctl -d /dev/v4l-subdev2 --set-dv-bt-timings query
BT timings set
pi@raspberrypi:~/hdmi_to_csi_driver $

```

- Configure interface

```
media-ctl -d /dev/media0 -r
```

```
media-ctl -d /dev/media0 -l '"csi2\':4 -> '\rp1-cfe-csi2_ch0\':0 [1]
```

```
media-ctl -d /dev/media0 -V '"csi2\':0 [fmt:RGB888_1X24/1280x720 field:none
colorspace:srgb]
```

```
media-ctl -d /dev/media0 -V '"csi2\':4 [fmt:RGB888_1X24/1280x720 field:none
colorspace:srgb]
```

```
v4l2-ctl -v width=1280,height=720,pixelformat=RGB3
```

```

pi@raspberrypi:~/hdmi_to_csi_driver $ media-ctl -d /dev/media0 -r
pi@raspberrypi:~/hdmi_to_csi_driver $ media-ctl -d /dev/media0 -l '"csi2\':4 -> '\rp1-cfe-csi2_ch0\':0 [1]
pi@raspberrypi:~/hdmi_to_csi_driver $ media-ctl -d /dev/media0 -V '"csi2\':0 [fmt:RGB888_1X24/1280x720 field:none
colorspace:srgb]'
pi@raspberrypi:~/hdmi_to_csi_driver $ media-ctl -d /dev/media0 -V '"csi2\':4 [fmt:RGB888_1X24/1280x720 field:none
colorspace:srgb]'
pi@raspberrypi:~/hdmi_to_csi_driver $ v4l2-ctl -v width=1280,height=720,pixelformat=RGB3

```