

# CAM-MIPI7251RAW User Manual



Normally We will update our development Mannual here https://github.com/INNO-MAKER/cam-mipiov7251-trigger

Date	Revision
2022-10-27	Correct Chapter 2.3 Mode Description
2022-11-23	Add method about install header files
2023-04-04	Add Innocam SDK Description



InnoMaker CAM-MIPI7251RAW --Low Cost Global Shutter Camera --Software External Trigger --Hardware External Trigger

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# **Chapter 1 Hardware Description:**

# 1.1 Features

- 1, Active array size: 640x480, Global Shutter, External Trigger.
- 2, Output formats: 8bit RAW BW and 10 bit RAW BW.
- 3, Frame rate: 158fps.
- 4, Optical coupled isolated external trigger input and flash output support
- 5, Support 4 work mode:
- 0, 10 bit stream mode
- 1, 8 bit stream mode
- 2, 10 bit external trigger mode
- 3, 8 bit external trigger mode

Work on 8bit stream mode by default.

- 6, Software trigger input support.
- 7, driver feature support: gain, exposure, hflip, vflip

#### **Board Size**





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## 1.2 Camera LEN



- Interface: M12
- Field of view Fov(D) = 148 degrees , Fov(H) = 118 degrees
- Focal Length 2.8 mm
- Focal Distance Adjustable
- TV DISTORTION <-17%
- F(N) /Aperture 2.2

### 1.3 Signal/Power Connector J1







#### 1.4 STROB Connector J2





### 1.4.1 Reference Circuit



On-board TLP281 optocoupler isolation, Notice the max collector current is 50mA.

#### **Output Specifications**

				Value	l.	
S. No	Parameter	Test Condition	Min	Тур	Max	Unit
1	Driver Voltage (VCC)			12	24	V
2	Drive current (Icc)			10	50	mA
3	Collector Emitter Breakdown Voltage				80	V
4	Collector Emitter Saturation Voltage	lcc = 1 mA		0.1	0.2	V
5	Power Dissipation				150	mW

Collector-Emitter	V <sub>CE(sat)</sub>	$I_F = 10 \text{mA}, I_C = 1 \text{mA}$	0.1	0.2	v
Saturation Voltage	2		5		

So If the current required to drive the Flash LED is no more than 50mA

The value of series resistor: R1 = ( VCC- Vf - VCE ) / If

VCC: system Voltage

Vf: Forward voltage of Flash LED for current lcc

VCE: Collection Emitter voltage, typical:0.1V

If the current required to drive the flash exceeds 50mA, then it is required to drive it with the help of LED driver circuit, and LED driver circuit can be controlled by using the strobe output pin.

### **1.5 EXT TRIG Connector J3**





J3 PIN	Symbol	Description
1	TRIG+	3.3V-5.0V External Trigger Input
2	TRIG-	External GND

### 1.5.1 Reference Circuit



For example, VCC = 12V, Vf = 1.25V



The calculations done here are based on 12VDC. Please do follow these calculations for other voltages like 24VDC.

Let's take the current through IR LED I<sub>f</sub> = 20mA. Voltage drop across the IR LED = 1.25V The value of Resistor R<sub>1</sub> =  $(V_{cc}-V_f)/I_f = (12 - 1.25)/0.02 = 537.5 \Omega$ Wattage of resistor R<sub>1</sub> > I<sub>f</sub><sup>2</sup> \* R<sub>1</sub> =  $0.02^{2*}537.5 = 0.215W$ Wattage of the resistor R<sub>1</sub> selected should be greater than 0.215W.

And there is a resistor on board (R4 = 200  $\Omega$  ), So the R\_add = R1 - R4 = 537.5 - 200 = 337.5  $\Omega$ 

# Chapter 2 Innomaker Driver Install Guide

#### Step1, Download Source Code

\$sudo git clone https://github.com/INNO-MAKER/cam-mipiov7251-trigger.git

#### Step2, Install kernel headers

If you are using the latest version of Raspbian, Install the Linux kernel headers via below command.

\$sudo apt-get install raspberrypi-kernel-headers

Remark:

If you are use the older version of Raspbian or unable to locate package, manually download the correct headers files from below link. We take kernel 5.15.32-v8+(64bit,released data 2020-0404) as an example.

https://archive.raspberrypi.org/debian/pool/main/r/raspberrypi-firmware/

raspberrypi-kernel-headers\_1.20220331-1\_amd64.deb
 raspberrypi-kernel-headers\_1.20220331-1\_arm64.deb
 raspberrypi-kernel-headers\_1.20220331-1\_armhf.deb

2022-04-04 12:55 37M 2022-04-04 12:55 9.2M 2022-04-04 12:56 27M

Use dpkg tools installl the headers deb files via below command.

\$sudo dpkg -i raspberry-kernel-headers\_1,20220331-1\_arm64.deb

#### Step3, Compile the driver source code

\$cd cam-mipiov7251-trigger



\$sudo chmod -R a+rwx \*
\$cd ov7251\_driver\_source\_code/source\_code
\$sudo make

### Step4, Install driver

\$sudo make install #Work on 8bit stream mode by default.

## Step5, System Setting

#### For PI4/PI3+/PI3/PI2

edit /boot/config.txt

\$sudo nano /boot/config.txt

Add below content to the last line and reboot dtoverlay=inno\_mipi\_ov7251

Reboot

\$sudo reboot

### For CM4/CM3+/CM3 Dual Camera

Copy dtbo file to /boo/overlays and point it as default device.

\$ sudo cp ov7251\_driver\_source\_code/inno\_mipi\_ov7251\_cm4\_dual.dtbo /boot/overlays

Add below content to the last line save and reboot

Edit /boot/config.txt

\$ sudo nano /boot/config.txt

\$ dtoverlay=inno\_mipi\_ov7251\_cm4\_dual

\$sudo reboot



### For PI Zero/PI Zero W

edit /boot/config.txt

\$sudo nano /boot/config.txt

Add below content to the last line and reboot

dtoverlay=inno\_mipi\_ov7251, i2c\_pins\_28\_29=1

Reboot

\$sudo reboot

Step5, Check driver install status

\$ls /dev/video\*

```
pi@raspberrypi:~ $ ls /dev/video*
/dev/video0 /dev/video11 /dev/video13 /dev/video
/dev/video10 /dev/video12 /dev/video14 /dev/video
pi@raspberrypi:~ $
```

# Chapter 3 PI OS Driver Install Guide

Only Need below setting to enable Raspberry Pi Os BuildIn Driver: Enable the official driver by edit /boot/config.txt by add below content dtoverlay=ov7251,media-controller=1

Remark: No need to follow Chapter2

# **Chapter 4 Working Mode**

### 4.1 Working Mode Description

Mode	Description	array	Frame rate
0	10bit stream mode	640x480	158fps
1	8bit stream mode	640x480	158fps
2	10bit external trigger mode	640x480	EXT_TRIG
3	8bit external trigger mode	640x480	EXT_TRIG



## 4.2 Working Mode Selection Method

\$cd cam-mipiov7251-trigger/inno\_mipi\_ov7251\_driver\_pi\_lattice\_linux5.15
\$sudo make setmodex # x can be 0 1 2 3

Get camera module work mode information:

\$ modinfo inno\_mipi\_ov7251

#### 4.3 Software Trigger Mode

Step1 : set camera work in external trigger mode.

For example set the module work in mode3

\$ sudo make setmode3

Open /dev/video0 device in VLC

Step2: Transfer software trigger command through i2c bus

\$ i2cset -f -y 10 0x10 204 1

Remark:

\*\*\* Set the sensor module back to external hardware trigger mode by:

\$ i2cset -f -y 10 0x10 204 0

### 4.4 Hardware Trigger Working Mode

\*\*\* Set the sensor module back to external hardware trigger mode by:

\$ i2cset -f -y 10 0x10 204 0

### Wire connection

You can connect the TRIG- to the GND Pin and connect the TRIG+ to 3.3V Pin of Raspberry Pi to simulate a trigger signal. This test function will comes with repeated trigger signal sometime.







Step1 : set camera work in external trigger mode. For example set the module work in mode3

\$ sudo make setmode3

Open /dev/video0 device in VLC Step2: Put external trigger signal through TRIG pin head.

## Give 3.3V GPIO Trigger Signal to J1

For example a 3.3v gpio rising edge signal will trigger the frame output.



\$cd cam-mipiov7251-trigger/2-Tools
\$sudo ./gpio-sysfs

# **Chapter 5 Video Capture And Preview**

# 5.1 VLC Capture Function

Open VLC And Choose /dev/video\*

			V	LC media	player			~	^ X					
Media	Playback	<u>A</u> udio	<u>V</u> ideo	Subti <u>t</u> le	Tool <u>s</u>	Vjew	<u>H</u> elp			€ <u>F</u> ile	S Disc	😤 <u>N</u> etwork	Capture <u>D</u> evice	
										Capture	mode		Video camera	•
										Device S	Selection			
										Video	device nan	ne	/dev/video0	•
										Audio	device nan	ne		•
				C	2					Options				
										Video	standard	Undef	ned	*
		_	_		_	_		-	;				dvan	ced options.
► F	H H H	C 3   141	= 5	×	_		4	0%		Show r	<u>n</u> ore optior	าร		
	-	-			-								Play	- <u>C</u> ancel

Adjust v4l2 controls

v4l2:///dev/video0 - VLC media pla	yer v x X			Adjustments and Effects	-	~ ^ X
Media Playback Audio Video Subtitle Tokks View I	lelp	Audio Effects	Video Effects	Synchronization	v4l2 controls	
Effects and Track Sync	Filters Ctrl+E					
Media Infor	mation Ctrl+I	Exposure 💳			0	

## 5.2 Framerate test

\$v4l2-ctl --stream-mmap --stream-count=-1 -d /dev/video0 --stream-to=/dev/null



pigraspberrypi:~ 5 V412-cttstream-mmapstream-count=-1 -d /dev/video0stream-to=/dev/hutt	
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
<<<<<<<< 158.29 fps	
***************************************	
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<	
***************************************	
<<<<<<< 158.29 fps	
***************************************	<<<<<
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***************************************	<<<<<
<<<<<<< 158.29 fps	
ALL CONTRACT	

#### 5.3 InnoMaker Soft INNOCAM

Run the INNOCAM Software

\$cd 2-Tools

\$tar -xzvf innocam\_v20220820.tar.gz

\$cd innocam\_v20220820

\$sudo ./innocam.sh

Device: /dev/video0 Width: 1280 Heigh: 800 Mode: -1  StartPreview 4 Stop FullScreen/Esc  Exposure Gain 5 Get Mode V412_PIX_FMT_GREY(V8) 2 Set Device //dev/video0 1
Exposure Gain 5 Set Mode 3 Get Mode V4L2_PIX_FMT_GREY(Y8) 2 Set Device //dev/video0 1

Support: support@inno-maker.com Bulk Price: sales@inno-maker.com



- 1, Check if video0 exist;
- 2, Choose Y8 Mode
- 3, Set working mode as 1
- 4,Press StartPreview button

5, Adjust Exposure and Gain value according to working scene.