



Pivariety Motorized Focus Camera Module for Raspberry Pi



16MP IMX298

(SKU: B0323)

QUICK START GUIDE

SPECS

Image Sensor	16MP IMX298
Max. Resolution	4656 H x 3496 V
Pixel Size	1.12um x 1.12um
Optical Format	1/2.8"
Lens Spec	Focal length: 4.04mm, F.NO: 2.0±5%, FOV: horizontal 62deg
IR Sensitivity	Integral IR filter, visible light only
Focus Type	Motorized focus, programmable focus control
Frame Rate	4640x3472@10fps, 2320x1732@20fps, 3264x2464@15fps, 3840x2160@15fps, 2592x1944@20fps, 1920x1080@30fps, 1280x800@45fps, 1280x720@50fps
Sensor Output Format	RAW10
ISP Output Format	Output image format of JPG, YUV420, RAW, DNG; output video format of MJPEG, H.264
Interface Type	2-Lane MIPI
Board Size	40x40mm

INTRODUCTION

• About Arducam

Arducam has been a professional designer and manufacturer of SPI, MIPI, DVP and USB cameras since 2012. We also offer customized turnkey design and manufacturing solution services for customers who want their products to be unique.

• About Pivariety Camera

Arducam Pivariety is a Raspberry Pi camera solution to take the advantage of using its hardware ISP functions. Using Arducam Pivariety camera modules, users can get better performance and a wider variety of camera, lens options. For a long time, Raspberry Pi users are limited to use the closed-source official supported camera driver and camera modules (V1/V2/HQ).

Now Arducam made it possible to provide well-tuned ISP for Pivariety camera modules with Auto Exposure, Auto White Balance, Auto Gain Control, Lens Shading Correction, etc. This series of cameras use the libcamera framework, they can't be supported by Raspistill, and the way to access the camera is libcamera SDK(for C++)/libcamera-still/libcamera-vid/Gstreamer.

If you want to know more about other models of Pivariety Camera, please visit: <https://www.arducam.com/docs/cameras-for-raspberry-pi/pivariety/>

SOFTWARE

1. Driver Installation

```
wget -O install_pivariety_pkgs.sh https://github.com/ArduCAM/Arducam-Pivariety-V4L2-Driver/releases/download/install_script/install_pivariety_pkgs.sh
```

```
chmod +x install_pivariety_pkgs.sh
```

```
./install_pivariety_pkgs.sh -p kernel_driver
```

press **y** to reboot

NOTE: The kernel driver installation only supported by the latest version 5.10. For other kernel versions, please go to our Doc page: <https://www.arducam.com/docs/cameras-for-raspberry-pi/pivariety/how-to-install-kernel-driver-for-pivariety-camera/#2-how-to-build-raspberry-pi-kernel-driver-for-arducam-pivariety-camera>

You can also visit this doc page to refer to the hardware connection: <https://www.arducam.com/docs/cameras-for-raspberry-pi/pivariety/16mp-imx298-pivariety-motorized-focus-camera-module/>

2. Test the Driver and Camera

After you've finished the hardware assembly and driver installation, you can test whether the camera is detected and working.

• View the Status of Driver and Camera

```
dmesg | grep arducam
```

It will display **arducam-pivariety** if driver installed successfully and **firmware version** if the camera can be detected. The display should be **probe failed** if the camera can't be detected, you might have to check the ribbon connection, then reboot the Raspberry Pi.

• View the Video Node

The Pivariety camera modules are emulated as the standard video device under **/dev/video*** node, so you can use the **ls** command for listing the contents in the **/dev** folder.

```
ls /dev/video* -l
```

Since the camera module is V4L2 compliant, you can use the V4L2 controls to list the supported color space, resolutions, and frame rates.

```
v4l2-ctl --list-formats-ext
```

NOTE: Although V4L2 interface is supported, only RAW format images can be obtained, without ISP support.

3. Official Libcamera App Installation

```
./install_pivariety_pkgs.sh -p libcamera_dev
```

```
./install_pivariety_pkgs.sh -p libcamera_apps
```

4. Capture Image and Record Video

• Capture image

For example, preview for **5s** and save the image named **test.jpg**

```
libcamera-still -t 5000 -o test.jpg
```

• Record video

For example, record a **H.264 10s** video with the frame size **1920W x 1080H**

```
libcamera-vid -t 10000 --width 1920 --height 1080 -o test.h264
```

NOTE: H.264 format only supports 1920x1080 and below resolution.

• Plugin gstreamer installation

Install gstreamer

```
sudo apt update
```

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

Preview

```
gst-launch-1.0 libcamerasrc ! 'video/x-raw,width=1920,height=1080' ! videoconvert ! autovideosink
```

5. Control the Focusing Manually

• Control via v4l2-ctl

```
v4l2-ctl -c focus_absolute=300
```

• Control via script

```
git clone https://github.com/ArduCAM/Arducam-Pivariety-V4L2-Driver.git
```

```
cd Arducam-Pivariety-V4L2-Driver/focus
```

```
python3 FocuserExample.py
```

Now you can use the up and down on the keyboard to control the focus position

6. Automatically Control the Focusing

• Focus once

```
libcamera-still -t 0 --autofocus
```

```
libcamera-vid -t 0 --autofocus
```

• Enable autofocus using F

```
libcamera-still -t 0 --keypress
```

press **f** to trigger autofocus

NOTE: Note: Please install the Arducam latest version of libcamera-dev and libcamera-apps, and update the firmware of Pivariety(contacting Arducam: support@arducam.com) if the camera can not autofocus.

TROUBLESHOOT

1. Cannot Allocate Memory

```
[3:45:35.833744413] [6019] INFO RPI raspberrypi.cpp:611 Sensor: /base/soc/i2c0mux/i2c@1/arducam@0c - Selected mode: 5344x4012-pRAA
```

```
[3:45:35.948442507] [6019] ERROR V4L2 v4l2_videodevice.cpp:1126 /dev/video14[17:cap]: Unable to request 4 buffers: Cannot allocate memory
```

```
[3:45:35.948551358] [6019] ERROR RPI raspberrypi.cpp:808 Failed to allocate buffers
```

```
ERROR: *** failed to start camera ***
```

Edit **/boot/cmdline.txt** and add **cma=400M** at the end

More details: <https://lists.libcamera.org/pipermail/libcamera-devel/2020-December/015838.html>

2. The Image Displays Color Dots

Add code **--denoise cdn_off** at the end of command

```
./libcamera-still -t 5000 -o test.jpg --denoise cdn_off
```

More details: <https://github.com/raspberrypi/libcamera-apps/issues/19>

3. Failed to Install the Driver

Please check the kernel version, we only provide the driver for the latest official kernel version image when this Pivariety camera released. You can follow Arducam Doc page <https://www.arducam.com/docs/cameras-for-raspberry-pi/pivariety/> to get the drivers for other kernel versions.

If you have any other problems, please feel free to contact us via support@arducam.com.