# Coral
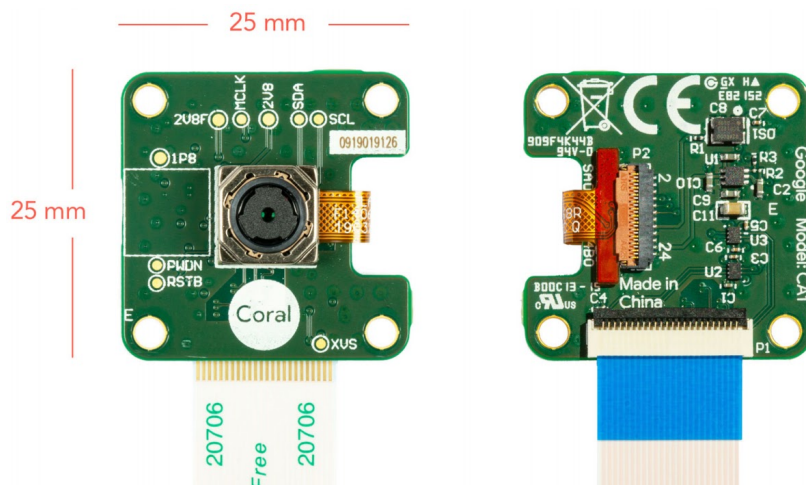
# Camera datasheet

Version 1.1

## Features



- 5-megapixel OmniVision sensor
  - 1.4 x 1.4 µm pixel size
  - 2582 x 1933 active array size
- Optical size: ¼"
- Field of view: 84.0° / 87.6°
- F-number: F=2.2 ±5%
- TV distortion: <1.5%
- Focal length: 2.5 mm
- Focusing range: 10 cm ~ ∞
- Dual lane MIPI output interface
- Board dimensions: 25 x 25 mm

## Description

The camera attaches to the Coral Dev Board or Dev Board Mini with a 24-pin flexible flat cable (FFC).

Other features include:

- ISP function: Automatic exposure control (AEC), automatic white balance (AWB), automatic band filter (ABF), automatic 50/60 Hz lumination, automatic blacklevel calibration (ABLC).
- Image quality control: color saturation, hue, gamma, sharpness, lens correction, defective pixel canceling, and noise canceling.
- Autofocus control (AFC) with embedded AF VCM Driver.

For details about the sensor, read about the Omnivision SOC.

## Ordering information

| Part number | Description |
|---|---|
| G840-00180-01 | Coral Camera |

# Table of contents

# 1 Dimensions

**Table 1.** Camera module dimensions

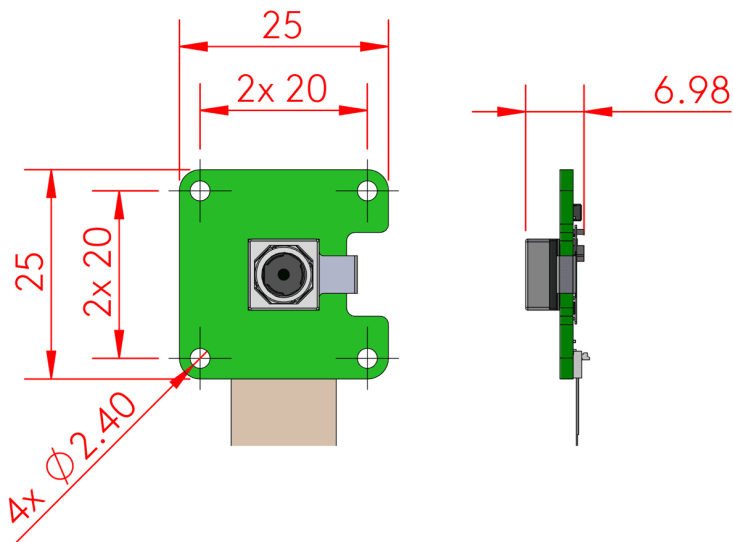| Measurement | Value |
|---|---|
| Module size | 25 x 25 x 6.98 mm |
| Hole size/spacing | Diameter: 2.4 mm<br>Horizontal spacing: 20 mm<br>Vertical spacing: 20 mm |
| Cable size | 150 x 12.5 mm |
| Module weight | 3 g (3.6 g with cable) |



**Figure 1.** Camera module dimensions (in millimeters)

## 2  Autofocus interface

The camera supports one-shot autofocus and continuous autofocus modes.

The sysfs node for autofocus is at `/sys/module/ov5645_camera_mipi_v2/parameters/ov5645_af`. It reads back the decimal representation of the status register in the autofocus hardware, as shown in table 2. To change the autofocus mode, write one of the values shown in table 3.

**Table 2.** Autofocus read values from sysfs node

| Read value | Description |
| --- | --- |
| 0 (0x00) | Autofocus is running. |
| 16 (0x10) | Autofocus is complete (focused). |
| 32 (0x20) | Analyzing the image. This state occurs intermittently when attempting to reach focus. It occurs once during one-shot autofocus mode before focus locks, and it is the steady state during continuous autofocus mode. |
| 112 (0x70) | Idle. Focus is released and the lens is at its resting (furthest) position. |

**Table 3.** Autofocus write values for sysfs node

| Write value | Description |
| --- | --- |
| 0 | Turn off autofocus. |
| 1 | Enable one-shot autofocus mode. The camera will seek focus and then lock focus. (It will analyze the image once, and focus once.) |
| 2 | Enable continuous autofocus mode. The camera will continuously seek focus. (It will analyze the image and focus, then continue to analyze the image and refocus when necessary.) |

For example, the following command enables continuous autofocous:

```
echo 2 > /sys/module/ov5645_camera_mipi_v2/parameters/ov5645_af
```

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## 3 Camera adapter

The camera module is a simple adapter board between the camera sensor and the host board, as illustrated in figure 2.
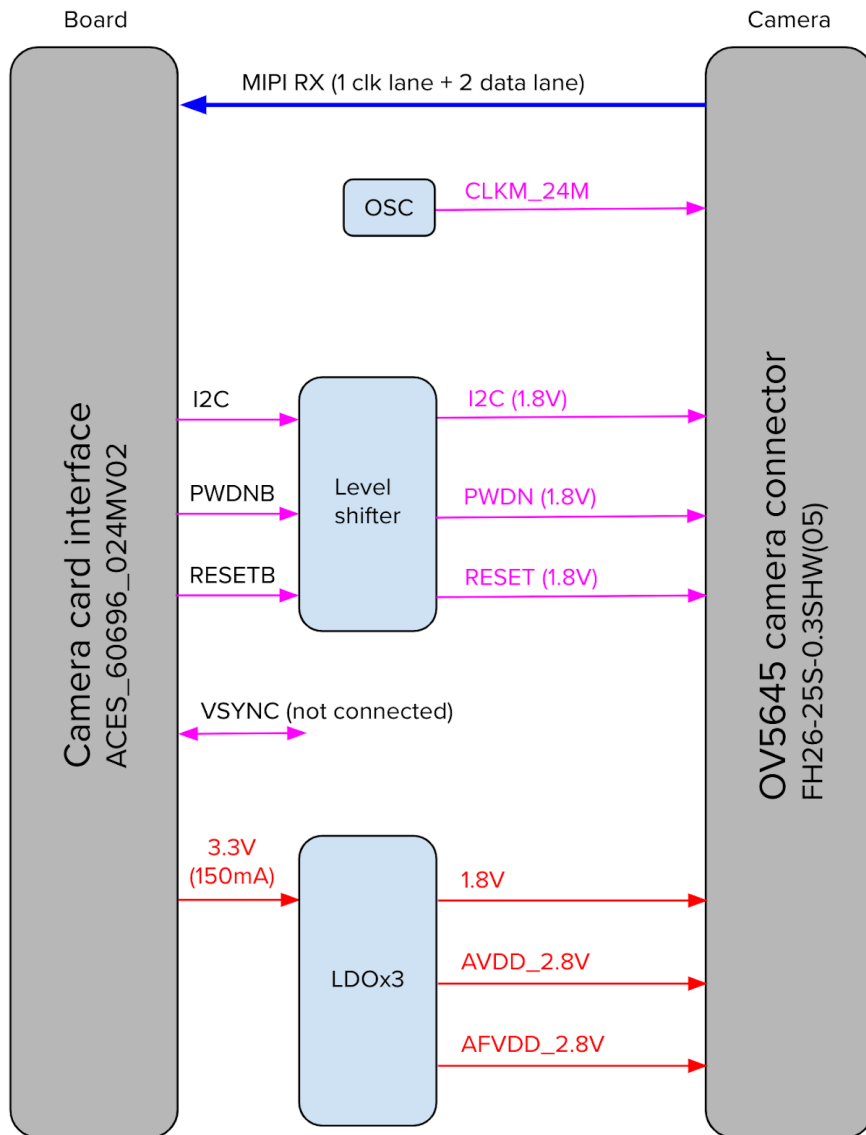


**Figure 2.** Camera adapter card diagram

The pinout for the small connector between the camera sensor and the camera module is shown in table 4.

The MIPI-CSI2 camera connector that connects the camera module to the host board is a 24-pin flex cable connector that's designed specifically for the Coral Camera, and its pinout is shown in table 5.

**Table 4.** Pinout for the cable between the OmniVision camera sensor and the Coral Camera module

| Pin | Name | Description | | Pin | Name | Description |
|---|---|---|---|---|---|---|
| 1 | GND | | | 14 | GND | |
| 2 | NC | | | 15 | MIPI_CSI1_D0_N | Differential data0 N |
| 3 | AFVDD 2.8V | 2.8 V analog circuit power | | 16 | MCLK | |
| 4 | DVDD 1.2V (NC) | 1.2 V digital circuit power | | 17 | MIPI_CSI1_D0_P | Differential data0 P |
| 5 | CAM_I2C_SDA 1.8V | I2C data | | 18 | GND | |
| 6 | NC | | | 19 | MIPI_CSI1_D1_N | Differential data1 N |
| 7 | CAM_I2C_SCL 1.8V | I2C clock | | 20 | NC | |
| 8 | VDDIO 1.8V | 1.8 V power | | 21 | MIPI_CSI1_D1_P | Differential data1 P |
| 9 | GND | | | 22 | AVDD 2.8V | 2.8 V analog circuit power |
| 10 | CAM_PWDN 1.8V | Power down (active low) | | 23 | NC | |
| 11 | MIPI_CSI1_CLK_N | Differential clock N | | 24 | GND | |
| 12 | CAM_RESETB 1.8V | Reset (active low) | | 25 | NC | |
| 13 | MIPI_CSI1_CLK_P | Differential clock P | | | | |

**Table 5.** Pinout for the cable between the Coral Camera module and the Dev Board or Dev Board Mini

| Pin | Name | Description | | Pin | Name | Description |
|---|---|---|---|---|---|---|
| 1 | GND | | | 13 | GND | |
| 2 | MIPI_CSI_D0_N | Differential data N | | 14 | MIPI_CSI_D3_N | Differential data N |
| 3 | MIPI_CSI_D0_P | Differential data P | | 15 | MIPI_CSI_D3_P | Differential data P |
| 4 | GND | | | 16 | GND | |
| 5 | MIPI_CLK_N | Differential clock N | | 17 | CAM_PWDNB | Camera power down (active low) |
| 6 | MIPI_CLK_P | Differential clock P | | 18 | CAM_CLK (NC) | Not connected |
| 7 | GND | | | 19 | GND | |
| 8 | MIPI_CSI_D1_N | Differential data N | | 20 | CAM_I2C_SCL | I2C clock, has pull-up |
| 9 | MIPI_CSI_D1_P | Differential data P | | 21 | CAM_I2C_SDA | I2C data, has pull-up |
| 10 | GND | | | 22 | CAM_VSYNC (NC) | Not connected |
| 11 | MIPI_CSI_D2_N | Differential data N | | 23 | CAM_RESETB | Camera reset (active low) |
| 12 | MIPI_CSI_D2_P | Differential data P | | 24 | 3.3V | |

**Table 6.** I2C address

| | |
|---|---|
| Write | 0X78 |
| Read | 0X79 |

## 4  Snapshot tool

The Mendel system image for the Coral boards includes a Python program called `snapshot` that captures images from the Coral Camera.

To start it using an interactive mode, run `snapshot` from the board's shell terminal. Then use the following keys to control the camera:

- Spacebar to snap a photo
- R to refocus
- Q to quit (or Control+C)

When using this interactive mode, each time you press Spacebar, it saves the image to the current directory as a JPEG. The filename includes an incrementing number, starting with `img0000.jpg`. Overwriting filenames is avoided by always starting with the first available enumeration of the filename.

The command also accepts the arguments shown in table 7.

**Table 7.** Snapshot tool commands

| Argument | Description |
|---|---|
| `--oneshot` | Enable one-shot mode: Capture just one picture and quit, instead of using the interactive mode that accepts keyboard commands. |
| `--prefix,-p` *name* | The filename prefix. This name is also appended with a four-digit number to avoid overwriting any file with the same prefix—the number is always the first enumeration that's not used. For example, *name*`0000.jpg` and then *name*`0001.jpg`. The default prefix name is `img`. |
| `--format,-f` *type* | The file format. The *type* may be either: `jpg`, `bmp`, or `png`. The default is `jpg`. |

The `snapshot` code is located at `/usr/bin/snapshot`.

**Table 8.** 3D CAD files

| File | Description |
|---|---|
| [Coral-Camera.STEP](Coral-Camera.STEP) | 3D CAD file for the Coral Camera in STEP format |

# 5  Document revisions

**Table 9.** History of changes to this document

| Version | Changes |
|---------|---------|
| 1.1 (October 2020) | Added CSI pin descriptions and clarified the different pinout tables.<br>Copy edits for compatibility with new Dev Board Mini.<br>Removed list of certifications (instead see product availability).<br>Added product ordering information (part number).<br>Updated document styles and miscellaneous copy edits. |
| 1.0 (August 2019) | Corrections for camera cable pinout.<br>Miscellaneous style cleanup. |
| Beta (March 2019) | Initial release. |