

ARDUINO Camera 2MP OV2640

The **OV2640** is a popular 2MP (2-megapixel) camera module that can be interfaced with an Arduino or other microcontrollers. It is commonly used for capturing images and video in embedded projects. Below is a guide on how to set up and use the OV2640 camera module with an Arduino.

Components Needed

1. **Arduino Board** (e.g., Arduino Uno, Arduino Mega, or ESP32)
 2. **OV2640 Camera Module**
 3. **Breadboard and Jumper Wires**
 4. **Power Supply** (if needed, depending on the camera module)
 5. **SD Card** (optional, for saving images)
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Wiring the OV2640 to Arduino

The OV2640 typically communicates over the **I2C** or **SPI** interface. However, many OV2640 modules are designed to work with ESP32 or ESP8266 boards due to their higher processing power and built-in support for camera interfaces.

Pin Connections

OV2640 Pin Arduino/ESP32 Pin

3.3V 3.3V



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OV2640 Pin Arduino/ESP32 Pin

GND	GND
SCL	SCL (I2C Clock)
SDA	SDA (I2C Data)
D0-D7	GPIO Pins (for parallel data)
VSYNC	GPIO Pin (vertical sync)
HREF	GPIO Pin (horizontal sync)
PCLK	GPIO Pin (pixel clock)
XCLK	GPIO Pin (external clock)
RESET	GPIO Pin (reset)
PWDN	GPIO Pin (power down)

Note: The exact pin configuration depends on the specific Arduino or ESP board you are using. For ESP32, the camera library provides predefined pin mappings.

Installing Required Libraries

To use the OV2640 with Arduino, you need to install the **ESP32 Camera Library** (if using ESP32) or other compatible libraries.

1. Open the Arduino IDE.
 2. Go to **Tools > Manage Libraries**.
 3. Search for **ESP32 Camera** and install the library.
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Example Code for ESP32

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Here's an example code to capture an image using the OV2640 camera module with an ESP32:

cpp

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```
#include "esp_camera.h"

// Define camera pin configuration
#define PWDN_GPIO_NUM  -1
#define RESET_GPIO_NUM -1
#define XCLK_GPIO_NUM  0
#define SIOD_GPIO_NUM  26
#define SIOC_GPIO_NUM  27

#define Y9_GPIO_NUM  35
#define Y8_GPIO_NUM  34
#define Y7_GPIO_NUM  39
#define Y6_GPIO_NUM  36
#define Y5_GPIO_NUM  21
#define Y4_GPIO_NUM  19
#define Y3_GPIO_NUM  18
#define Y2_GPIO_NUM   5
#define VSYNC_GPIO_NUM 25
#define HREF_GPIO_NUM  23
#define PCLK_GPIO_NUM  22

void setup() {
  Serial.begin(115200);

  // Initialize the camera
  camera_config_t config;
  config.ledc_channel = LEDC_CHANNEL_0;
  config.ledc_timer = LEDC_TIMER_0;
  config.pin_d0 = Y2_GPIO_NUM;
  config.pin_d1 = Y3_GPIO_NUM;
  config.pin_d2 = Y4_GPIO_NUM;
  config.pin_d3 = Y5_GPIO_NUM;
  config.pin_d4 = Y6_GPIO_NUM;
  config.pin_d5 = Y7_GPIO_NUM;
  config.pin_d6 = Y8_GPIO_NUM;
  config.pin_d7 = Y9_GPIO_NUM;
  config.pin_xclk = XCLK_GPIO_NUM;
  config.pin_pclk = PCLK_GPIO_NUM;
  config.pin_vsync = VSYNC_GPIO_NUM;
  config.pin_href = HREF_GPIO_NUM;
  config.pin_sscb_sda = SIOD_GPIO_NUM;
```

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```
config.pin_sscb_scl = SIOC_GPIO_NUM;
config.pin_pwdn = PWDN_GPIO_NUM;
config.pin_reset = RESET_GPIO_NUM;
config.xclk_freq_hz = 20000000;
config.pixel_format = PIXFORMAT_JPEG;

if(psramFound()){
  config.frame_size = FRAMESIZE_UXGA; // Full resolution
  config.jpeg_quality = 10; // Lower number means higher quality
  config.fb_count = 2;
} else {
  config.frame_size = FRAMESIZE_SVGA;
  config.jpeg_quality = 12;
  config.fb_count = 1;
}

// Camera init
esp_err_t err = esp_camera_init(&config);
if (err != ESP_OK) {
  Serial.printf("Camera init failed with error 0x%x", err);
  return;
}

Serial.println("Camera initialized!");
}

void loop() {
  // Capture a photo
  camera_fb_t * fb = esp_camera_fb_get();
  if (!fb) {
    Serial.println("Camera capture failed");
    return;
  }

  // Save the photo to an SD card or transmit it over Wi-Fi
  // Example: Save to SD card
  // File file = SD.open("/photo.jpg", FILE_WRITE);
  // if (file) {
  //   file.write(fb->buf, fb->len);
  //   file.close();
  //   Serial.println("Photo saved to SD card");
  // } else {
  //   Serial.println("Failed to open file on SD card");
  // }

  // Return the frame buffer to the driver for reuse
  esp_camera_fb_return(fb);

  delay(5000); // Wait 5 seconds before capturing the next photo
}
```

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Key Points

1. **ESP32 is Recommended:** The OV2640 works best with ESP32 due to its built-in camera support and sufficient processing power.
 2. **Power Supply:** Ensure the camera module is powered with 3.3V. Avoid using the Arduino's 5V pin.
 3. **SD Card:** If you want to save images, connect an SD card module to the Arduino/ESP32.
 4. **Image Quality:** Adjust the `frame_size` and `jpeg_quality` settings in the code to optimize image quality and resolution.
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Troubleshooting

- **No Image Captured:** Check the wiring and ensure the camera module is powered correctly.
- **Blurry Images:** Adjust the focus of the camera lens manually.
- **ESP32 Not Detecting Camera:** Verify the pin connections and ensure the camera module is compatible with the ESP32.