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› AITRIP ESP32-CAM Camera WiFi + Bluetooth Module User Manual

AITRIP ESP32-CAM

AITRIP ESP32-CAM Camera WiFi + Bluetooth Module User Manual

Model: ESP32-CAM

1. INTRODUCTION

The AITRIP ESP32-CAM is a compact development board integrating WiFi, Bluetooth, and a camera module. It is designed for various Internet of Things (IoT) applications, including smart home devices, industrial wireless control, wireless surveillance, and QR identification systems. This module features a dual-core 32-bit CPU, 4M PSRAM, and supports the OV2640 2MP camera for image capture and WiFi upload capabilities.

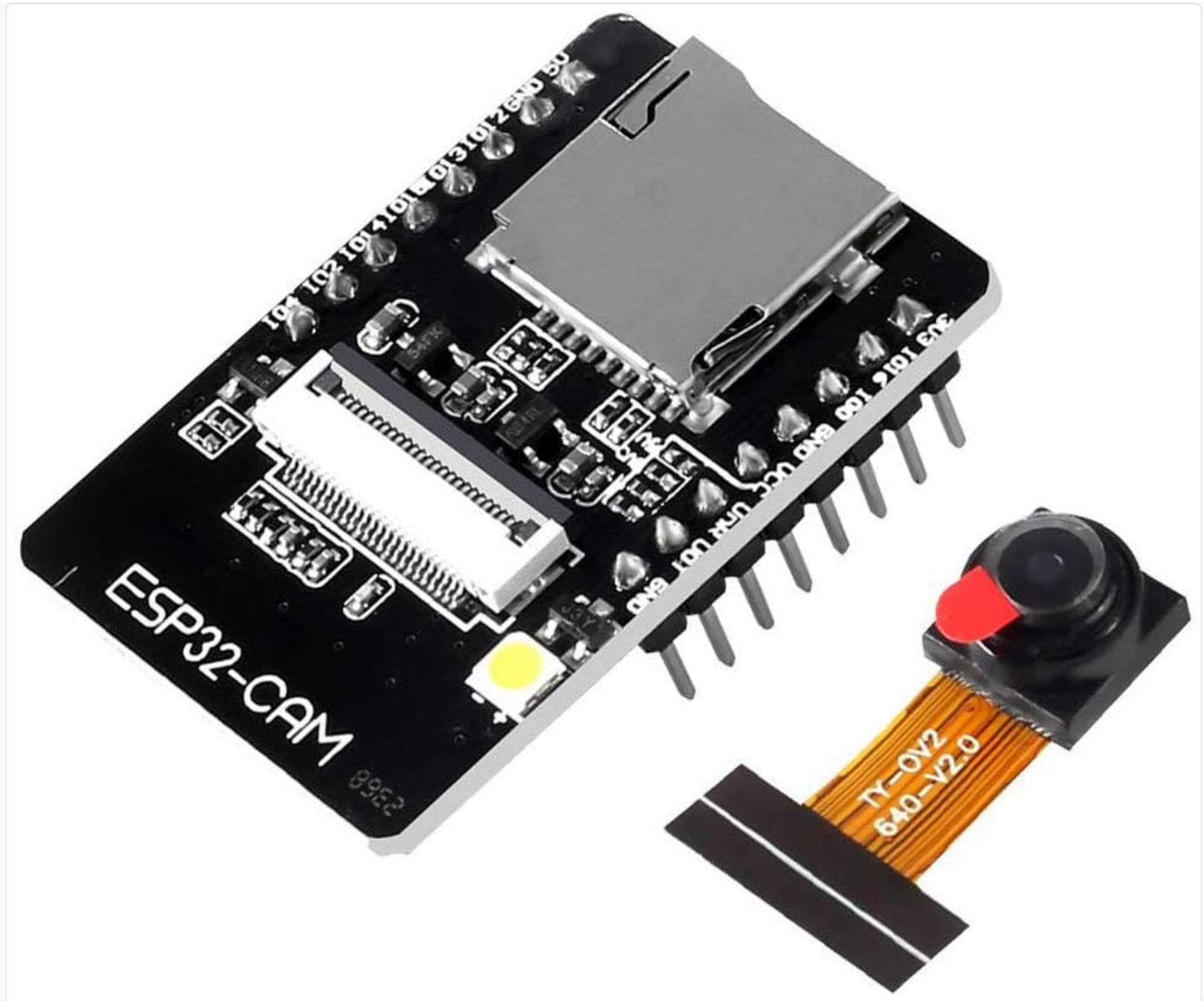


Figure 1: AITRIP ESP32-CAM module with the OV2640 camera connected. This image shows the compact size of the development board and the attached camera, highlighting the main components.

2. PRODUCT OVERVIEW

The ESP32-CAM module is built around the ESP32-S chip, offering robust wireless communication and processing power. Key components include the ESP32-S module, PSRAM, a voltage regulator, a reset button, a TF card holder, a camera FPC socket, and a flash LED.

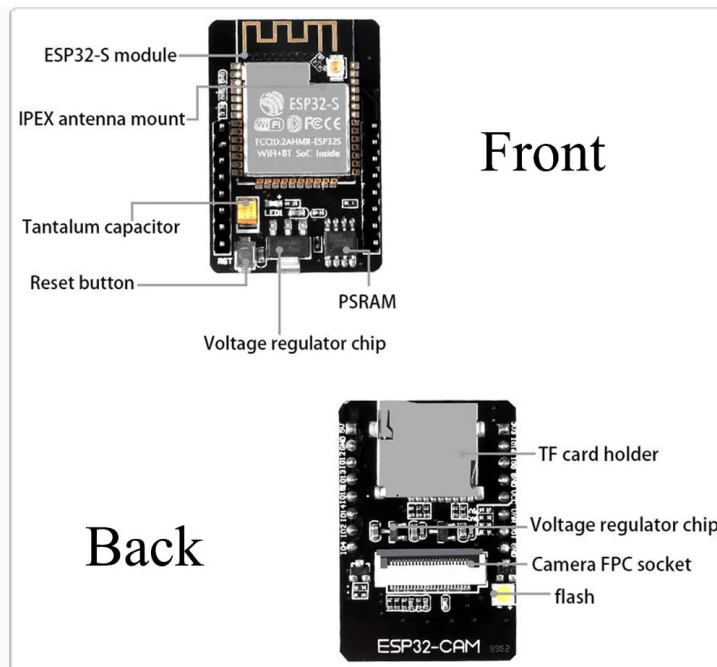


Figure 2: Front view of the ESP32-CAM module, detailing the ESP32-S module, IPEX antenna mount, tantalum capacitor, reset button, PSRAM, and voltage regulator chip.



Figure 3: Back view of the ESP32-CAM module, showing the TF card holder, voltage regulator chip, camera FPC socket, and flash LED.

The OV2640 camera module is a 1/4 inch CMOS UXGA image sensor, capable of capturing 2-megapixel images. It connects to the ESP32-CAM via a flexible flat cable (FPC).

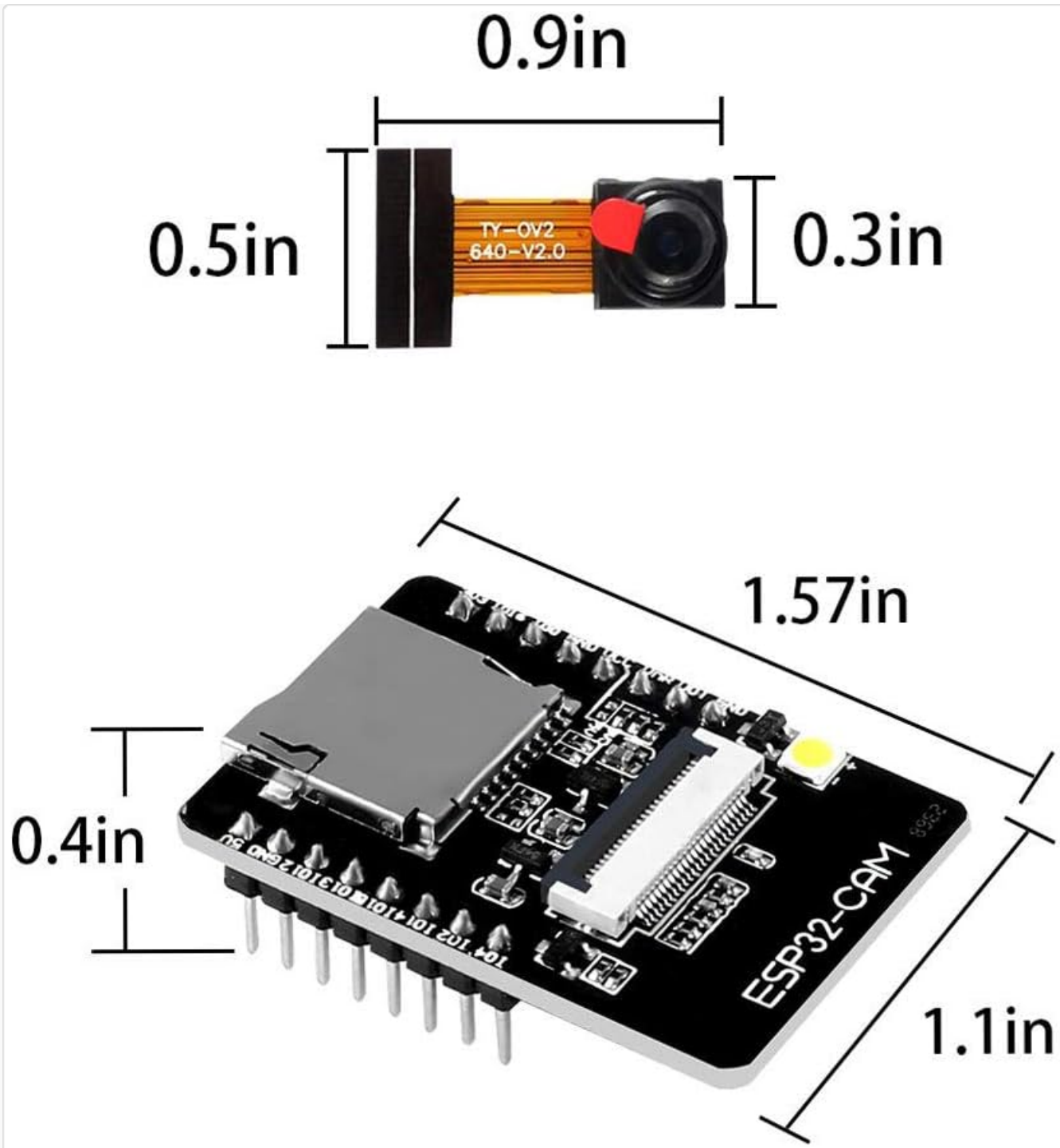


Figure 4: The OV2640 camera module, a 2-megapixel sensor, shown from front and back views, highlighting its compact design and FPC connector.

Dimensions:

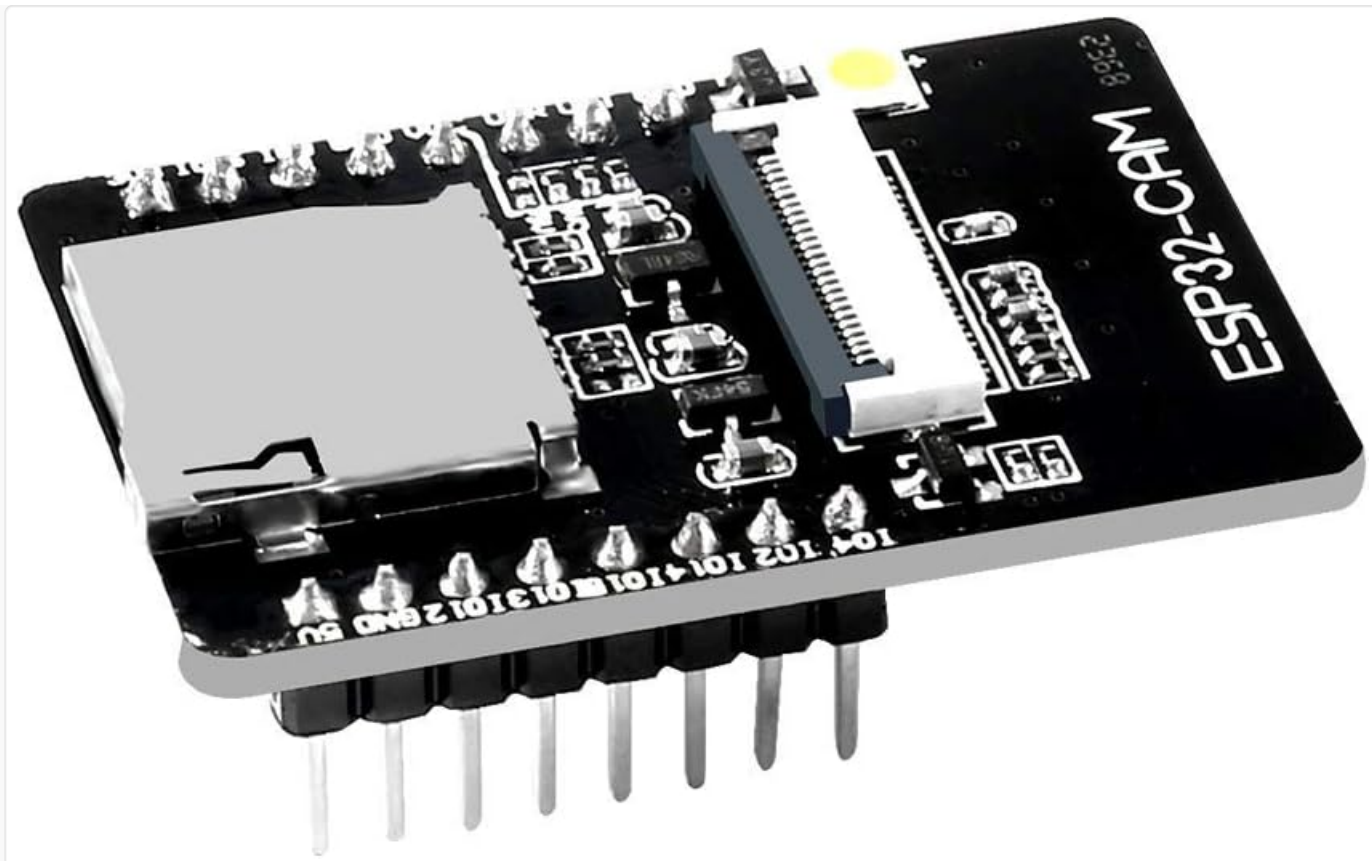


Figure 5: Dimensional drawing of the ESP32-CAM module and the OV2640 camera, indicating key measurements for integration into projects.

3. SETUP AND PROGRAMMING

The ESP32-CAM is a development board requiring external programming. It does not include a built-in USB port for direct connection to a computer. An external FTDI serial converter board is necessary for programming.

3.1 Required Components

- AITRIP ESP32-CAM Module with OV2640 Camera
- FTDI Serial Converter (3.3V/5V compatible)
- Jumper wires
- Computer with Arduino IDE installed
- Micro-USB cable for FTDI converter

3.2 Initial Connection for Programming

1. **Connect the OV2640 Camera:** Carefully insert the flexible flat cable (FPC) of the OV2640 camera into the camera FPC socket on the ESP32-CAM module. Ensure it is securely seated.
2. **Connect FTDI Converter:**
 - Connect the FTDI converter to the ESP32-CAM module using jumper wires. Typical connections are:
 - ESP32-CAM **U0R** to FTDI **TX**
 - ESP32-CAM **U0T** to FTDI **RX**
 - ESP32-CAM **GND** to FTDI **GND**
 - ESP32-CAM **5V** to FTDI **VCC (5V)**
 - **Important:** For programming mode, connect the **GPIO0** pin of the ESP32-CAM to **GND**. This puts the ESP32

into flash mode.

3. **Power Supply:** Connect the FTDI converter to your computer via a Micro-USB cable. Ensure the FTDI converter is set to 5V output. The ESP32-CAM can be sensitive to power supply, and 5V is generally recommended for stable operation, especially during programming and when streaming video.

3.3 Arduino IDE Setup

1. **Install ESP32 Board Support:** In Arduino IDE, go to *File > Preferences*. In "Additional Board Manager URLs", add: https://raw.githubusercontent.com/espressif/arduino-esp32/gh-pages/package_esp32_index.json.
2. Go to *Tools > Board > Board Manager*, search for "ESP32" and install the "esp32 by Espressif Systems" package.
3. **Select Board:** Go to *Tools > Board > ESP32 Arduino* and select "AI Thinker ESP32-CAM".
4. **Select Port:** Go to *Tools > Port* and select the serial port corresponding to your FTDI converter.
5. **Upload Sketch:** Open an example sketch (e.g., *File > Examples > ESP32 > Camera > CameraWebServe*). Modify the sketch to include your WiFi SSID and password.
6. **Initiate Upload:** Click the "Upload" button in Arduino IDE. When "Connecting..." appears in the console, press the **RESET** button on the ESP32-CAM module. Hold it for a few seconds until the upload begins.
7. **After Upload:** Once the upload is complete, disconnect **GPIO0** from **GND**. Press the **RESET** button again to run the newly uploaded firmware.

4. OPERATING INSTRUCTIONS

After successful programming, the ESP32-CAM module will connect to your specified WiFi network and typically host a web server for camera streaming and control.

4.1 Accessing the Web Server

1. **Monitor Serial Output:** Open the Serial Monitor in Arduino IDE (*Tools > Serial Monitor*) with a baud rate of 115200. After resetting the ESP32-CAM, it will print its assigned IP address.
2. **Open Web Browser:** Enter the displayed IP address into a web browser on a device connected to the same WiFi network.
3. **Control Interface:** The web interface will allow you to start/stop video streaming, capture still images, and adjust camera parameters such as resolution, brightness, contrast, and special effects.

4.2 Key Features

- **Image WiFi Upload:** Supports uploading captured images over WiFi.
- **Multiple Sleep Modes:** Allows for power optimization in battery-powered applications.
- **STA/AP/STA+AP Modes:** Flexible WiFi operating modes.
- **TF Card Support:** Max 4GB for local storage of images or data.
- **Secondary Development:** Fully supports custom firmware development using various IDEs and frameworks.

5. MAINTENANCE

The ESP32-CAM module is a robust electronic component, but proper handling and care are essential for its longevity.

- **Handle with Care:** Avoid dropping or subjecting the module to physical shock.
- **Static Electricity:** Always handle the module in an anti-static environment to prevent damage from electrostatic discharge.
- **Power Supply:** Ensure a stable 5V 2A power supply. Inadequate power can lead to brownout errors or unstable operation.

- **Environmental Conditions:** Operate and store the module in a dry environment, away from extreme temperatures and humidity.
- **Camera FPC:** The camera ribbon cable is delicate. Avoid excessive bending or pulling. Ensure it is securely connected to prevent image issues.
- **Cleaning:** If necessary, gently clean the module with a soft, dry brush or compressed air. Do not use liquids.

6. TROUBLESHOOTING

This section addresses common issues encountered during the setup and operation of the ESP32-CAM module.

6.1 Common Issues and Solutions

- **"Brownout Detector" Error / Unstable Operation:**

This is often caused by insufficient power. Ensure your power supply provides a stable 5V and at least 2A. If using an FTDI converter, ensure it's set to 5V and can supply enough current. Some users report success by switching the FTDI to 5V and connecting to the ESP32's 5V pin, rather than 3.3V.
- **Failed to Connect to WiFi:**

Verify your WiFi SSID and password in the code. Ensure you are connecting to a 2.4GHz WiFi network, as the ESP32-CAM does not support 5GHz networks. Check WiFi signal strength.
- **Camera Not Detected / Black Screen:**

Ensure the OV2640 camera's FPC cable is correctly and securely inserted into the socket. A loose connection or incorrect orientation can prevent detection. Also, ensure adequate power supply, as camera initialization requires power.
- **Upload Fails / "Connecting..." Loop:**

Confirm that **GPIO0** is connected to **GND** during the upload process. Press and hold the **RESET** button on the ESP32-CAM when the Arduino IDE console shows "Connecting..." and release it once the upload starts. Verify correct FTDI connections (TX/RX swapped, GND, 5V). Ensure the correct board ("AI Thinker ESP32-CAM") and COM port are selected in Arduino IDE.
- **Poor Image Quality / Out of Focus:**

The OV2640 camera module typically has a fixed focus. If images are consistently blurry, check for physical damage to the lens or ensure the camera is properly seated. Some modules might have manufacturing variations affecting focus.
- **Module Runs Hot:**

When streaming video or performing intensive tasks, the ESP32 chip can generate heat. This is normal to some extent. Ensure adequate ventilation and a stable power supply. Excessive heat might indicate a short circuit or an overloaded component.

7. SPECIFICATIONS

Feature	Detail
Brand	AITRIP
Model Name	ESP32-CAM
Processor	Dual-core 32-bit LX3 CPU (80MHz to 240MHz)
RAM	Internal 520KB SRAM + External 4M PSRAM
SPI Flash	Default 32Mbit

Feature	Detail
WiFi Standard	802.11 b/g/n/e/i (2.4GHz)
Bluetooth Standard	Bluetooth 4.3 BR/EDR and BLE
Camera Support	OV2640 (2MP), OV7670
Image Output Format	JPEG (OV2640 only), BMP, GRAYSCALE
TF Card Support	Max 4GB
IO Ports	9
Interfaces	UART, SPI, I2C, PWM, ADC, DAC
Power Supply	5V 2A (Recommended)
Operating System	Embedded Lwip and FreeRTOS
Antenna Form	Onboard PCB antenna, gain 2dBi
Dimensions (Module)	Approx. 1.57 x 1.1 x 0.4 inches (40 x 27 x 10 mm)
Weight	Approx. 0.634 ounces (18g)

8. SUPPORT

For further assistance, technical documentation, or community support, please refer to the official Espressif documentation for ESP32 and the extensive online resources available for ESP32-CAM development. Many online forums and communities provide valuable insights and troubleshooting tips for specific projects. As this is a development board, support primarily comes from the open-source community and documentation provided by the chip manufacturer.

ASK A QUESTION ABOUT THIS MANUAL

Ask about setup, troubleshooting, compatibility, parts, safety, or missing instructions. Manuals+ will review the question and use this page’s manual context to help answer it.

Name

Anonymous

Email

you@example.com

After a successful submission, we securely hash the supplied account or form email before sending it to Microsoft Advertising for conversion attribution. [Privacy details](#).

Question

Example: How do I reset this device or fix this error?

Details

Model number, symptoms, what you tried, or the section of the manual you are using.

Submit question