Introduction

The DFRobot FireBeetle 2 ESP32-S3 development board combines a dual-core ESP32-S3 processor, dedicated AI accelerator, and pre-integrated OV2640 camera (2MP, 1600x1200 resolution) for computer vision applications. Features include 16MB Flash, 8MB PSRAM, WiFi/Bluetooth 5 connectivity, battery management, and GDI display interface. Compatible with [Arduino](#) IDE, MicroPython, and ESP-IDF for rapid deployment of image recognition, smart home systems, and industrial IoT solutions.

Unmatched AI Vision Capability: Onboard OV2640 Camera (2MP) & ESP32-S3 AI Accelerator

Jumpstart computer vision and image recognition projects (like face detection, object tracking) right out of the box! The included OV2640 camera delivers 1600x1200 resolution with a 68° field of view. The ESP32-S3's built-in AI acceleration hardware dramatically speeds up neural network inference for real-time image processing on the edge, perfect for smart security cameras or interactive installations. No complex camera setup required!

Image recognition

Video picture transmission

Powerful Processing & Ample Memory for AI Models: Dual-core ESP32-S3 @ 240MHz, 16MB Flash, 8MB PSRAM

Handle complex AI models and data with ease. The Xtensa LX7 dual-core processor provides raw power, while the generous 16MB Flash stores large programs and 8MB PSRAM is essential for holding machine learning models (like TensorFlow Lite Micro) and image buffers. Train and deploy more sophisticated face recognition models or voice command systems directly on the board.

Powerful Chip

Robust Connectivity & IoT Ready: WiFi 4 (802.11 b/g/n) & Bluetooth 5 LE/Mesh, Matter Support

Connect projects effortlessly to the cloud, smartphones, or other devices. Features stable WiFi (station/AP modes) and energy-efficient Bluetooth 5 with support for Bluetooth Mesh and Espressif WiFi Mesh for large networks. Matter protocol compatibility future-proofs smart home device development. Ideal for remote monitoring and wireless data transmission.

Simplified Development & Power Management: Arduino/MicroPython/ESP-IDF, GDI Display Port, Battery Charging

Get started quickly with popular frameworks: Arduino IDE for simplicity, MicroPython for rapid scripting, or ESP-IDF for maximum control. The onboard GDI port simplifies connecting displays. Integrated power management supports Li-ion battery charging (up to 1A) and features hardware power on/off control for low-power projects and portable applications.

Optimized Design & Reliability: Independent Camera Power, Anti-Interference, Industrial Temp Range

Engineered for performance. The dedicated camera power supply circuit minimizes interference for cleaner image capture. Built to operate reliably in industrial environments (-20°C to 70°C).

Features

Image Recognition:Onboard GDI for easy connection with screens

Powerful Chips: ESP32-S3 module with AI Acceleration

More storage space: 16MB Flash & 8MB PSRAM

Onboard camera interface & independent camera power supply, easy to connect and strong anti-interference

Power management integrated, support Li-ion battery charging and hardware On/OFF controlling

Wi-Fi and Bluetooth 5 dual-mode communication

Applications

AI-Powered Image Recognition: Build face recognition door locks, object detection systems, product counters, gesture control interfaces, license plate readers.

Smart Home & Security: Create intruder detection cameras, pet monitors, smart doorbells with video, environmental sensing (combine with sensors).

Industrial IoT & Machine Vision: Develop simple machine vision inspections, QR/barcode scanners, equipment monitoring with visual feedback.

Edge AI & TinyML: Deploy on-device TensorFlow Lite Micro models for sensor fusion, anomaly detection, predictive maintenance at the edge.

Wireless Video Streaming: Implement low-latency video transmission for FPV projects, remote monitoring feeds (consider bandwidth limits).

Voice Control Interfaces: Combine with microphones for local voice command recognition using the AI accelerator.

Specification

Basic Parameters

Operating Voltage: 3.3V

Type-C Input Voltage: 5V DC

VCC Input Voltage: 5V DC

Max Charging Current: 1A

Operating Temperature: -20 to 70℃

Dimension: 25.4x60mm/1x2.36"

Hardware Information

Processor: Xtensa® dual-core 32-bit LX7 microprocessor

Main Frequency: 240 MHz

SRAM: 512KB

ROM: 384KB

Flash: 16MB

PSRAM: 8MB

RTC SRAM: 16KB

USB: USB 2.0 OTG full-speed

WIFI

WIFI Protocol: IEEE 802.11b/g/n

Bandwidth: Support 20 MHz and 40 MHz at 2.4 GHz band

WIFI Mode: Station, SoftAP, SoftAP+Station combined mode

WIFI Frequency: 2.4GHz

Frame Aggregation: TX/RX A-MPDU, TX/RX A-MSDU

Bluetooth

Bluetooth Protocol: Bluetooth 5, Bluetooth mesh

Bluetooth Frequency: 125 Kbps, 500 Kbps, 1 Mbps, 2 Mbps

Ports

Digital I/O x26

LED PWM Controller 8 Channels

SPI x2

UART x3

I2C x2

I2S x2

IR Transceiver: transmit channel x5, receive channel x5

2×12-bit SAR ADC, 20 Channels

DMA Controller: transmit channel x5, receive channel x5

Documents

[Product wiki](#)

[ESP32-S3-WROOM-1 Datasheet](#)

[ESP32-S3 Chip Datasheet](#)

[Schematics](#)

[Dimension](#)

Shipping List

FireBeetle 2 Board ESP32-S3 (N16R8) AIoT Microcontroller (Supports Wi-Fi & Bluetooth) x1

OV2640 Camera x1

18pin-2.54mm Pin Header x1

18pin-2.54mm Female Header x1

14pin-2.54mm Pin Header x1

14pin-2.54mm Female Header x1