ESPRESSIF

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About the Company

Who We Are

Espressif Systems (688018) is a public multinational, fabless semiconductor company established in 2008, with headquarters in Shanghai and offices in China, India, Czechia, Singapore, Brazil and the United States.

What We Are Doing

As the world's leading AIoT solution platform, we provide millions of users with secure smart devices, Wi-Fi and/or Bluetooth connectivity, wireless mesh technology and artificial intelligence solutions—voice interaction, face recognition, data management and edge computing.

Our Commitments

Espressif is committed to bringing AIoT to its customers and developers, commercial and non-commercial alike, by open-sourcing its technology and solutions, so that developers from all walks of life can use this technology to solve some of the most pressing problems of our times.

ESPRESSIF

Milestones

2008
- Apr. — Espressif Founded

2013
- Dec. — ESP8089 Released

2014
- May. — ESP8266EX Released

2015
- Sep. — 2015 **Red Herring** Top 100 Asia Award

2016
- May — **Gartner's Cool Vendor**

2018
- Mar. — Leading **Embedded MCU in the Wi-Fi** Chip Market
- Sep. — **ESP32** Released

2019
- Jan. — **ESP-ADF** v1.0 Released
- Feb. — **ESP-WHO** Released
- May. — **ESP-MDF** Released
- Jul. — Espressif's successful **IPO**
- Jul. — **ESP32-S2** Released
- Aug. — **ESP-Skainet** Released
- Next Milestone

INNOVATING FOR QUALITY

ESP
Hardware

ESP32-S2

ESP32

ESP8266

Series

Espressif is the first company to have successfully integrated a high-power amplifier, balun, RF switch and LNA for Wi-Fi applications of the CMOS technology.

- Small and simple design, with only 7 external components
- Improved yield and high reliability
- Low cost
- Reduced time to market and logistics complexity

APIs

Toolchains

CONNECTING ESP-SDKs

ALL WIRELESS Devices

Espressif's Wi-Fi chips are now compliant with, and recommended by, many IoT platforms and service providers. Due to Espressif's unique cost structure and uncompromising quality, our company has become a top choice for many developers as well. With an accompanying easy-to-use toolchain, Espressif has enabled rapid prototyping and fast IoT connections for a broad range of small and medium-sized businesses (SMBs) in over 100 countries. Espressif has built a modern software platform for the IoT industry, based on the community-driven development of its powerful wireless MCUs.

The Espressif SDK provides toolchains, APIs, components and workflows for the development of applications based on the ESP8266, ESP32 and ESP32-S Series which are compatible with Windows, Linux and Mac OS operating systems.

ESP

Software

Ecosystem

Popular Third-Party Development Platforms

Arduino IDE, Amazon FreeRTOS, NodeMCU, MicroPython, PlatformIO, Mongoose OS

Third-Party Cloud Platforms

More than **40** mainstream cloud platforms support Espressif Products

Strong Community Engagement

- **>34,000** open-source projects on Github
- Arduino ESP8266 is one of the most popular open-source projects on Github with **>5,100** forks
- More than **60** books have been written about ESP8266 and ESP32 in English, German, Italian, Japanese, Chinese, and Urdu.
- www.ESP8266.com is ranked **40,000**th in the world

Product Map

ESP32-S2
Wi-Fi
32 bit MCU
ESP8266
Wi-Fi
32 bit MCU
Chips & SoCs
ESP32-S2
(Single Core)
ESP8266EX
(Single Core)
ESP8285
(Single Core)
Modules
ESP32-S2-WROVER
ESP32-S2-WROOM
ESP-WROOM-02D
ESP-WROOM-02U
ESP-WROOM-02
ESP-WROOM-S2
DevKits
ESP32-S2-Saola Series
ESP32-S2-Kaluga-1
ESP8266-DevKitC Series
ESP-Launcher

Product Map

ESP32
32 bit MCU
Wi-Fi
Bluetooth/BLE
Chips & SoCs
ESP32-D0WD-V3
(Dual Core)
ESP32-D0WDQ6-V3
(Dual Core)
ESP32-U4WDH
(Single Core)
ESP32-D0WD
(Dual Core)
ESP32-D2WD
(Dual Core)
ESP32-S0WD
(Single Core)
ESP32-PICO-V3
(Dual Core)
Modules
ESP32-WROVER-E
ESP32-WROVER-IE
ESP32-WROOM-32E
ESP32-WROOM-32UE
ESP32-WROVER-B
ESP32-WROVER-IB
ESP32-WROOM-32D
ESP32-WROOM-32U
ESP32-SOLO-1
ESP32-PICO-V3-ZERO
DevKits
ESP32-DevKitC Series
ESP-WROVER-KIT
ESP32-LyraT Series
ESP32-Korvo
ESP-EYE
ESP32-DevKitC Series
ESP-PICO-KIT

Wi-Fi and Bluetooth combo SoC

CPU

Xtensa® 32-bit LX6 dual-core processor, up to 600 DMIPS, clock at 240MHz

Wi-Fi

2.4 GHz IEEE 802.11b/g/n, HT40

Memory

520 KB SRAM, 448 KB ROM, 16 KB RTC SRAM

Bluetooth

Dual mode Bluetooth, BT Classic v4.2 and Bluetooth LE v5.0

40nm

Designed with TSMC's ultra-low-power 40 nm technology

Low Power

5μA at deep sleep mode, support for 5 low-power modes

ESP32-S2 SOC

- Environmental Compliance: RoHS & REACH

Peripherals

- 43 programmable GPIOs
- 12-bit SAR ADCs (20 channels)
- 8-bit DAC
- I2C, I2S, UART, SPI
- 14 touch-sensing IOs
- RMT (TX/RX)
- LED PWM (8 channels)
- 1 Full-speed USB OTG
- Temperature sensor

Actual-sized depiction of chips

Part Number	ESP32-S2
Core Type	Single Core
Package Type	QFN 56-pin
SPQ (Reel)	2K
MOQ (Reel)	2K
Dimensions (mm)	7x7

More Information

ESP32 SoCs

- Environmental Compliance: RoHS & REACH

Peripherals

- 10 × capacitive touch pads
- 12-bit SAR ADC (18 channels)
- 8-bit DAC, Hall sensor
- Temperature sensor
- I2C, I2S, UART, SPI
- Host SDIO/eMMC
- Slave SDIO/SPI
- CAN2.0, dedicated DMA
- Ethernet MAC interface
- Motor PWM
- LED PWM (16 channels) etc.

Actual-sized depiction of chips

Part Number	ESP32-D0WD-V3	ESP32-D0WDQ6-V3	ESP32-D0WD	ESP32-D2WD
Core Type	Dual core	Dual core	Dual core	Dual core
Flash (MB)	N/A	N/A	N/A	2
Package Type	QFN 48-pin	QFN 48-pin	QFN 48-pin	QFN 48-pin
SPQ (Reel)	5k	3k	5k	5k
MOQ (Reel)	1k	1k	1k	1k
Dimension (mm)	5x5	6x6	5x5	5x5

Datasheet

More Information

ESP32 SOCs

- Environmental Compliance: RoHS & REACH

Peripherals

- 10 × capacitive touch pads
- 12-bit SAR ADC (18 channels)
- 8-bit DAC, Hall sensor
- Temperature sensor
- I2C, I2S, UART, SPI
- Host SDIO/eMMC
- Slave SDIO/SPI
- CAN2.0, dedicated DMA
- Ethernet MAC interface
- Motor PWM
- LED PWM (16 channels) etc.

Actual-sized depiction of chips

Part Number	ESP32-U4WDH	ESP32-S0WD
Core Type	Single core	Single core
Flash (MB)	N/A	N/A
Package Type	QFN 48-pin	QFN 48-pin
SPQ (Reel)	5k	5k
MOQ (Reel)	1k	1k
Dimension (mm)	5x5	5x5

Datasheet

More Information

ESP32 SIP SOC

- Environmental Compliance: RoHS & REACH

Peripherals

- Support for SD card
- UART, SPI, SDIO
- I2S, I2C, IR, GPIO
- LED PWM
- Motor PWM
- Capacitive touch sensor
- ADC, DAC, LNA pre-amplifier, etc.

Actual-sized depiction of chips

Part Number	ESP32-PICO-V3
Core Type	Dual Core
Flash (MB)	4
Package Type	LGA 48-pin
SPQ (Reel)	2k
MOQ (Reel)	1k
Dimensions (mm)	7x7

More Information

ESP32-S2 Modules

- Environmental Compliance: RoHS & REACH

Peripherals

- 43 GPIOS
- UART, SPI
- I2S, I2C, IR, GPIO
- LCD
- LED PWM
- Camera interface
- Touch sensor, temperature sensor
- USB OTG 1.1
- ADC, DAC, etc.

Actual-sized depiction of modules

Part Number	ESP32-S2-WROOM	ESP32-S2-WROVER
Core	ESP32-S2	ESP32-S2
Flash (MB)	4, 8, 16	4, 8, 16
PSRAM (MB)	N/A	2
Antenna Type	PCB antenna/IPEX antenna	PCB antenna/IPEX antenna
SPQ (Reel)	650	650
MOQ (Reel)	650	650
Dimensions (mm)	18x31x3.3	18x31x3.3

More Information

ESP32 WROOM Modules

- Environmental Compliance: RoHS & REACH
- Operating Temperature: -40 °C ~+85 °C

Peripherals

- Support for SD card
- UART, SPI, SDIO
- I2S, I2C, IR, GPIO
- LED PWM
- Motor PWM
- Capacitive touch sensor
- ADC, DAC, LNA pre-amplifier, etc.

Actual-sized depiction of modules

Part Number	ESP32-WROOM-32E	ESP32-WROOM-32UE
Core	ESP32-D0WD-V3	ESP32-D0WD-V3
Flash (MB)	4, 8, 16	4, 8, 16
PSRAM (MB)	N/A	N/A
Antenna Type	PCB antenna	IPEX antenna
SPQ (Reel)	650	650
MOQ (Reel)	650	650
Dimensions (mm)	18x25.5x3.1	18x19.2x3.2

More Information

ESP32 WROOM Modules

- Environmental Compliance: RoHS & REACH
- Operating Temperature: -40 °C ~+85 °C

Peripherals

- Support for SD card
- UART, SPI, SDIO
- I2S, I2C, IR, GPIO
- LED PWM
- Motor PWM
- Capacitive touch sensor
- ADC, DAC, LNA pre-amplifier, etc.

Actual-sized depiction of modules

Part Number	ESP32-WROOM-32D	ESP32-WROOM-32U	ESP32-SOLO-1
Core	ESP32-D0WD	ESP32-D0WD	ESP32-S0WD
Flash (MB)	4, 8, 16	4, 8, 16	4
PSRAM (MB)	N/A	N/A	N/A
Antenna Type	PCB antenna	IPEX antenna	PCB antenna
SPQ (Reel)	650	650	650
MOQ (Reel)	650	650	650
Dimensions (mm)	18x25.5x3.1	18x19.2x3.2	18x25.5x3.1

More Information

ESP32 WROVER Modules

- Environmental Compliance: RoHS & REACH

Peripherals

- Support for SD card
- UART, SPI, SDIO
- I2S, I2C, IR, GPIO
- LED PWM
- Motor PWM
- Capacitive touch sensor
- ADC, DAC, LNA pre-amplifier, etc.

Actual-sized depiction of modules

Part Number	ESP32-WROVER-E	ESP32-WROVER-IE	ESP32-WROVER-B	ESP32-WROVER-IB
Core	ESP32-D0WD-V3	ESP32-D0WD-V3	ESP32-D0WD	ESP32-D0WD
Flash (MB)	4, 8, 16	4, 8, 16	4, 8, 16	4, 8, 16
PSRAM (MB)	8	8	8	8
Antenna Type	PCB antenna	IPEX antenna	PCB antenna	IPEX antenna
SPQ (Reel)	650	650	650	650
MOQ (Reel)	650	650	650	650
Dimensions (mm)	18x31.4x3.3	18x31.4x3.3	18x31.4x3.3	18x31.4x3.3

More Information

ESP32 Development Kits

ESP32-DevKitC Series

Jump right into what matters. Start prototyping with our flagship SoC, ESP32. ESP32-DevKitC is a low-footprint, breadboard-friendly, entry-level development board which is powered by the ESP32 module.

Getting Started

- Core: ESP32-WROOM-32E/ESP32-WROOM-32UE/ESP32-WROVER-E/ESP32-WROVER-IE/ESP32-WROOM-32D/ESP32-WROOM-32U/ESP32-SOLO-1/ESP32-WROVER-B/ESP32-WROVER-IB
- Flash/PSRAM: 4 MB Flash
- Interfaces: I/O, USB
- UI: Buttons, LEDs

ESP32-PICO-KIT

One of Espressif's mini development boards based on ESP32-PICO-D4, a System-in-Package (SiP) module with Wi-Fi and Bluetooth connectivity.

Getting Started

- Core: ESP32-PICO-D4
- Flash/PSRAM: 4 MB Flash
- Interfaces: I/O, USB
- UI: Buttons, LEDs

ESP32 LyraT Evaluation Kits

ESP32-LyraT

An audio development board, supporting Espressif Systems' ADF and featuring voice wake-up, a wake-up button and an audio player. Designed for smart speakers and smart-home applications.

User Guide

- **Core:** ESP32-WROVER-B
- **Flash/PSRAM:** 4 MB Flash+4 MB PSRAM
- **Interfaces:** Micro SD Card, Audio, Output, USB, Speaker
- **UI:** Touch Buttons, Keys, LEDs

ESP32-LyraTD-MSC

Designed for smart speakers and AI applications. Featuring Acoustic Echo Cancellation (AEC), Automatic Speech Recognition (ASR), wake-up interrupt and voice interaction.

User Guide

- **Core:** ESP32-WROVER-B
- **Flash/PSRAM:** 4 MB Flash+4 MB PSRAM
- **Interfaces:** USB, I²S, SPI, Earphone jack, Speaker, Micro SD Card, JTAG, Programing
- **UI:** LEDs, Keys

DSP: Microsemi ZL38063 3 MiC

ESP32 LyraT Evaluation Kits

ESP32-LyraTD-DSPG

Based on ESP32-WROVER-B, a BT/Wi-Fi combo module, and a digital signal processor (DSP) .
Featuring a three-microphone array for noise reduction, echo cancellation, beamforming and wake-word detection.

User Guide

- Core: ESP32-WROVER-B
- Flash/PSRAM: 16 MB Flash+8 MB PSRAM
- Interfaces: USB, FPC, Speaker, Phone Jack
- UI: Buttons, Microphone, LEDs
- DSP: DSP Group DBMB5P 3 Mic

ESP32-LyraTD-SYNA

One of Espressif's Audio Development Boards, consisting of two development boards and integrated with peripheral devices. It is an Acoustic Echo Cancelation (AEC) solution supporting voice recognition and voice wake-up.

User Guide

- Core: ESP32-WROVER-B
- Flash/PSRAM: 16 MB Flash+ 8 MB PSRAM
- Interfaces: USB, FPC, Earphone jack, Speaker
- UI: Buttons, Microphone, LEDs
- DSP: Synaptics Cx20921 2 Mic

ESP32 Development Kits

ESP-EYE

Espressif's development board for image recognition and audio processing in AIoT applications.

Getting Started

- Core: ESP32
- Flash: 4 MByte flash + 8 MByte PSRAM
- Interfaces: I/O, USB
- UI: Buttons, LEDs

ESP32 Sense Evaluation Kit

ESP32-Sense Kit

The ESP32-Sense Kit is used for evaluating and developing the ESP32 touch sensor system. The ESP32-Sense Kit consists of one motherboard and five daughterboards. Users can design and add their own daughterboards for special use cases.

Duplex Slider | Matrix Button | Spring Slider | Linear Slider | Wheel Slider

- **Core:** ESP32-WROOM-32D
- **Flash/PSRAM:** 4 MB Flash
- **Interfaces:** I/O, USB, ESP-Prog
- **UI:** Touch Sensors, LEDs, RGB, 7-Segment, Displays

Getting Started

ESP32 Mesh Evaluation Kit

ESP32-Mesh Kit

ESP32-MeshKit-Sense is a development board with an ESP32 module at its core. It features peripherals, such as a temperature and humidity sensor, an ambient light sensor, etc. The board can be interfaced with screens. When connected to different peripherals, the board is mainly used for detecting the current consumption of ESP32 modules in a normal-operation state or in sleep mode.

ESP32-MeshKit-Light

ESP32-MeshKit-Sense

- Core: ESP32-WROOM-32
- Flash/PSRAM: 4 MB Flash
- Interfaces: I/O, USB, LCD, ESP-Prog
- UI: LEDs, Buttons

Getting Started Video

More Information

Low-power, highly-integrated

Wi Fi CERTIFIED

CPU

Xtensa® 32-bit LX6 core processor, up to 160 MHz

Wi-Fi

2.4 GHz IEEE 802.11b/g/n,

Memory

96 KB dRAM, 64 KB iRAM

32-bit

Integrates Tensilica's L106 32-bit processor and on-chip SRAM

Low Power

As low as 20 µA of current consumption in deep sleep

ESP8266 SOCS

- Environmental Compliance: RoHS & REACH

Peripherals

- 10-bit ADC,
- SPI, UART,
- PWM,
- I2C, I2S,
- SDIO interfaces integrated

Actual-sized depiction of chips

Part Number	ESP8266EX	ESP8285N08	ESP8285H16
Core Type	Single core	Single core	Single core
Flash (MB)	N/A	1	2
PSRAM (MB)	N/A	N/A	N/A
Package Type	QFN 32-pin	QFN 32-pin	QFN 32-pin
SPQ (Reel)	5k	5k	5k
MOQ (Reel)	1k	1k	5k
Dimensions (mm)	5x5	5x5	5x5

More Information

ESP8266 WROOM Modules

- Environmental Compliance: RoHS & REACH

Peripherals

- 10-bit ADC,
- SPI, UART,
- PWM,
- I2C, I2S,
- SDIO interfaces integrated

Actual-sized depiction of chips

Part Number	ESP-WROOM-02D	ESP-WROOM-02U
Core	ESP8266EX	ESP8266EX
Flash (MB)	2, 4	2, 4
PSRAM (MB)	N/A	N/A
Antenna Type	PCB antenna	IPEX antenna
SPQ (Reel)	650	650
MOQ (Reel)	650	650
Dimensions (mm)	18x20x3.2	18x14.3x3.2

More Information

ESP8266 Development Board

ESP-LAUNCHER

A Micro USB-powered development board that allows access to all 32 pins of ESP8266. It integrates commonly-used peripherals.

Getting Started

- Core: ESP8266EX
- Flash/PSRAM: 4 MB SPI Flash+4 MB HSPI Flash
- Interfaces: I/O, USB
- UI: Buttons, LEDs

ESP8266-DevKitC Series

A small-sized ESP8266-based development board produced by Espressif. All of the I/O pins of the module are broken out to the pin headers on both sides of the board for easy interfacing.

Getting Started

- Core: ESP-WROOM-02D/ESP-WROOM-02U
- Flash/PSRAM: 2 MB Flash
- Interfaces: HSPI, PWM, IR, I/O, ADC, UART, I2S, I2C, USB
- UI: Buttons

ESP Skainet Solution

Empowering Things by Speech

ESP-Skainet is Espressif's smart voice assistant, which currently supports a wake-word engine (WakeNet), an offline speech-recognition engine (MultiNet) and acoustic algorithms (VAD, AEC, etc.).

Github: https://github.com/espressif/esp-skainet/blob/master/README.md

ESP
Audio Solution

Make Your Life Easier with Smart Technology

Espressif enables advanced, cloud-based, voice-controlled applications with its digital signal processor (DSP) chips which can be connected to voice-service providers over the cloud. ESP32 has already been approved by many renowned voice-service providers, such as Amazon Alexa, Google Assistant and Microsoft Azure.
Espressif's Wi-Fi Audio Solution: ESP-ADF with ESP32 LyraT Evaluation Kits.

ESP-ADF「Espressif Audio Development Framework」: github.com/espressif/esp-adf
ESP-IDF「Espressif IoT Development Framework」: github.com/espressif/esp-idf
ESP-VA-SDK「ESP-Voice-Assistant SDK」: https://github.com/espressif/esp-va-sdk)

ESP WHO Solution

Create Your Own AIoT Applications

ESP-WHO is a face detection and recognition development framework designed for AIoT applications. You can use it with the ESP-EYE development board, the Amazon FreeRTOS-qualified ESP-WROVER-KIT or other ESP32-based development boards. Then, by adding only a few peripherals, such as cameras and screens, you can easily create complete AIoT applications.

ESP-WHO 「Espressif Face Detection and Recognition Framework」: github.com/espressif/esp-who
ESP-IDF 「Espressif IoT Development Framework」: github.com/espressif/esp-idf

ESP Wi-Fi Mesh

Connecting All Your Wireless Devices

ESP-MDF is a multi-hop mesh networking solution, based on **ESP-IDF** and the ESP-Mesh communication protocol. Its function materializes device distribution networks, local and remote control, firmware upgrade, linkage control between devices, low-power consumption, etc.

- Automatic Meshing
- Supports cloud and local network connectivity
- Secure Network with standard security
- Smartphone Bluetooth LE Setup
- Even works without a Wi-Fi router
- No Extra Gateways Needed

ESP-MDF「Espressif Mesh Development Framework」: github.com/espressif/esp-mdf
ESP-IDF「Espressif IoT Development Framework」: github.com/espressif/esp-idf

ESP
BLE Mesh

Supporting Global Bluetooth Mesh Standard

ESP-BLE-MESH is an open-source software protocol stack which supports all the core features and models of the SIG Bluetooth Mesh Spec v1.0.1, having been fully SIG-certified since September 2019. It is totally compatible with devices that support the SIG Bluetooth Mesh. Any Bluetooth LE device could support ESP-BLE-Mesh via an OTA upgrade.

Supports Thousands of Nodes and Fast Provisioning

Industrial-Grade Security for Protection Against All Known Attacks

SIG Bluetooth Mesh Full-Feature Certification and Multi-Vendor Interoperability

Supports Wi-Fi & Bluetooth Mesh & Bluetooth LE & BR/EDR Coexistence

Supports Friend Feature and Low Power Feature

ESP-BLE-MESH: github.com/espressif/esp-idf/tree/master/components/bt/esp_ble_mesh

Document: docs.espressif.com/projects/esp-idf/en/latest/api-guides/esp-ble-mesh/ble-mesh-index.html

ESP Jumpstart

Building production-ready firmware can be hard. It involves multiple questions and decisions about the best ways of doing things. It involves building phone applications and integrating cloud agents for all the features to be completed properly. "**ESP-Jumpstart**" is a framework created by Espressif, which addresses this common requirement. It also functions as a step-by-step tutorial with a production-quality boilerplate code right from a simple "Hello World" to the use case of a cloud-connected production.
It covers all the common aspects required by any Internet-connected device. Using standard components of ESP-IDF, it ensures that there is consistency with other projects maintained by Espressif. It works with ESP32 as well as ESP8266. The tutorials cover the following:

More information can be found here: https://docs.espressif.com/projects/esp-jumpstart/en/latest/

ESP-Jumpstart「Espressif's new reference guide」: https://github.com/espressif/esp-jumpstart

Hardware services

PCB Review

We can carry out a schematic and layout review to ensure correctness and high-performance on your self-designed circuits and PCBs using chips and modules from Espressif Systems.

Hardware Design Resources >
Hardware Examination Form >

RF Testing

PCBA proofing, RF matching, debugging, and RF testing are now part of the available services for your designs.

Testing Reports >

Certification Support Program

We are committed to assisting you in obtaining international certifications required for product sales.

These include, but are not limited to, SRRC/FCC/CE/TELEC/KCC/NCC/IC/Wi-Fi Alliance/RoHS/REACH.

Certifications >

Manufacturing services

Module Pre-Provisioning Services

(Applicable to ESP32 modules only)

ESP32 modules can be securely provisioned in the factory to program per-device unique certificates and private keys. This enables out-of-the-box connectivity with common IoT clouds that use the X.509 certificate-based authentica-tion.

Customized Flash Contents Programming

Espressif can help to program customers' firmware images as well as other contents (such as device ID, key, license etc.) into a module's built-in flash as well as into eFuse (ESP32 only) during the manufacturing process. The manufacturing test firmware as well as the production firmware can be programmed in the flash to simplify and speed up our customers' manufacturing process significantly.

Customized Flash Encryption/ Secure Boot

(Applicable to ESP32 modules only)

As the ESP32 SoC supports flash encryption and secure boot, the customer's manufacturing process needs to enable these features. Espressif's manufacturing process enables these features and provides the secured modules directly to the customer.

ESPRESSIF

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