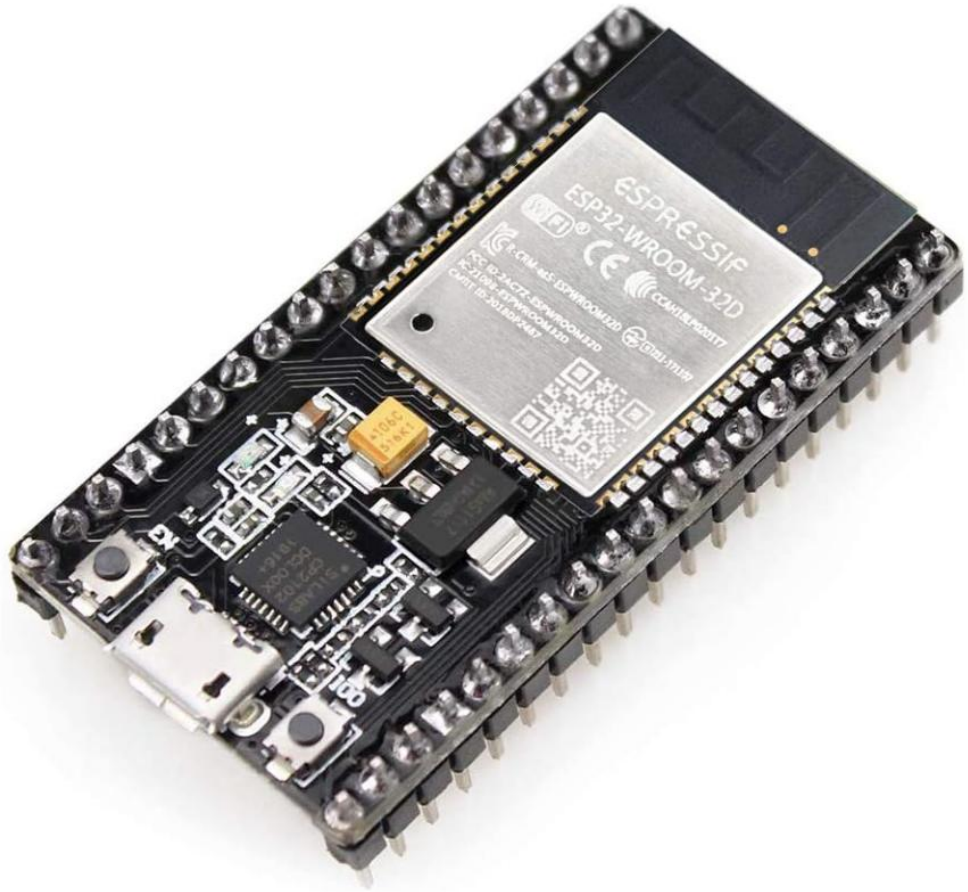
Product Reference Manual
SKU: TEKFA1053/0

ESP-WROOM-32D Development Board 2.4GHz Dual-Mode WiFi + Bluetooth Dual Cores Microcontroller Processor Integrated with Antenna RF AMP Filter AP STA for Arduino IDE



Description

The ESP32 is a series of low-cost and low-power System on a Chip (SoC) microcontrollers developed by Espressif that include Wi-Fi and Bluetooth wireless capabilities and dual-core processor. If you're familiar with the ESP8266, the ESP32 is its successor, loaded with lots of new features.

1. The Board

First, to get started, what is an ESP32? The ESP32 is a series of chip microcontrollers developed by Espressif.

Why are they so popular? Mainly because of the following features:

- Low-cost: you can get an ESP32 starting at $6, which makes it easily accessible to the general public;
- Low-power: the ESP32 consumes very little power compared with other microcontrollers, and it supports low-power mode states like deep sleep to save power;
- Wi-Fi capabilities: the ESP32 can easily connect to a Wi-Fi network to connect to the internet (station mode), or create its own Wi-Fi wireless network (access point mode) so other devices can connect to it—this is essential for IoT and Home Automation projects—you can have multiple devices communicating with each other using their Wi-Fi capabilities;
- Bluetooth: the ESP32 supports Bluetooth classic and Bluetooth Low Energy (BLE)—which is useful for a wide variety of IoT applications;
- Dual-core: most ESP32 are dual-core— they come with 2 Xtensa 32-bit LX6 microprocessors: core 0 and core 1.
- Rich peripheral input/output interface—the ESP32 supports a wide variety of input (read data from the outside world) and output (to send commands/signals to the outside world) peripherals like capacitive touch, ADCs, DACs, UART, SPI, I2C, PWM, and much more.
- Compatible with the Arduino "programming language": those that are already familiar with programming the Arduino board, you'll be happy to know that they can program the ESP32 in the Arduino style.
- Compatible with MicroPython: you can program the ESP32 with MicroPython firmware, which is a re-implementation of Python 3 targeted for microcontrollers and embedded systems.

2. ESP32 Specifications

If you want to get a bit more technical and specific, you can take a look at the following detailed specifications of the ESP32 (source: http://esp32.net/)—for more details, check the datasheet):

ESP32 module: ESP-WROOM-32

Wireless connectivity WiFi: 150.0 Mbps data rate with HT40

- Bluetooth: BLE (Bluetooth Low Energy) and Bluetooth Classic
- Processor: Tensilica Xtensa Dual-Core 32-bit LX6 microprocessor, running at 160 or 240 MHz

Memory:

- ROM: 448 KB (for booting and core functions)
- SRAM: 520 KB (for data and instructions)
- RTC fast SRAM: 8 KB (for data storage and main CPU during RTC Boot from the deep-sleep mode)
- RTC slow SRAM: 8KB (for co-processor accessing during deep-sleep mode)
- eFuse: 1 Kbit (of which 256 bits are used for the system (MAC address and chip configuration) and the remaining 768 bits are reserved for customer applications, including Flash-Encryption and Chip-ID)
- Embedded flash: flash connected internally via IO16, IO17, SD_CMD, SD_CLK, SD_DATA_0 and SD_DATA_1 on ESP32-D2WD and ESP32-PICO-D4.
    - 0 MiB (ESP32-D0WDQ6, ESP32-D0WD, and ESP32-S0WD chips)
    - 2 MiB (ESP32-D2WD chip)
    - 4 MiB (ESP32-PICO-D4 SiP module)

Low Power:

Ensures that you can still use ADC conversions, for example, during deep sleep.

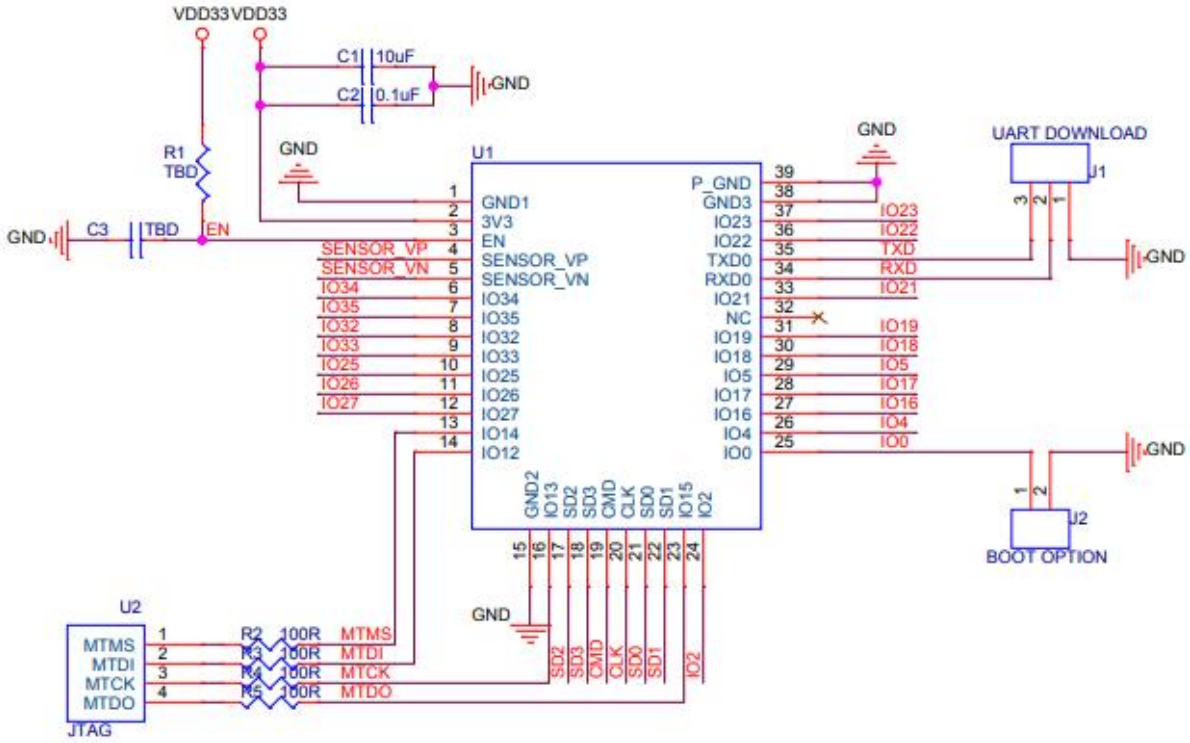
3. Peripheral Input/Output:

- peripheral interface with DMA that includes capacitive touch
- ADCs (Analog-to-Digital Converter)
- DACs (Digital-to-Analog Converter)
- I²C (Inter-Integrated Circuit)
- UART (Universal Asynchronous Receiver/Transmitter)
- SPI (Serial Peripheral Interface)
- I²S (Integrated Interchip Sound)
- RMII (Reduced Media-Independent Interface)
- PWM (Pulse-Width Modulation)

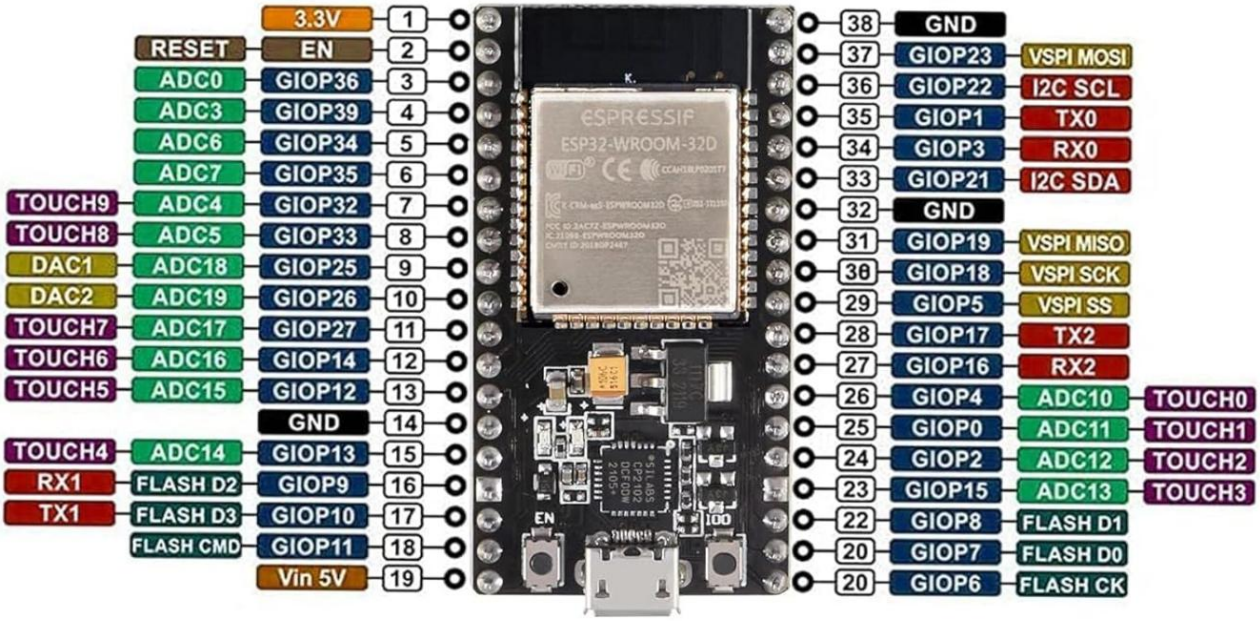
Security:

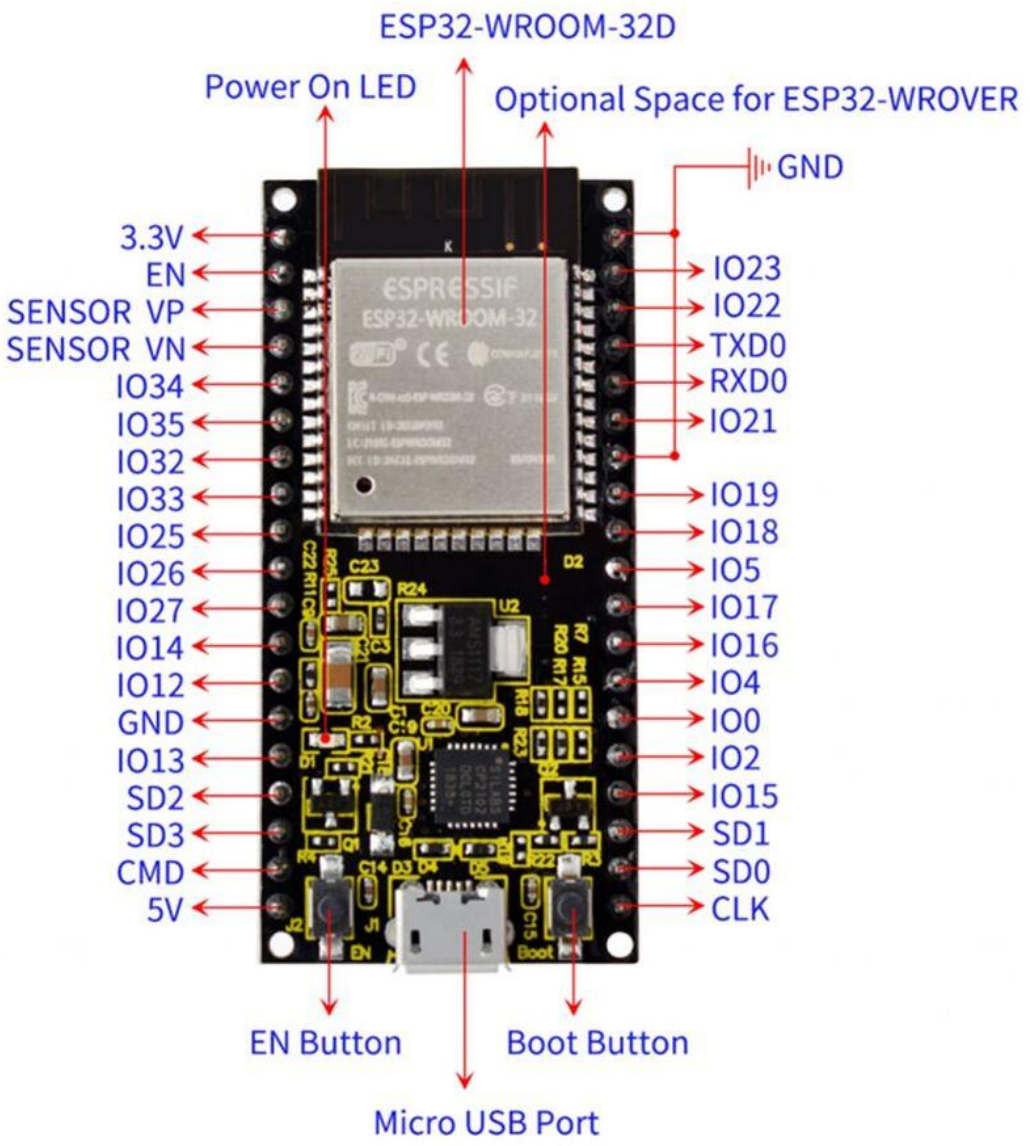
Hardware accelerators for AES and SSL/TLS

4. Connector Pinouts



MTDI should be kept at a low electric level when powering up the module.


3.3V 1
RESET EN 2
ADC0 GIOP36 3
ADC3 GIOP39 4
ADC6 GIOP34 5
ADC7 GIOP35 6
TOUCH9 ADC4 GIOP32 7
TOUCH8 ADC5 GIOP33 8
DAC1 ADC18 GIOP25 9
DAC2 ADC19 GIOP26 10
TOUCH7 ADC17 GIOP27 11
TOUCH6 ADC16 GIOP14 12
TOUCH5 ADC15 GIOP12 13
GND 14
TOUCH4 ADC14 GIOP13 15
RX1 FLASH D2 GIOP9 16
TX1 FLASH D3 GIOP10 17
FLASH CMD GIOP11 18
Vin 5V 19
38 GND
37 GIOP23 VSPI MOSI
36 GIOP22 I2C SCL
35 GIOP1 TX0
34 GIOP3 RX0
33 GIOP21 I2C SDA
32 GND
31 GIOP19 VSPI MISO
30 GIOP18 VSPI SCK
29 GIOP5 VSPI SS
28 GIOP17 TX2
27 GIOP16 RX2
26 GIOP4 ADC10 TOUCH0
25 GIOP0 ADC11 TOUCH1
24 GIOP2 ADC12 TOUCH2
23 GIOP15 ADC13 TOUCH3
22 GIOP8 FLASH D1
20 GIOP7 FLASH D0
20 GIOP6 FLASH CK
ESPRESSIF
ESP32-WROOM-32D
EN
100


ESP32-WROOM-32D
Power On LED
Optional Space for ESP32-WROVER
GND
3.3V
EN
SENSOR VP
SENSOR VN
IO34
IO35
IO32
IO33
IO25
IO26
IO27
IO14
IO12
GND
IO13
SD2
SD3
CMD
5V
IO23
IO22
TXD0
RXD0
IO21
IO19
IO18
IO5
IO17
IO16
IO4
IO0
IO2
IO15
SD1
SD0
CLK
EN Button
Boot Button
Micro USB Port