

ESP32-C2

esp-dev-kits Documentation



Release master
Espressif Systems
Dec 31, 2024

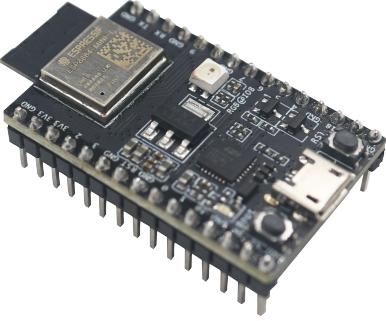
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This document provides detailed user guides and examples for ESP32-C2 series development boards.

The ESP32-C2 SoC currently consists of only one series, the ESP8684, so the references of ESP32-C2 in this document refers to the ESP8684 Series SoCs.

Note: For the full list of Espressif development boards, please go to [ESP DevKits](#).

ESP32-C2 Development Boards	
	
ESP8684-DevKitM-1	ESP8684-DevKitC-02

Chapter 1

ESP8684-DevKitM-1

The ESP8684-DevKitM-1 is an entry-level development board based on ESP8684-MINI-1, a general-purpose module with 1 MB/2 MB/4 MB SPI flash. This board integrates complete Wi-Fi and Bluetooth LE functions.

1.1 ESP8684-DevKitM-1 v1.1

The older version: [ESP8684-DevKitM-1](#).

This user guide will help you get started with ESP8684-DevKitM-1 and will also provide more in-depth information.

The ESP8684-DevKitM-1 is an entry-level development board based on ESP8684-MINI-1, a general-purpose module with 1 MB/2 MB/4 MB SPI flash. This board integrates complete Wi-Fi and Bluetooth LE functions.

Most of the I/O pins on the module are broken out to the pin headers on both sides of this board for easy interfacing. Developers can either connect peripherals with jumper wires or mount ESP8684-DevKitM-1 on a breadboard.

The document consists of the following major sections:

- *Getting Started*: Overview of the board and hardware/software setup instructions to get started.
- *Hardware Overview*: More detailed information about the board's hardware.
- *Hardware Revision Details*: Hardware revision history, known issues, and links to user guides for previous versions (if any) of the board.
- *Related Documents*: Links to related documentation.

1.1.1 Getting Started

This section provides a brief introduction of ESP8684-DevKitM-1, instructions on how to do the initial hardware setup and how to flash firmware onto it.

Description of Components

The key components of the board are described in a counter-clockwise direction.

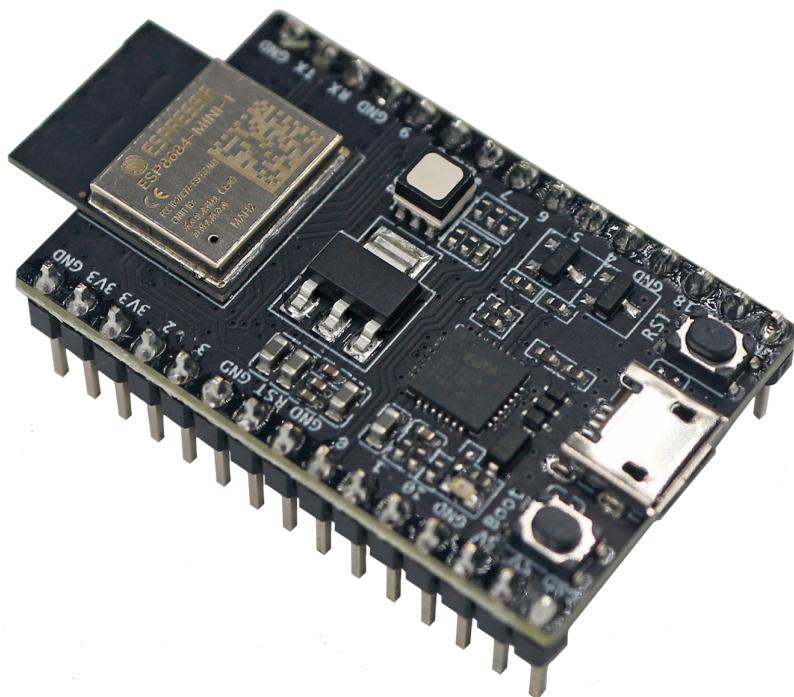


Fig. 1: ESP8684-DevKitM-1 with ESP8684-MINI-1 module

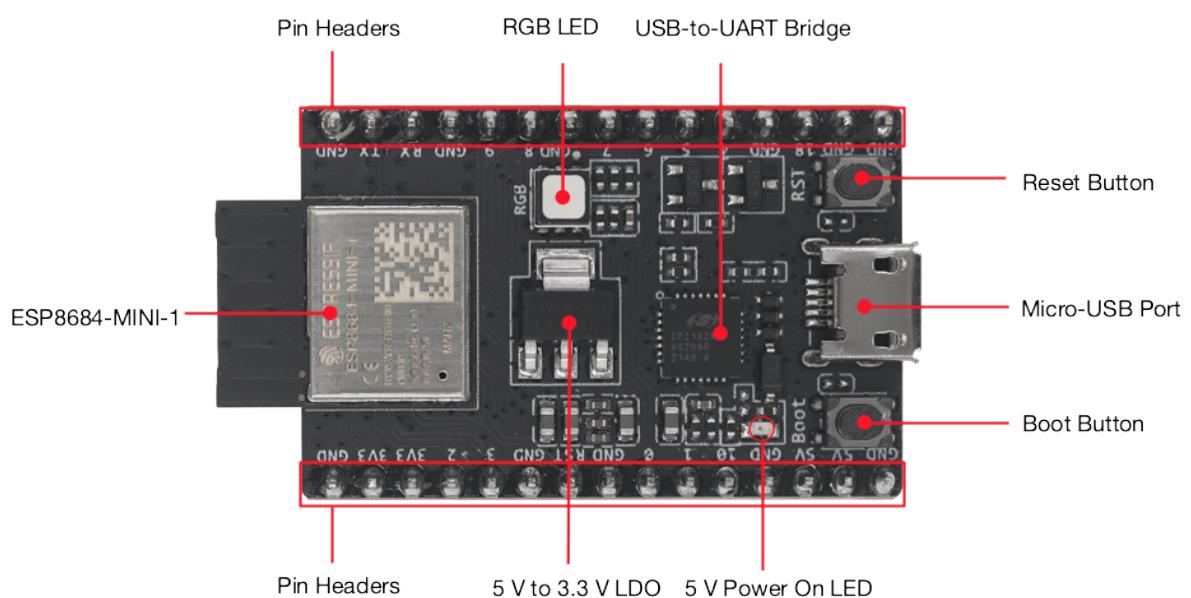


Fig. 2: ESP8684-DevKitM-1 - front

Key Component	Description
ESP8684-MINI-1	ESP8684-MINI-1 from Espressif is a powerful and general-purpose module that offers Wi-Fi and Bluetooth LE coexistence. It has a PCB antenna and a 1 MB/2 MB/4 MB SPI flash.
Pin Headers	All available GPIO pins are broken out to the pin headers on the board. For details, please see Header Block .
5 V to 3.3 V LDO	Power regulator that converts a 5 V supply into a 3.3 V output.
5 V Power On LED	Turns on when the USB power is connected to the board.
Boot Button	Download button. Holding down Boot and then pressing Reset initiates Firmware Download mode for downloading firmware through the serial port.
Micro-USB Port	USB interface. Power supply for the board as well as the communication interface between a computer and the ESP8684 chip.
Reset Button	Press this button to restart the system.
USB-to-UART Bridge	Single USB-to-UART bridge chip provides transfer rates up to 3 Mbps.
RGB LED	RGB LED, driven by GPIO0, GPIO1 and GPIO8.

Start Application Development

Before powering up your board, please make sure that it is in good condition with no obvious signs of damage.

Required Hardware

- ESP8684-DevKitM-1
- USB 2.0 cable (Standard-A to Micro-B)
- Computer running Windows, Linux, or macOS

Note: Be sure to use an appropriate USB cable. Some cables are for charging only and do not provide the needed data lines nor work for programming the boards.

Software Setup Please proceed to [Get Started](#), where Section [Installation Step by Step](#) will quickly help you set up the development environment then flash an application example onto your board.

ESP-AT Support The ESP8684-DevKitM-1 supports ESP-AT software that provides a set of AT commands with which you can quickly integrate wireless connectivity features into your product without a need for embedded application development of the module on this development board .

The software is available as a pre-built binary that can be downloaded from [ESP-AT repository](#).

For more information about using ESP-AT, including information on how to customize pre-built binaries, please refer to [ESP-AT User Guide](#).

Contents and Packaging

Retail Orders If you order a few samples, each board comes in an individual package in either antistatic bag or any packaging depending on your retailer.

For retail orders, please go to <https://www.espressif.com/en/company/contact/buy-a-sample>.

Wholesale Orders If you order in bulk, the boards come in large cardboard boxes.

For wholesale orders, please go to <https://www.espressif.com/en/contact-us/sales-questions>.

1.1.2 Hardware Overview

Block Diagram

The block diagram below shows the components of ESP8684-DevKitM-1 and their interconnections.

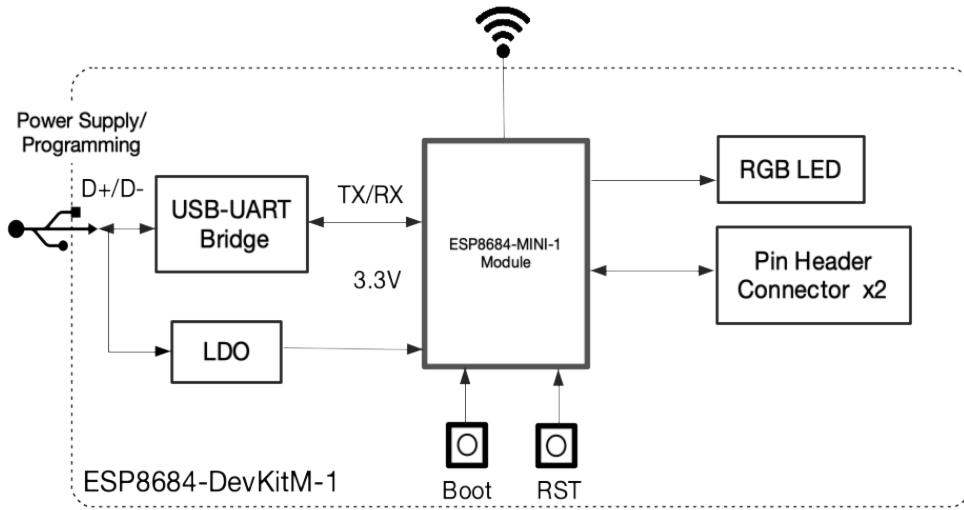


Fig. 3: ESP8684-DevKitM-1 (click to enlarge)

Power Supply Options There are three mutually exclusive ways to provide power to the board:

- Micro-USB Port, default power supply (recommended)
- 5V and G (GND) pins
- 3V3 and G (GND) pins

Header Block

The two tables below provide the **Name** and **Function** of the pins on both sides of the board (J1 and J3). The pin names are shown in [ESP8684-DevKitM-1 - front](#). The numbering is the same as in the [Board Schematic \(PDF\)](#).

J1

No.	Name	Type ¹	Function
1	G	G	Ground
2	3V3	P	3.3 V power supply
3	3V3	P	3.3 V power supply
4	2	I/O/T	GPIO2, ADC1_CH2, FSPIQ
5	3	I/O/T	GPIO3, ADC1_CH3
6	G	G	Ground
7	RST	I	Reset; High: enable; Low: powers off
8	G	G	Ground
9	0	I/O/T	GPIO0, ADC1_CH0, LED Red
10	1	I/O/T	GPIO1, ADC1_CH1, LED Green
11	10	I/O/T	GPIO10, FSPICS0
12	G	G	Ground
13	5V	P	5 V power supply
14	5V	P	5 V power supply
15	G	G	Ground

¹ P: Power supply; I: Input; O: Output; T: High impedance.

J3

No.	Name	Type [?]	Function
1	G	G	Ground
2	TX	I/O/T	GPIO20, U0TXD
3	RX	I/O/T	GPIO19, U0RXD
4	G	G	Ground
5	9	I/O/T	GPIO9 ²
6	8	I/O/T	GPIO8 ^{Page 7, 2} , LED Blue
7	G	G	Ground
8	7	I/O/T	GPIO7, FSPID, MTDO
9	6	I/O/T	GPIO6, FSPICLK, MTCK
10	5	I/O/T	GPIO5, ADC2_CH0, FSPIWP, MTDI
11	4	I/O/T	GPIO4, ADC1_CH4, FSPIHD, MTMS
12	G	G	Ground
13	18	I/O/T	GPIO18
14	G	G	Ground
15	G	G	Ground

ESP8684-DevKitM-1

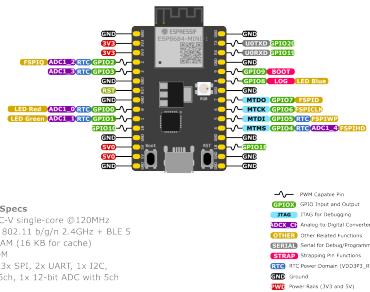


Fig. 4: ESP8684-DevKitM-1 Pin Layout (click to enlarge)

Pin Layout

1.1.3 Hardware Revision Details

Initial release

Main differences compared to the previous version:

- Addressable RGB LED in the previous version of the board has been changed to an RGB LED with discrete inputs for each color.
- The addressable LED was connected to GPIO8, and the new discrete LED is connected to GPIO0, GPIO1, and GPIO8.

Note: Both versions of ESP8684-DevKitM-1 are available on the market.

² GPIO8 and GPIO9 are strapping pins of the ESP8684 chip. These pins are used to control several chip functions depending on binary voltage values applied to the pins during chip power-up or system reset. For description and application of the strapping pins, please refer to [ESP8684 Datasheet](#) > Section *Strapping Pins*.

1.1.4 Related Documents

- [ESP8684 Datasheet \(PDF\)](#)
- [ESP8684-DevKitM-1 Schematic \(PDF\)](#)
- [ESP8684-DevKitM-1 PCB layout \(PDF\)](#)
- [ESP8684-DevKitM-1 Dimensions \(PDF\)](#)
- [ESP8684-DevKitM-1 Dimensions source file \(DXF\)](#) - You can view it with [Autodesk Viewer](#) online

For further design documentation for the board, please contact us at sales@espressif.com.

ESP8684-DevKitM-1

The latest version: [*ESP8684-DevKitM-1 v1.1*](#).

This user guide will help you get started with ESP8684-DevKitM-1 and will also provide more in-depth information.

The ESP8684-DevKitM-1 is an entry-level development board based on ESP8684-MINI-1, a general-purpose module with 1 MB/2 MB/4 MB SPI flash. This board integrates complete Wi-Fi and Bluetooth LE functions.

Most of the I/O pins on the module are broken out to the pin headers on both sides of this board for easy interfacing. Developers can either connect peripherals with jumper wires or mount ESP8684-DevKitM-1 on a breadboard.

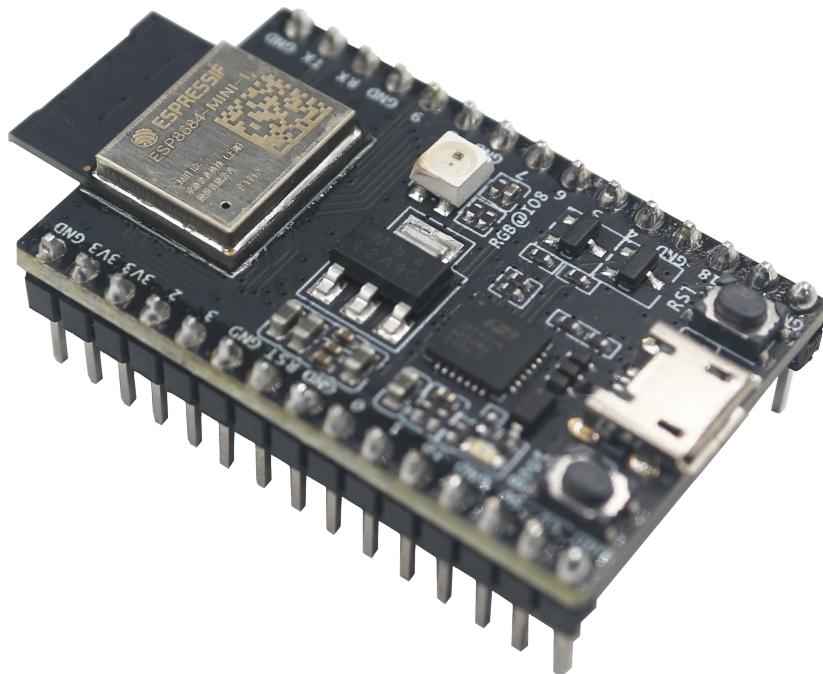


Fig. 5: ESP8684-DevKitM-1 with ESP8684-MINI-1 module

The document consists of the following major sections:

- [*Getting Started*](#): Overview of the board and hardware/software setup instructions to get started.
- [*Hardware Overview*](#): More detailed information about the board's hardware.

- **Hardware Revision Details:** Hardware revision history, known issues, and links to user guides for previous versions (if any) of the board.
- **Related Documents:** Links to related documentation.

Getting Started This section provides a brief introduction of ESP8684-DevKitM-1, instructions on how to do the initial hardware setup and how to flash firmware onto it.

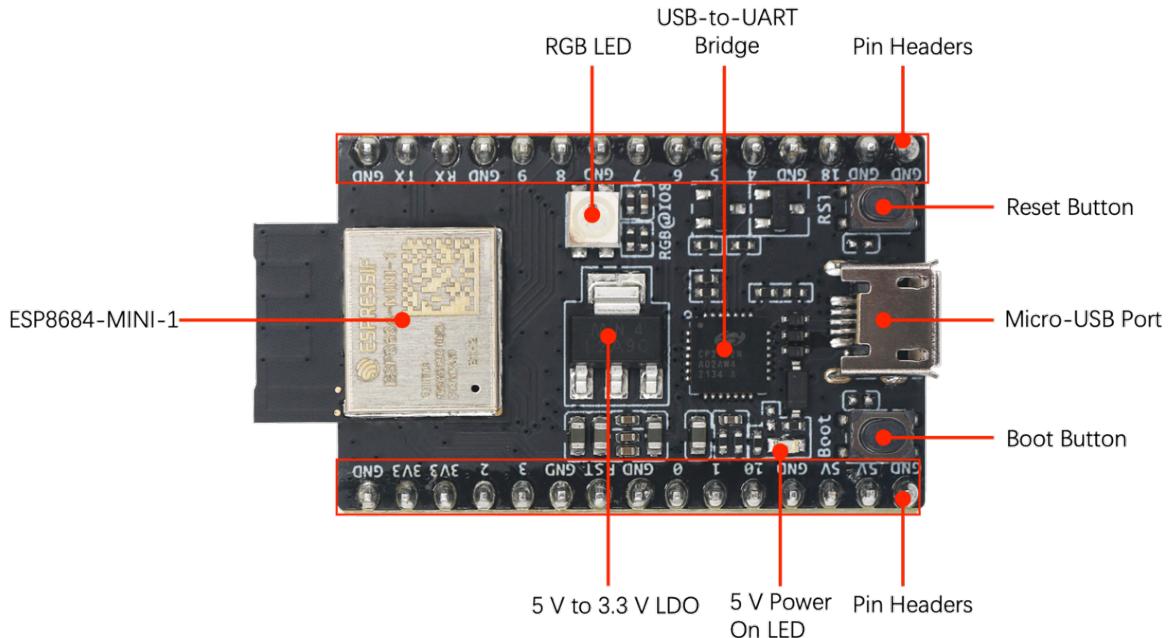


Fig. 6: ESP8684-DevKitM-1 - front

Description of Components The key components of the board are described in a counter-clockwise direction.

Key Component	Description
ESP8684-MINI-1	ESP8684-MINI-1 from Espressif is a powerful and general-purpose module that offers Wi-Fi and Bluetooth LE coexistence. It has a PCB antenna and a 1 MB/2 MB/4 MB SPI flash.
5 V to 3.3 V LDO	Power regulator that converts a 5 V supply into a 3.3 V output.
5 V Power On LED	Turns on when the USB power is connected to the board.
Pin Headers	All available GPIO pins are broken out to the pin headers on the board. For details, please see Header Block .
Boot Button	Download button. Holding down Boot and then pressing Reset initiates Firmware Download mode for downloading firmware through the serial port.
Micro-USB Port	USB interface. Power supply for the board as well as the communication interface between a computer and the ESP8684 chip.
Reset Button	Press this button to restart the system.
USB-to-UART Bridge	Single USB-to-UART bridge chip provides transfer rates up to 3 Mbps.
RGB LED	Addressable RGB LED, driven by GPIO8.

Start Application Development Before powering up your board, please make sure that it is in good condition with no obvious signs of damage.

Required Hardware

- ESP8684-DevKitM-1
- USB 2.0 cable (Standard-A to Micro-B)
- Computer running Windows, Linux, or macOS

Note: Be sure to use an appropriate USB cable. Some cables are for charging only and do not provide the needed data lines nor work for programming the boards.

Software Setup Please proceed to [Get Started](#), where Section [Installation Step by Step](#) will quickly help you set up the development environment then flash an application example onto your board.

ESP-AT Support The ESP8684-DevKitM-1 supports ESP-AT software that provides a set of AT commands with which you can quickly integrate wireless connectivity features into your product without a need for embedded application development of the module on this development board.

The software is available as a pre-built binary that can be downloaded from [ESP-AT repository](#).

For more information about using ESP-AT, including information on how to customize pre-built binaries, please refer to [ESP-AT User Guide](#).

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Wholesale Orders If you order in bulk, the boards come in large cardboard boxes.

For wholesale orders, please go to <https://www.espressif.com/en/contact-us/sales-questions>.

Hardware Overview

Block Diagram The block diagram below shows the components of ESP8684-DevKitM-1 and their interconnections.

Power Supply Options There are three mutually exclusive ways to provide power to the board:

- Micro-USB Port, default power supply (recommended)
- 5V and G (GND) pins
- 3V3 and G (GND) pins

Header Block The two tables below provide the **Name** and **Function** of the pins on both sides of the board (J1 and J3). The pin names are shown in [ESP8684-DevKitM-1 - front](#). The numbering is the same as in the [Board Schematic \(PDF\)](#).

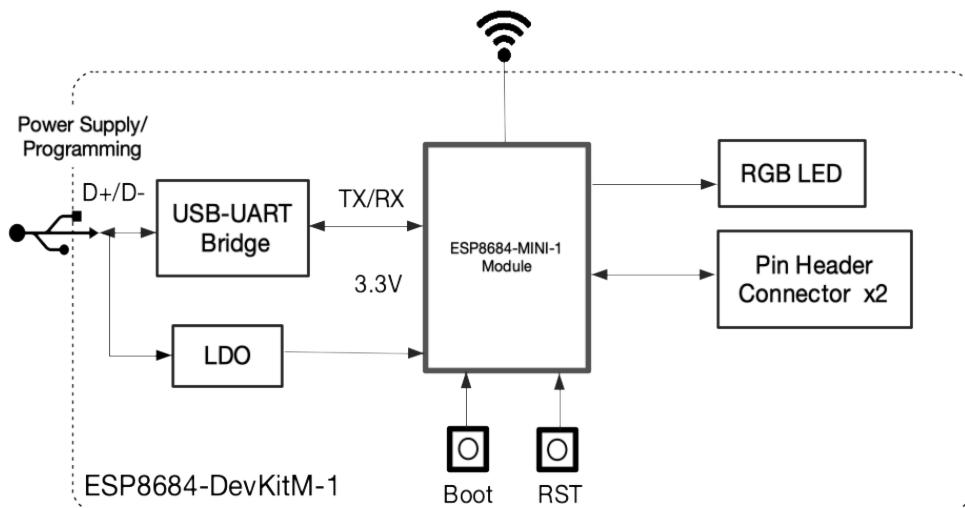


Fig. 7: ESP8684-DevKitM-1 (click to enlarge)

J1

No.	Name	Type ^{Page 11, 1}	Function
1	G	G	Ground
2	3V3	P	3.3 V power supply
3	3V3	P	3.3 V power supply
4	2	I/O/T	GPIO2, ADC1_CH2, FSPIQ
5	3	I/O/T	GPIO3, ADC1_CH3
6	G	G	Ground
7	RST	I	Reset; High: enable; Low: powers off
8	G	G	Ground
9	0	I/O/T	GPIO0, ADC1_CH0
10	1	I/O/T	GPIO1, ADC1_CH1
11	10	I/O/T	GPIO10, FSPICS0
12	G	G	Ground
13	5V	P	5 V power supply
14	5V	P	5 V power supply
15	G	G	Ground

¹ P: Power supply; I: Input; O: Output; T: High impedance.

J3

No.	Name	Type [?]	Function
1	G	G	Ground
2	TX	I/O/T	GPIO20, U0TXD
3	RX	I/O/T	GPIO19, U0RXD
4	G	G	Ground
5	9	I/O/T	GPIO9 ²
6	8	I/O/T	GPIO8 ^{Page 12, 2} , RGB LED
7	G	G	Ground
8	7	I/O/T	GPIO7, FSPID , MTDO
9	6	I/O/T	GPIO6, FSPICLK , MTCK
10	5	I/O/T	GPIO5, ADC2_CH0, FSPIWP ,MTDI
11	4	I/O/T	GPIO4, ADC1_CH4, FSPIHD ,MTMS
12	G	G	Ground
13	18	I/O/T	GPIO18
14	G	G	Ground
15	G	G	Ground

ESP8684-DevKitM-1

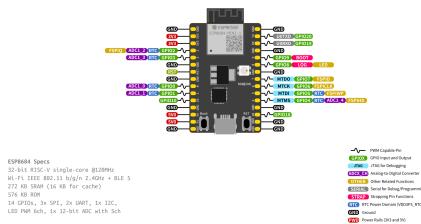


Fig. 8: ESP8684-DevKitM-1 Pin Layout (click to enlarge)

Pin Layout

Hardware Revision Details This is the first revision of this board released.

Related Documents

- [ESP8684-DevKitM-1 Schematic \(PDF\)](#)
- [ESP8684-DevKitM-1 PCB layout \(PDF\)](#)
- [ESP8684-DevKitM-1 Dimensions \(PDF\)](#)
- [ESP8684-DevKitM-1 Dimensions source file \(DXF\)](#) - You can view it with [Autodesk Viewer](#) online

For further design documentation for the board, please contact us at sales@espressif.com.

² GPIO8 and GPIO9 are strapping pins of the ESP8684 chip. These pins are used to control several chip functions depending on binary voltage values applied to the pins during chip power-up or system reset.

Chapter 2

ESP8684-DevKitC-02

The ESP8684-DevKitC-02 is an entry-level development board based on ESP8684-WROOM-02C/02UC, a general-purpose module with 2 MB/4 MB in-package flash. This board integrates complete Wi-Fi and Bluetooth LE functions.

2.1 ESP8684-DevKitC-02 v1.0

The latest version: [*ESP8684-DevKitC-02 v1.0*](#).

This user guide will help you get started with ESP8684-DevKitC-02 and will also provide more in-depth information.

The ESP8684-DevKitC-02 is an entry-level development board based on ESP8684-WROOM-02C/02UC, a general-purpose module with 2 MB/4 MB in-package flash. This board integrates complete Wi-Fi and Bluetooth LE functions.

Most of the I/O pins on the module are broken out to the pin headers on both sides of this board for easy interfacing. Developers can either connect peripherals with jumper wires or mount ESP8684-DevKitC-02 on a breadboard.

The document consists of the following major sections:

- *Getting Started*: Overview of the board and hardware/software setup instructions to get started.
- *Hardware Overview*: More detailed information about the board's hardware.
- *Hardware Revision Details*: Hardware revision history, known issues, and links to user guides for previous versions (if any) of the board.
- *Related Documents*: Links to related documentation.

2.1.1 Getting Started

This section provides a brief introduction of ESP8684-DevKitC-02, instructions on how to do the initial hardware setup and how to flash firmware onto it.

Description of Components

The key components of the board are described in a counter-clockwise direction.

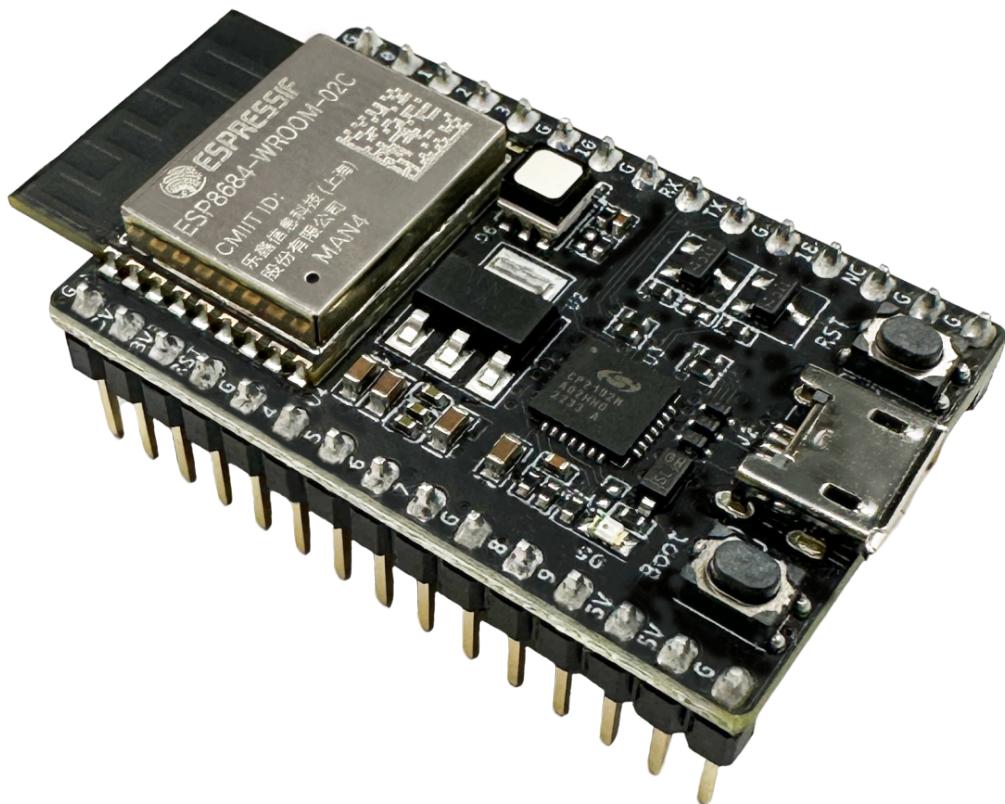


Fig. 1: ESP8684-DevKitC-02

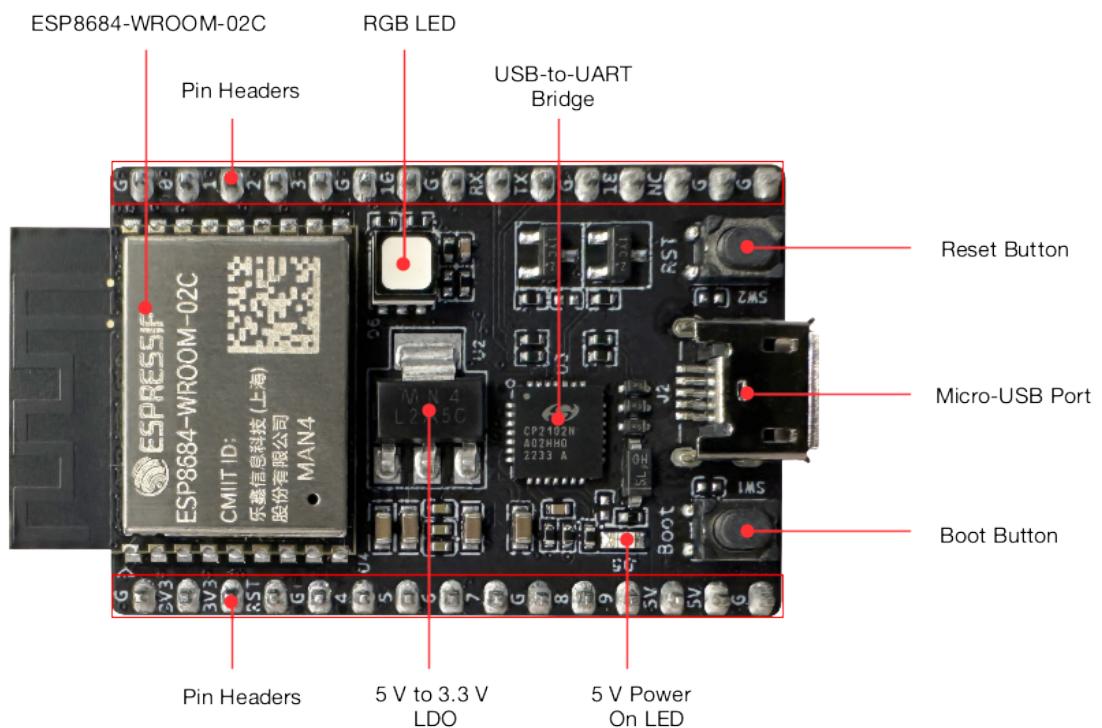


Fig. 2: ESP8684-DevKitC-02 - front

Key Component	Description
ESP8684-WROOM-02C	ESP8684-WROOM-02C from Espressif is a powerful and general-purpose module that offers Wi-Fi and Bluetooth LE coexistence. It has a PCB antenna and a 2 MB/4 MB in-package flash.
Pin Headers	Most of the GPIO pins on the module are broken out to the pin headers on the board. For details, please see Header Block .
5 V to 3.3 V LDO	Power regulator that converts a 5 V supply into a 3.3 V output.
5 V Power On LED	Turns on when the USB power is connected to the board.
Boot Button	Download button. Holding down Boot and then pressing Reset initiates Firmware Download mode for downloading firmware through the serial port.
Micro-USB Port	USB interface. Power supply for the board as well as the communication interface between a computer and the ESP8684 chip.
Reset Button	Press this button to restart the system.
USB-to-UART Bridge	Single USB-to-UART bridge chip provides transfer rates up to 3 Mbps.
RGB LED	RGB LED, driven by GPIO0, GPIO1 and GPIO8.

Start Application Development

Before powering up your board, please make sure that it is in good condition with no obvious signs of damage.

Required Hardware

- ESP8684-DevKitC-02
- USB 2.0 cable (Standard-A to Micro-B)
- Computer running Windows, Linux, or macOS

Note: Be sure to use an appropriate USB cable. Some cables are for charging only and do not provide the needed data lines nor work for programming the boards.

Software Setup Please proceed to [Get Started](#), where Section [Installation Step by Step](#) will quickly help you set up the development environment then flash an application example onto your board.

ESP-AT Support The ESP8684-DevKitC-02 supports ESP-AT software that provides a set of AT commands with which you can quickly integrate wireless connectivity features into your product without a need for embedded application development of the module on this development board.

The software is available as a pre-built binary that can be downloaded from [ESP-AT repository](#).

For more information about using ESP-AT, including information on how to customize pre-built binaries, please refer to [ESP-AT User Guide](#).

Contents and Packaging

Retail Orders If you order a few samples, each board comes in an individual package in either antistatic bag or any packaging depending on your retailer.

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Wholesale Orders If you order in bulk, the boards come in large cardboard boxes.

For wholesale orders, please go to <https://www.espressif.com/en/contact-us/sales-questions>.

2.1.2 Hardware Overview

Block Diagram

The block diagram below shows the components of ESP8684-DevKitC-02 and their interconnections.

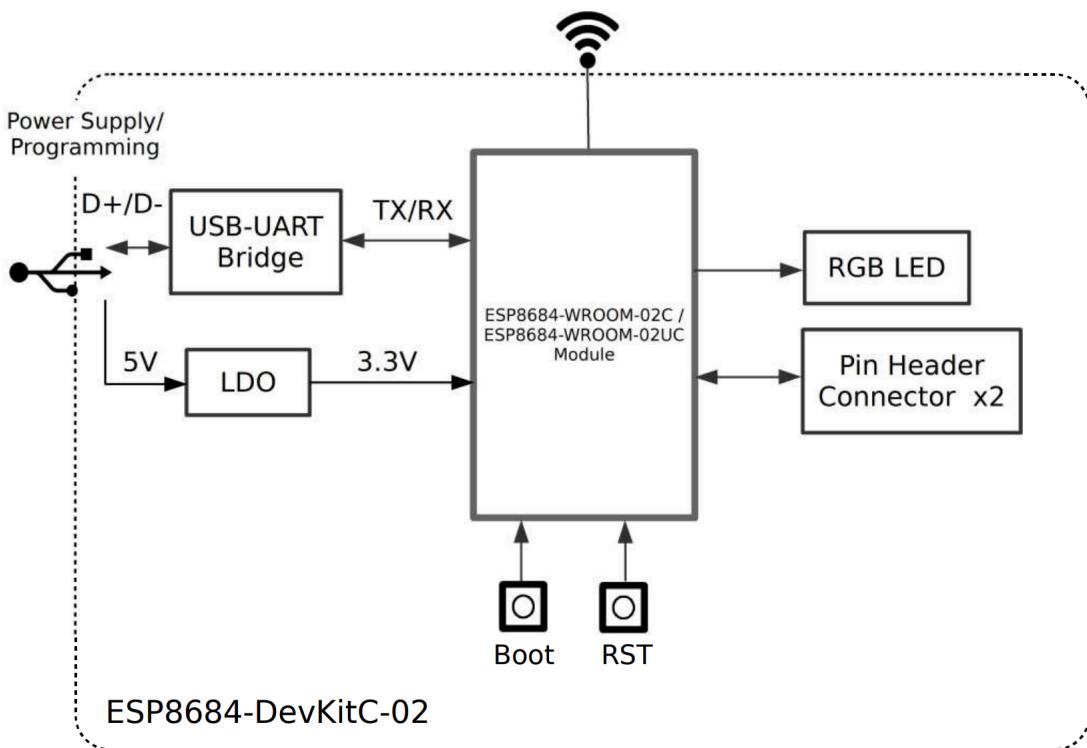


Fig. 3: ESP8684-DevKitC-02 (click to enlarge)

Power Supply Options There are three mutually exclusive ways to provide power to the board:

- Micro-USB Port, default power supply (recommended)
- 5V and G (GND) pins
- 3V3 and G (GND) pins

Header Block

The two tables below provide the **Name** and **Function** of the pins on both sides of the board (J1 and J3). The pin names are shown in [ESP8684-DevKitC-02 - front](#). The numbering is the same as in the [Board Schematic \(PDF\)](#).

J1

No.	Name	Type ¹	Function
1	G	G	Ground
2	3V3	P	3.3 V power supply
3	3V3	P	3.3 V power supply
4	RST	I	Reset; High: enable; Low: powers off; Pull up by default
5	G	G	Ground
6	4	I/O/T	GPIO4, ADC1_CH4, FSPIHD, MTMS
7	5	I/O/T	GPIO5, FSPIWP, MTDI
8	6	I/O/T	GPIO6, FSPICLK, MTCK
9	7	I/O/T	GPIO7, FSPIID , MTDO
10	G	G	Ground
11	8	I/O/T	GPIO8 ² , LED Blue
12	9	I/O/T	GPIO9 ^{Page 17, 2}
13	5V	P	5 V power supply
14	5V	P	5 V power supply
15	G	G	Ground

J3

No.	Name	Type?	Function
1	G	G	Ground
2	0	I/O/T	GPIO0, ADC1_CH0, LED Red
3	1	I/O/T	GPIO1, ADC1_CH1, LED Green
4	2	I/O/T	GPIO2, ADC1_CH2, FSPIQ
5	3	I/O/T	GPIO3, ADC1_CH3
6	G	G	Ground
7	10	I/O/T	GPIO10, FSPICS0
8	G	G	Ground
9	RX	I/O/T	GPIO19, U0RXD
10	TX	I/O/T	GPIO20, U0TXD
11	G	G	Ground
12	18	I/O/T	GPIO18
13	NC	—	—
14	G	G	Ground
15	G	G	Ground

ESP8684-DevKitC-02

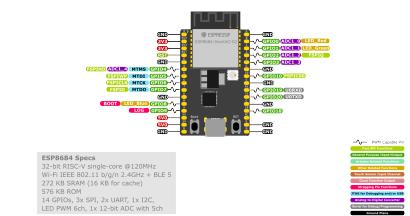


Fig. 4: ESP8684-DevKitC-02 Pin Layout (click to enlarge)

Pin Layout

¹ P: Power supply; I: Input; O: Output; T: High impedance.

² GPIO8 and GPIO9 are strapping pins of the ESP8684 chip. These pins are used to control several chip functions depending on binary voltage values applied to the pins during chip power-up or system reset. For description and application of the strapping pins, please refer to [ESP8684 Datasheet](#) > Section *Strapping Pins*.

2.1.3 Hardware Revision Details

This is the first revision of this board released.

2.1.4 Related Documents

- [ESP8684 Datasheet \(PDF\)](#)
- [ESP8684-DevKitC-02 Schematic \(PDF\)](#)
- [ESP8684-DevKitC-02 PCB layout \(PDF\)](#)
- [ESP8684-DevKitC-02 Dimensions \(PDF\)](#)
- [ESP8684-DevKitC-02 Dimensions source file \(DXF\)](#) - You can view it with [Autodesk Viewer](#) online

For further design documentation for the board, please contact us at sales@espressif.com.

Chapter 3

Related Documentation and Resources

3.1 Related Documentation

- [ESP32-C2 Datasheet](#) – Specifications of the ESP32-C2 hardware.
- [ESP32-C2 Technical Reference Manual](#) – Detailed information on how to use the ESP32-C2 memory and peripherals.
- [ESP32-C2 Hardware Design Guidelines](#) – Guidelines on how to integrate the ESP32-C2 into your hardware product.
- [ESP32-C2 Product/Process Change Notifications \(PCN\)](#)
<https://espressif.com/en/support/documents/pcns?keys=ESP32-C2>
- [ESP32-C2 Advisories](#) – Information on security, bugs, compatibility, component reliability.
<https://espressif.com/en/support/documents/advisories?keys=ESP32-C2>
- Certificates
<https://espressif.com/en/support/documents/certificates>
- Documentation Updates and Update Notification Subscription
<https://espressif.com/en/support/download/documents>

3.2 Developer Zone

- [ESP-IDF Programming Guide for ESP32-C2](#) – Extensive documentation for the ESP-IDF development framework.
- [ESP-IoT-Solution Programming Guide](#) - Extensive documentation for the ESP-IoT-Solution development framework.
- [ESP-FAQ](#) - A summary document of frequently asked questions released by Espressif.
- [ESP-IDF and other development frameworks on GitHub](#)
<https://github.com/espressif>
- [ESP32 BBS Forum](#) – Engineer-to-Engineer (E2E) Community for Espressif products where you can post questions, share knowledge, explore ideas, and help solve problems with fellow engineers.
<https://esp32.com/>
- The [ESP Journal](#) – Best Practices, Articles, and Notes from Espressif folks.
<https://blog.espressif.com/>
- See the tabs [SDKs and Demos](#), [Apps](#), [Tools](#), [AT Firmware](#).
<https://espressif.com/en/support/download/sdks-demos>

3.3 Products

- ESP32-C2 Series SoCs –Browse through all ESP32-C2 SoCs.
<https://espressif.com/en/products/socs?id=ESP32-C2>
- ESP32-C2 Series Modules –Browse through all ESP32-C2-based modules.
<https://espressif.com/en/products/modules?id=ESP32-C2>
- ESP32-C2 Series DevKits –Browse through all ESP32-C2-based devkits.
<https://espressif.com/en/products/devkits?id=ESP32-C2>
- ESP Product Selector –Find an Espressif hardware product suitable for your needs by comparing or applying filters.
<https://products.espressif.com/#/product-selector>

3.4 Contact Us

- See the tabs Sales Questions, Technical Enquiries, Circuit Schematic & PCB Design Review, Get Samples (Online stores), Become Our Supplier, Comments & Suggestions.
<https://espressif.com/en/contact-us/sales-questions>

Chapter 4

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