ESP32-C5

esp-dev-kits Documentation

Table of contents

This document provides detailed user guides and examples for ESP32-C5 series development boards.

Note: For the full list of Espressif development boards, please go to ESP DevKits.

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Chapter 1

ESP32-C5-DevKitC-1

ESP32-C5-DevKitC-1 is an entry-level development board based on the general-purpose module ESP32-C5-WROOM-1(U). This board integrates complete Wi-Fi, Bluetooth LE, Zigbee, and Thread functions.

1.1   ESP32-C5-DevKitC-1 v1.2

Older version: *ESP32-C5-DevKitC-1 v1.1*

This user guide will help you get started with ESP32-C5-DevKitC-1 and will also provide more in-depth information.

The ESP32-C5-DevKitC-1 is an entry-level development board based on the general-purpose module ESP32-C5-WROOM-1(U). This board integrates complete Wi-Fi, Bluetooth (LE), Zigbee, and Thread functions.

Most of the I/O pins are broken out to the pin headers on both sides for easy interfacing. Developers can either connect peripherals with jumper wires or mount ESP32-C5-DevKitC-1 on a breadboard.

The document consists of the following major sections:

- *Getting Started*: Overview of ESP32-C5-DevKitC-1 and hardware/software setup instructions to get started.
- *Hardware Reference*: More detailed information about the ESP32-C5-DevKitC-1's hardware.
- *Hardware Revision Details*: Information about revision history, known issues, and links to user guides for previous versions (if any).
- *Related Documents*: Links to related documentation.

1.1.1   Getting Started

This section provides a brief introduction to ESP32-C5-DevKitC-1, introducing how to perform the initial hardware setup and how to flash firmware onto the board.

Description of Components

The following list psrovides a description of the key components on the board in a clockwise direction.
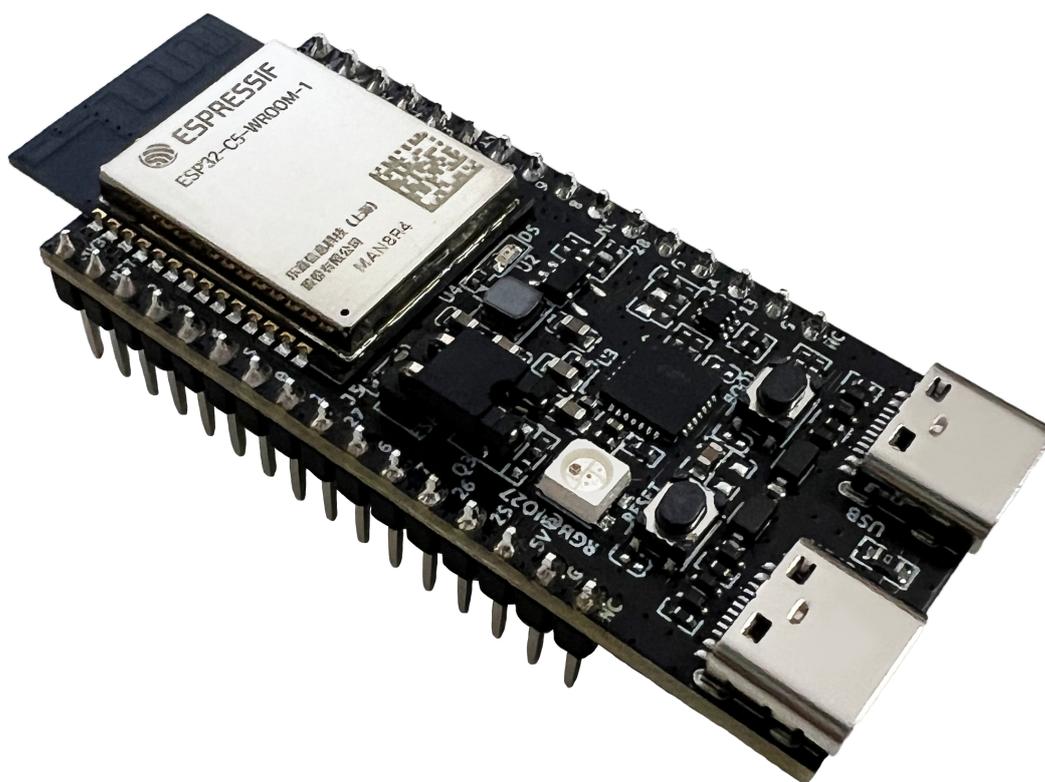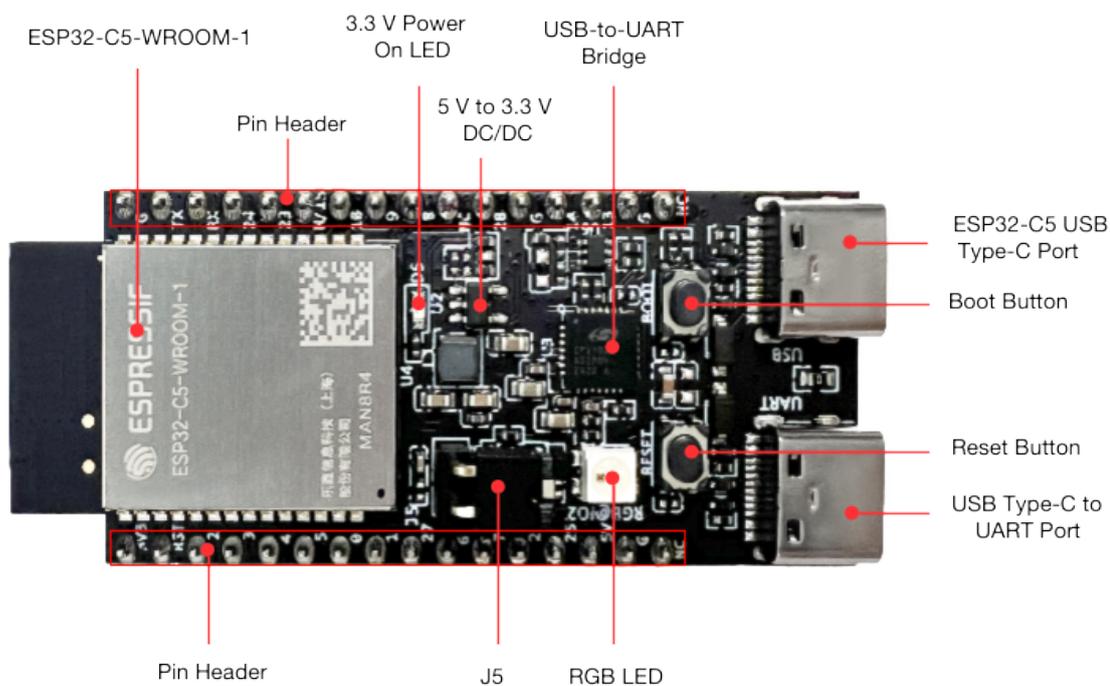
Fig. 1: ESP32-C5-DevKitC-1

Fig. 2: ESP32-C5-DevKitC-1 - front

Key Component	Description
ESP32-C5-WROOM-1(U)	ESP32-C5-WROOM-1(U) is a general-purpose module supporting Wi-Fi 6 in 2.4 & 5 GHz dual-band (802.11ax), Bluetooth® 5 (LE), Zigbee, and Thread (802.15.4) with on-board PCB antenna.
Pin Header	All available GPIO pins (except for the SPI bus for flash) are broken out to the pin headers on the board.
5 V to 3.3 V DC/DC	Power regulator that converts a 5 V supply into a 3.3 V output.
3.3 V Power On LED	Turns on when the the board is connected to USB power.
USB-to-UART Bridge	Single-chip USB-to-UART bridge offering transfer rate up to 3 Mbps.
ESP32-C5 USB Type-C Port	The USB Type-C port on the ESP32-C5 chip supports USB 2.0 full speed, with a data transfer rate of up to 12 Mbps. Note that this port does not support the 480 Mbps high-speed transfer mode. This port is used for power supply to the board, flashing applications to the chip, and communication with the chip via USB protocols, as well as for JTAG debugging.
Boot Button	Download button. Holding down **Boot** and then pressing **Reset** initiates Firmware Download mode for downloading firmware through the serial port.
Reset Button	Press this button to restart the system.
USB Type-C to UART Port	Used for power supply to the board, flashing applications to the chip, as well as communication with chip ESP32-C5 via the on-board USB-to-UART bridge.
RGB LED	Addressable RGB LED, driven by GPIO27.
J5	Used for current measurement. See details in Section *Current Measurement*.

Start Application Development

Before powering up your ESP32-C5-DevKitC-1, please make sure that it is in good condition with no obvious sign of damage.

Required Hardware

- ESP32-C5-DevKitC-1
- USB-A to USB-C cable
- Computer running Windows, Linux, or macOS

Note: Be sure to use a good quality 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 ESP-IDF Get Started, which will help you set up the development environment quickly and then flash an application example onto your board.

Contents and Packaging

Retail orders If you order a few samples, each ESP32-C5-DevKitC-1 comes in an individual package in either an antistatic bag or any other 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.

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1.1.2 Hardware Reference

Block Diagram

The block diagram below shows the components of ESP32-5-DevKitC-1 and their interconnections.
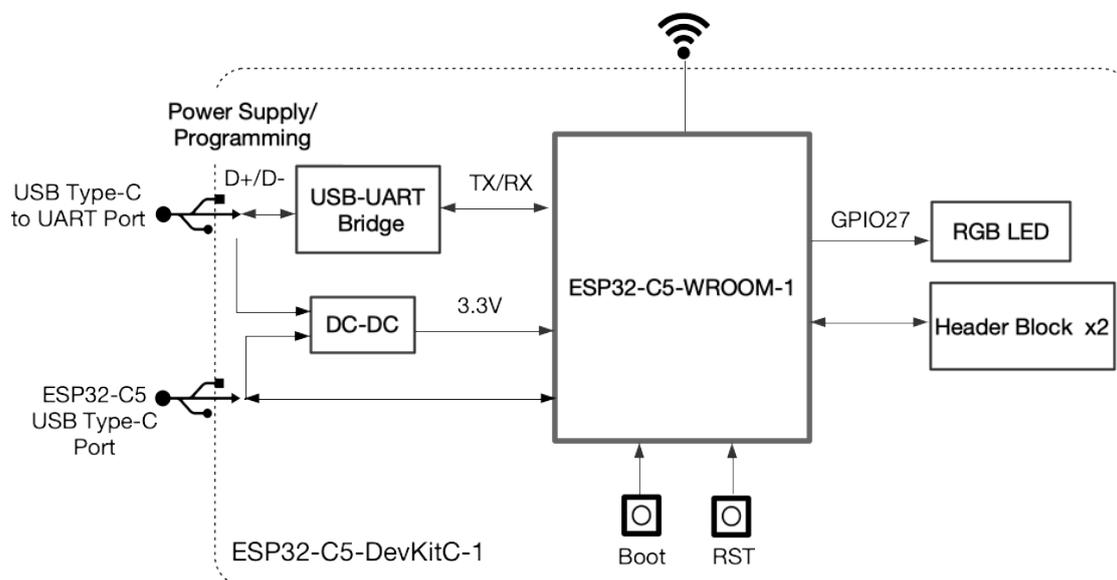

Fig. 3: ESP32-C5-DevKitC-1 (click to enlarge)

Power Supply Options

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

- USB Type-C to UART port and ESP32-C5 USB Type-C port (either one or both), default power supply (recommended)
- 5V and GND pin headers
- 3V3 and GND pin headers

Current Measurement

The J5 headers on ESP32-C5-DevKitC-1 (see J5 in Figure *ESP32-C5-DevKitC-1 - front*) can be used for measuring the current drawn by the ESP32-C5-WROOM-1(U) module:

- Remove the jumper: Power supply between the module and peripherals on the board is cut off. To measure the module's current, connect the board with an ammeter via J5 headers.
- Apply the jumper (factory default): Restore the board's normal functionality.

Note: When using 3V3 and GND pin headers to power the board, please remove the J5 jumper, and connect an ammeter in series between the external power supply and the 3V3 pin header to measure the module's current. This is because the 3V3 pin header supplies power directly to the module, bypassing the J5 headers. Removing the J5 jumper disconnects unnecessary circuits, allowing for a more accurate measurement of the module's current.

Header Block

The two tables below provide the **Name** and **Function** of the pin headers on both sides of the board (J1 and J3). The pin header names are shown in Figure *ESP32-C5-DevKitC-1 - front*. The numbering is the same as in the ESP32-

[C5-DevKitC-1 Schematic v1.2](#) (PDF).

J1

No.	Name	Type[1]	Function
1	3V3	P	3.3 V power supply
2	RST	I	High: enables the chip; Low: disables the chip.
3	2	I/O/T	MTMS[3], GPIO2, LP_GPIO2, LP_UART_RTSN, LP_I2C_SDA, ADC1_CH1, FSPIQ
4	3	I/O/T	MTDI[3], GPIO3, LP_GPIO3, LP_UART_CTSN, LP_I2C_SCL, ADC1_CH2
5	0	I/O/T	GPIO0, XTAL_32K_P, LP_GPIO0, LP_UART_DTRN
6	1	I/O/T	GPIO1, XTAL_32K_N, LP_GPIO1, LP_UART_DSRN, ADC1_CH0
7	6	I/O/T	GPIO6, LP_GPIO6, ADC1_CH5, FSPICLK
8	7	I/O/T	GPIO7[3], FSPID, SDIO_DATA1
9	8	I/O/T	GPIO8, PAD_COMP0, SDIO_DATA0
10	9	I/O/T	GPIO9, PAD_COMP1, SDIO_CLK
11	10	I/O/T	GPIO10, FSPICS0, SDIO_CMD
12	26	I/O/T	GPIO26[3],
13	25	I/O/T	GPIO25[3],
14	5V	P	5 V power supply
15	G	G	Ground
16	NC	–	No connection

J3

No.	Name	Type	Function
1	G	G	Ground
2	TX	I/O/T	U0TXD, GPIO11
3	RX	I/O/T	U0RXD, GPIO12
4	24	I/O/T	GPIO24
5	23	I/O/T	GPIO23
6	NC/15	I/O/T	No connection/GPIO15[4]
7	27	I/O/T	GPIO27[2][3]
8	4	I/O/T	MTCK, GPIO4, LP_GPIO4, LP_UART_RXD, ADC1_CH3, FSPIHD
9	5	I/O/T	MTDO, GPIO5, LP_GPIO5, LP_UART_TXD, ADC1_CH4, FSPIWP
10	NC	–	No connection
11	28	I/O/T	GPIO28[3]
12	G	G	Ground
13	14	I/O/T	GPIO14, USB_D+, SDIO_DATA2
14	13	I/O/T	GPIO13, USB_D-, SDIO_DATA3
15	G	G	Ground
16	NC	–	No connection

Pin Layout

1.1.3 Hardware Revision Details

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

[3] MTMS, MTDI, GPIO7, GPIO25, GPIO26, GPIO27, and GPIO28 are strapping pins of the ESP32-C5 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 [ESP32-C5 Datasheet](#) > Section *Boot Configurations*.

[4] In modules integrated with SPI PSRAM, this pin is already used for SPICS1 function, thus unavailable for external use. In modules without SPI PSRAM, this pin can be used as GPIO15.
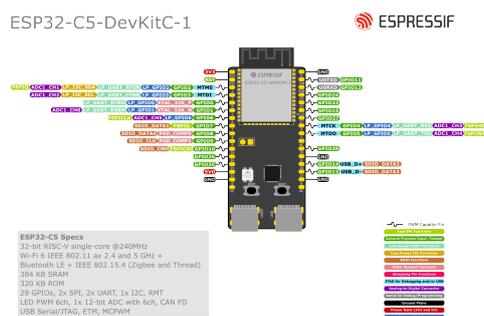
[2] Used to drive the RGB LED.

Fig. 4: ESP32-C5-DevKitC-1 Pin Layout (click to enlarge)

ESP32-C5-DevKitC-1 v1.2

For boards with the PW number of and after PW-2025-04-0446, J1 and J3 functions are updated. See details in Section *Header Block*.

Note: The PW number can be found in the product label on the large cardboard boxes for wholesale orders.

ESP32-C5-DevKitC-1 v1.1

Initial release

1.1.4 Related Documents

Please download the following documents from the HTML version of esp-dev-kits Documentation.

- ESP32-C5 Datasheet (PDF)
- ESP32-C5-WROOM-1 & ESP32-C5-WROOM-1U Datasheet (PDF)
- ESP32-C5-DevKitC-1 Schematic v1.2 (PDF)
- ESP32-C5-DevKitC-1 PCB Layout v1.2 (PDF)
- ESP32-C5-DevKitC-1 Dimensions v1.2 (PDF)
- ESP32-C5-DevKitC-1 Dimensions v1.2 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.

ESP32-C5-DevKitC-1 v1.1

Latest version: *ESP32-C5-DevKitC-1 v1.2*

This user guide will help you get started with ESP32-C5-DevKitC-1 and will also provide more in-depth information.

The ESP32-C5-DevKitC-1 is an entry-level development board based on the general-purpose module ESP32-C5-WROOM-1. This board integrates complete Wi-Fi, Bluetooth (LE), Zigbee, and Thread functions.

Most of the I/O pins are broken out to the pin headers on both sides for easy interfacing. Developers can either connect peripherals with jumper wires or mount ESP32-C5-DevKitC-1 on a breadboard.

The document consists of the following major sections:

- *Getting Started*: Overview of ESP32-C5-DevKitC-1 and hardware/software setup instructions to get started.
- *Hardware Reference*: More detailed information about the ESP32-C5-DevKitC-1's hardware.
- *Hardware Revision Details*: Information about revision history, known issues, and links to user guides for previous versions (if any).
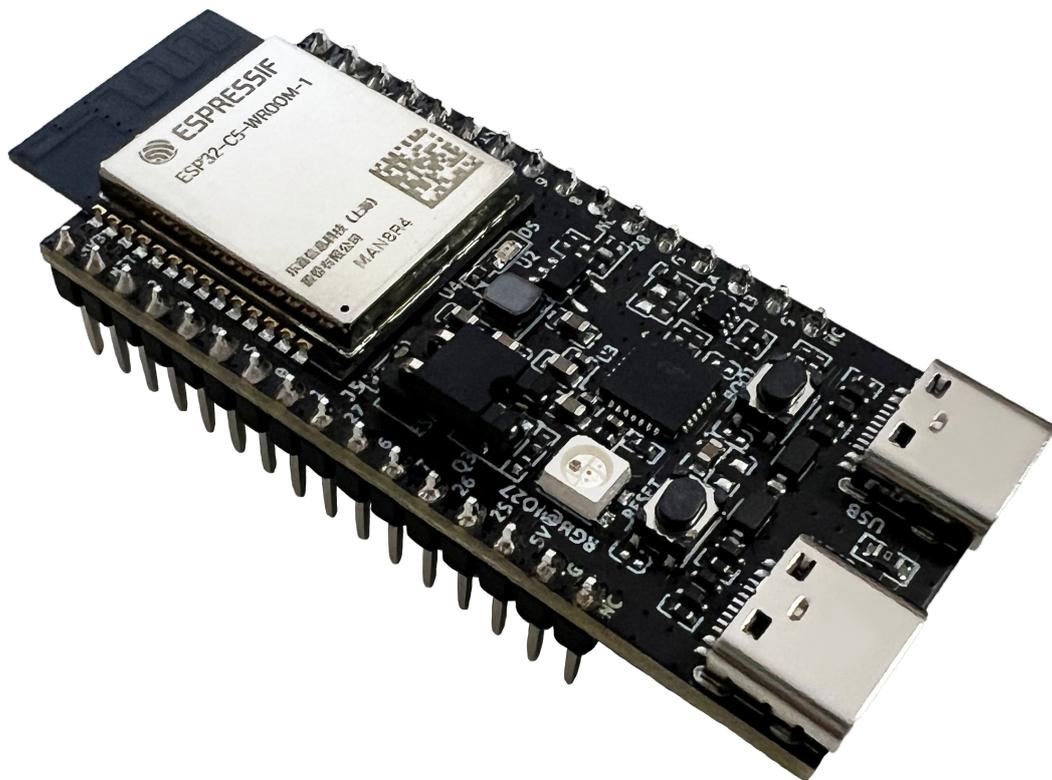
Fig. 5: ESP32-C5-DevKitC-1

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- *Related Documents*: Links to related documentation.

Getting Started   This section provides a brief introduction to ESP32-C5-DevKitC-1, introducing how to perform the initial hardware setup and how to flash firmware onto the board.
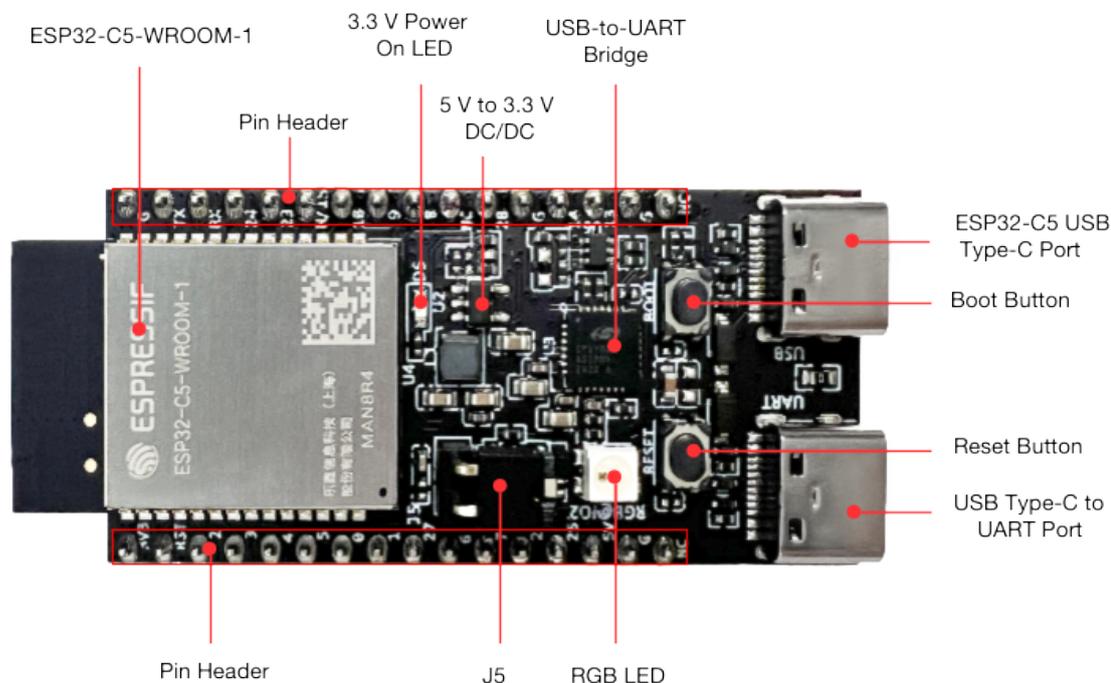

Fig. 6: ESP32-C5-DevKitC-1 - front

Description of Components   The following list psrovides a description of the key components on the board in a clockwise direction.

Key Component	Description
ESP32-C5-WROOM-1	ESP32-C5-WROOM-1 is a general-purpose module supporting Wi-Fi 6 in 2.4 & 5 GHz dual-band (802.11ax), Bluetooth® 5 (LE), Zigbee, and Thread (802.15.4) with on-board PCB antenna.
Pin Header	All available GPIO pins (except for the SPI bus for flash) are broken out to the pin headers on the board.
5 V to 3.3 V DC/DC	Power regulator that converts a 5 V supply into a 3.3 V output.
3.3 V Power On LED	Turns on when the the board is connected to USB power.
USB-to-UART Bridge	Single-chip USB-to-UART bridge offering transfer rate up to 3 Mbps.
ESP32-C5 USB Type-C Port	The USB Type-C port on the ESP32-C5 chip supports USB 2.0 full speed, with a data transfer rate of up to 12 Mbps. Note that this port does not support the 480 Mbps high-speed transfer mode. This port is used for power supply to the board, flashing applications to the chip, and communication with the chip via USB protocols, as well as for JTAG debugging.
Boot Button	Download button. Holding down **Boot** and then pressing **Reset** initiates Firmware Download mode for downloading firmware through the serial port.
Reset Button	Press this button to restart the system.
USB Type-C to UART Port	Used for power supply to the board, flashing applications to the chip, as well as communication with chip ESP32-C5 via the on-board USB-to-UART bridge.
RGB LED	Addressable RGB LED, driven by GPIO27.
J5	Used for current measurement. See details in Section *Current Measurement*.

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Start Application Development   Before powering up your ESP32-C5-DevKitC-1, please make sure that it is in good condition with no obvious sign of damage.

Required Hardware

- ESP32-C5-DevKitC-1
- USB-A to USB-C cable
- Computer running Windows, Linux, or macOS

Note: Be sure to use a good quality 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 ESP-IDF Get Started, which will help you set up the development environment quickly and then flash an application example onto your board.

ESP32-C5-DevKitC-1 v1.1 is equipped with ESP32-C5 chip revision v0.1. Support for ESP32-C5 v0.1 in ESP-IDF has been discontinued as of commit 16d7910. For ESP32-C5 v0.1 chip users, please use the last supported commit d930a38 for evaluation. See details in ESP32-C5 support status (IDFGH-13076).

Contents and Packaging

Retail orders   If you order a few samples, each ESP32-C5-DevKitC-1 comes in an individual package in either an antistatic bag or any other 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.

Hardware Reference

Block Diagram   The block diagram below shows the components of ESP32-5-DevKitC-1 and their interconnections.

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

- USB Type-C to UART port and ESP32-C5 USB Type-C port (either one or both), default power supply (recommended)
- 5V and GND pin headers
- 3V3 and GND pin headers

Current Measurement   The J5 headers on ESP32-C5-DevKitC-1 (see J5 in Figure *ESP32-C5-DevKitC-1 - front*) can be used for measuring the current drawn by the ESP32-C5-WROOM-1 module:

- Remove the jumper: Power supply between the module and peripherals on the board is cut off. To measure the module's current, connect the board with an ammeter via J5 headers.
- Apply the jumper (factory default): Restore the board's normal functionality.

Note: When using 3V3 and GND pin headers to power the board, please remove the J5 jumper, and connect an ammeter in series between the external power supply and the 3V3 pin header to measure the module's current. This
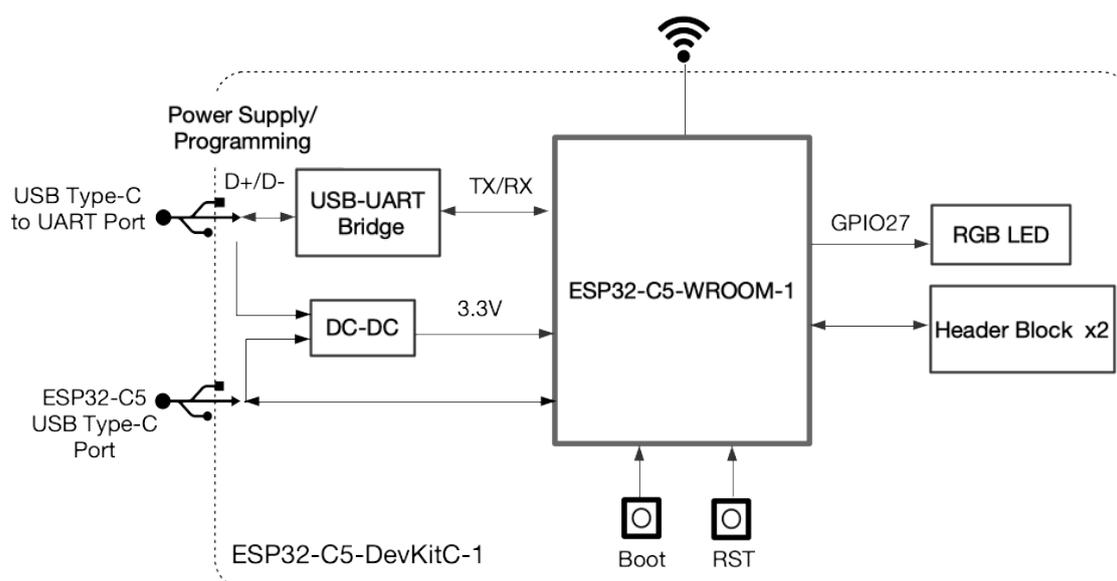
Fig. 7: ESP32-C5-DevKitC-1 (click to enlarge)

is because the 3V3 pin header supplies power directly to the module, bypassing the J5 headers. Removing the J5 jumper disconnects unnecessary circuits, allowing for a more accurate measurement of the module's current.

Header Block　　The two tables below provide the **Name** and **Function** of the pin headers on both sides of the board (J1 and J3). The pin header names are shown in Figure *ESP32-C5-DevKitC-1 - front*. The numbering is the same as in the ESP32-C5-DevKitC-1 Schematic (PDF).

J1

No.	Name	Type[1]	Function
1	3V3	P	3.3 V power supply
2	RST	I	High: enables the chip; Low: disables the chip.
3	2	I/O/T	MTMS[3], GPIO2, LP_GPIO2, LP_UART_RTSN, ADC1_CH1, FSPIQ
4	3	I/O/T	MTDI, GPIO3, LP_GPIO3, LP_UART_CTSN, ADC1_CH2
5	4	I/O/T	MTCK, GPIO4, LP_GPIO4, LP_UART_RXD, ADC1_CH3, FSPIHD
6	5	I/O/T	MTDO, GPIO5, LP_GPIO5, LP_UART_TXD, ADC1_CH4, FSPIWP
7	0	I/O/T	GPIO0, XTAL_32K_P, LP_GPIO0, LP_UART_DTRN
8	1	I/O/T	GPIO1, XTAL_32K_N, LP_GPIO1, LP_UART_DSRN, ADC1_CH0
9	27	I/O/T	GPIO27[23]
10	6	I/O/T	GPIO6, LP_GPIO6, LP_I2C_SDA, ADC1_CH5, FSPICLK
11	7	I/O/T	GPIO7[3], LP_GPIO7, LP_I2C_SCL, FSPID
12	26	I/O/T	GPIO26
13	25	I/O/T	GPIO25
14	5V	P	5 V power supply
15	G	G	Ground
16	NC	–	No connection

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

[3] MTMS, GPIO7, GPIO27, and GPIO28 are strapping pins of the ESP32-C5 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.

[2] Used to drive the RGB LED.

J3

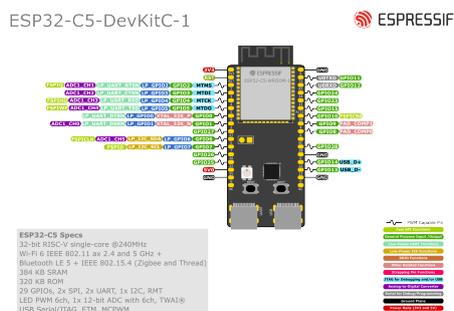| No.	Name	Type	Function
1	G	G	Ground
2	TX	I/O/T	U0TXD, GPIO11
3	RX	I/O/T	U0RXD, GPIO12
4	24	I/O/T	GPIO24
5	23	I/O/T	GPIO23
6	NC/15	I/O/T	No connection/GPIO15[4]
7	10	I/O/T	GPIO10, FSPICS0
8	9	I/O/T	GPIO9, PAD_COMP1
9	8	I/O/T	GPIO8, PAD_COMP0
10	NC	–	No connection
11	28	I/O/T	GPIO28[3]
12	G	G	Ground
13	14	I/O/T	GPIO14, USB_D+
14	13	I/O/T	GPIO13, USB_D-
15	G	G	Ground
16	NC	–	No connection

Fig. 8: ESP32-C5-DevKitC-1 Pin Layout (click to enlarge)

Pin Layout

Hardware Revision Details   This is the first revision of this board released.
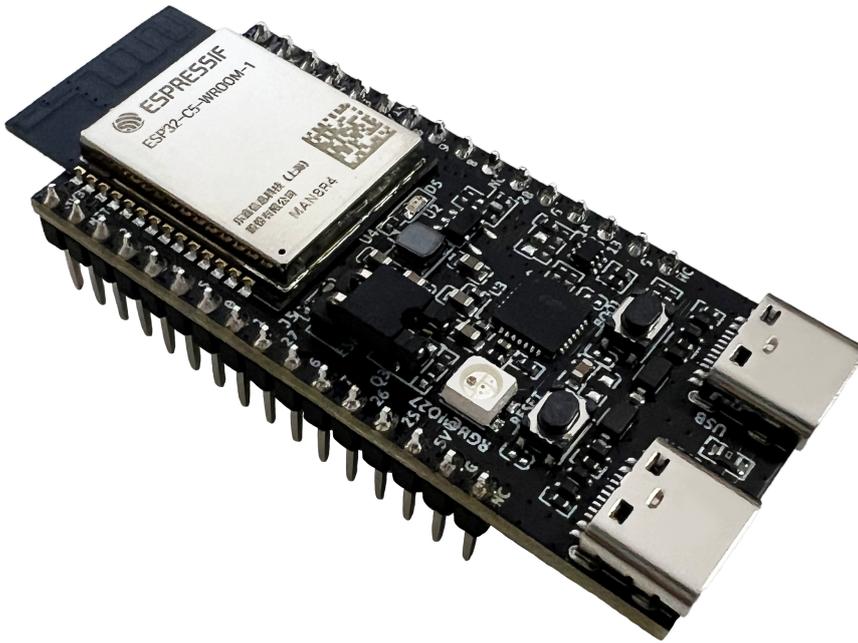
Related Documents   Please download the following documents from the HTML version of esp-dev-kits Documentation.

- ESP32-C5-DevKitC-1 Schematic (PDF)
- ESP32-C5-DevKitC-1 PCB Layout (PDF)
- ESP32-C5-DevKitC-1 Dimensions (PDF)
- ESP32-C5-DevKitC-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.

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[4] In modules integrated with SPI PSRAM, this pin is already used for SPICS1 function, thus unavailable for external use. In modules without SPI PSRAM, this pin can be used as GPIO15.

ESP32-C5 Development Boards	
ESP32-C5-DevKitC-1	

Chapter 2

Related Documentation and Resources

2.1 Developer Zone

- [ESP-IDF Programming Guide](#) –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

2.2 Products

- ESP32-C5 Series SoCs –Browse through all ESP32-C5 SoCs.
  https://espressif.com/en/products/socs?id=ESP32-C5
- ESP32-C5 Series Modules –Browse through all ESP32-C5-based modules.
  https://espressif.com/en/products/modules?id=ESP32-C5
- ESP32-C5 Series DevKits –Browse through all ESP32-C5-based devkits.
  https://espressif.com/en/products/devkits?id=ESP32-C5
- ESP Product Selector –Find an Espressif hardware product suitable for your needs by comparing or applying filters.
  https://products.espressif.com/#/product-selector

2.3 Contact Us

- See the tabs Sales Questions, Technical Enquiries, Circuit Schematic & PCB Design Review, Get Samples (Online stores), Become Our Supplier, Comments & Suggestions.
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Chapter 3

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