

Wireless Module for Crowpanel Advanced Series-ESP32-C6

DataSheet

(WiFi/WiFi6)

Wireless Module-Powered by Espressif

DataSheet

V1.2

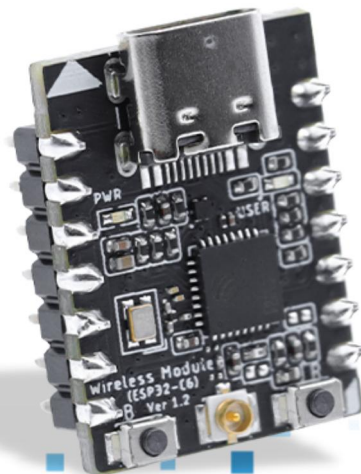


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1 Overview

1.1 Product Description

The ESP32-C6 wireless module is an IoT-specific communication module developed by Espressif Systems. Based on the high-performance ESP32-C6FH4 chip, it integrates Wi-Fi 6 (802.11ax) and Bluetooth 5.0 dual-mode technology, specifically designed for efficient interconnection of smart devices. Equipped with a single-core Xtensa® 32-bit LX7 processor, the module supports diverse communication interfaces such as SPI, UART, and I2C, meeting data processing requirements in complex scenarios. It adopts a 2.4GHz coaxial antenna, covering the full range of 2.4GHz ISM band channels to ensure stable wireless communication and wide coverage.

Featuring a highly integrated hardware design with dimensions of only 18mm×23.7mm×1.6mm, the module supports an industrial-grade operating temperature range (-40°C to +105°C). On-board BOOT/RESET buttons and LED status indicators simplify the development and debugging process. The module is mainly applied in smart home, industrial IoT, healthcare, and wearable device fields, supporting high-speed data transmission and BLE (Bluetooth Low Energy) connections. It serves as a core solution for building highly reliable and energy-efficient wireless systems.

1.2 Core Features

- **High-Performance Core:** Equipped with a single-core Xtensa® 32-bit LX7 processor running at a maximum frequency of 160MHz, delivering robust data processing capabilities.
- **Advanced Wireless Connectivity:** Integrates Wi-Fi 6 (802.11ax) and Bluetooth 5.0 (including BLE), supporting efficient and stable communication in the 2.4GHz band.
- **Multi-Protocol Support:** In addition to Wi-Fi and Bluetooth, it is compatible with Thread and Zigbee protocols, and supports the Matter standard for cross-platform smart device interconnection.
- **Rich Interfaces:** Provides various communication interfaces such as SPI, UART, I2C, and I2S, meeting peripheral connection requirements in complex application scenarios.
- **Compact Industrial-Grade Design:** With dimensions of only 18mm × 23.7mm × 1.6mm and an operating temperature range of -40°C to +105°C, it is suitable for harsh industrial environments.
- **Integrated Antenna:** External 2.4GHz omnidirectional coaxial antenna ensures excellent wireless coverage and signal quality.
- **Easy Development:** Equipped with BOOT/RESET buttons, status indicators, and an integrated USB interface, simplifying debugging and program flashing processes.

1.3 Application Fields

- **Smart Home**
- **Smart Wearables**
- **Industrial IoT (IIoT)**
- **Smart Office**
- **Healthcare**

2 Dimensions Drawing

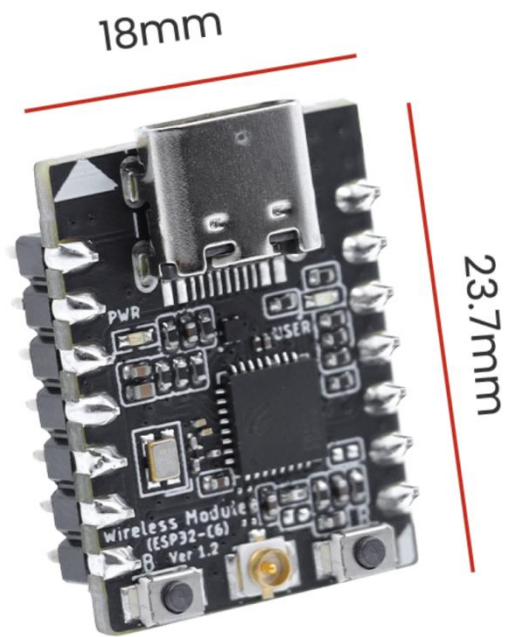


Figure 1:Dimensions Drawing

3 System Block Diagram

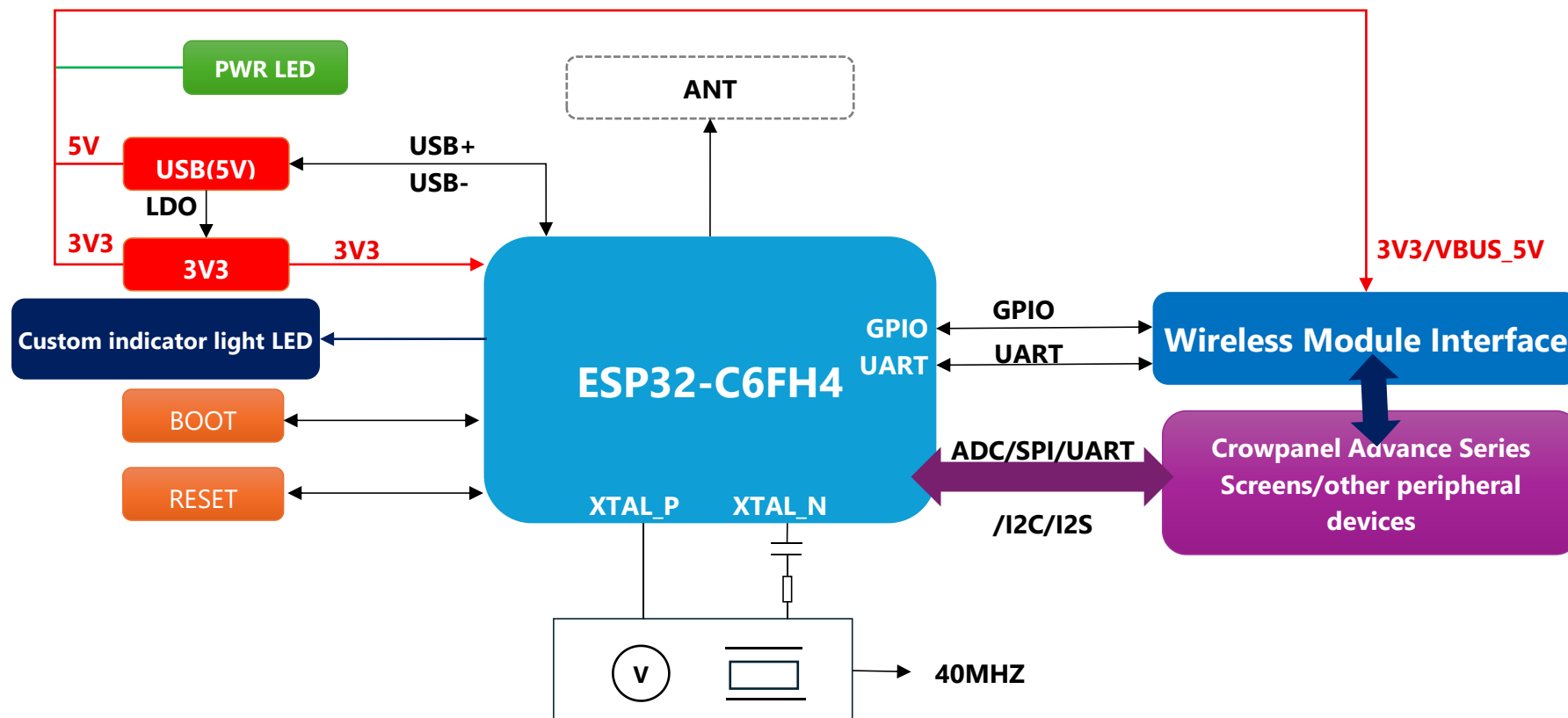


Figure 2: System Block Diagram

4 Hardware Overview

The hardware overview covers the ESP32-C6 module's interfaces, pin layout, and corresponding pin functions.

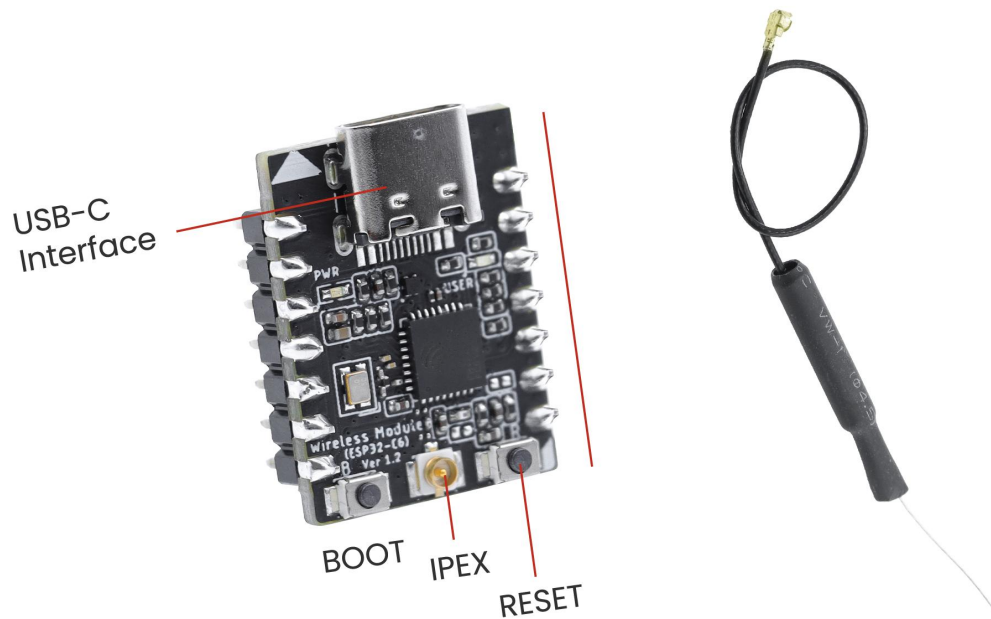


Figure 3: Module Interface Diagram

4.1 Buttons & LEDs

No.	Button Name	Silkscreen	Pin	MCU Pin	Description
1	RESET	RST	EN	CHIP_PU	Pressing the RESET button restarts the program or enables program flashing.
2	BOOT	BOOT	GPIO9	GPIO9	Press and hold the BOOT button, then press the RST button, and release the BOOT button to enter programming mode.

No.	Name	Silkscreen	Pin	MCU Pin	Color	Description
1	Power Indicator	PWR	VDD3V3	/	Green	Power indicator: stays steadily lit in green when the module is powered on.
2	User-Defined Indicator	USER	GPIO15	GPIO15	Blue	User-configurable function (for custom application scenarios).

4.2 USB Interface

No.	Name	Pin	MCU Pin	Description
1	USB-C Interface	USB+	GPIO13	Serves as the D+ differential signal positive terminal of the USB Serial/JTAG interface, a core signal pin for USB communication.
2		USB-	GPIO12	Serves as the D- differential signal negative terminal of the USB Serial/JTAG interface, forming a differential signal pair with USB+.

4.3 Antenna Interface

No.	Name	MCU Pin	Description
1	IPEX-1	ANT	External 2.4GHz coaxial antenna connection

4.4 Pin Layout

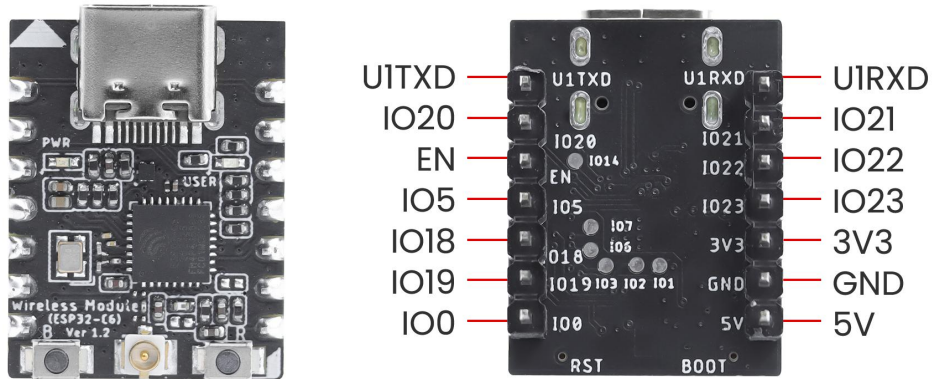


Figure 4: Module Pin Diagram

Pin Definition: The following table shows the pin definitions and descriptions of the ESP32-C6 wireless module:

Left Interface:

No.	Pin No.	Type	Pin	MCU Pin	Description
1	P\$1	I/O	U1TXD	U0TXD	UART1 Transmit Pin: Used for UART communication data transmission (TX)
2	P\$2	I/O	GPIO20	SDIO_DATA0	General Purpose Input/Output (GPIO)
3	P\$3	I/O	EN	CHIP_PU	ESP32 Enable Pin
4	P\$4	I/O	GPIO5	MTDI	General Purpose Input/Output (GPIO)
5	P\$5	I/O	GPIO18	SDIO_CMD	General Purpose Input/Output (GPIO)
6	P\$6	I/O	GPIO19	SDIO_CLK	General Purpose Input/Output (GPIO)
7	P\$7	I/O	GPIO0	XTAL_32K_P	General Purpose Input/Output (GPIO)

Right Interface:

No.	Pin No.	Type	Pin	MCU Pin	Description
1	P\$1	I/O	U1RXD	U0RXD	UART1 Receive Pin: Used for UART communication data reception (RX).
2	P\$2	I/O	GPIO21	SDIO_DATA1	General Purpose Input/Output (GPIO)
3	P\$3	I/O	GPIO22	SDIO_SATA2	General Purpose Input/Output (GPIO)
4	P\$4	I/O	GPIO23	SDIO_SATA3	General Purpose Input/Output (GPIO)
5	P\$5	VDD	VDD3V3	/	Provides 3.3V power for the analog circuit section
6	P\$6	GND	GND	/	Ground Pin
7	P\$7	PI	VBUS	/	Provides 5V power

5 Module Specifications

No.	Item	Parameter	Specification
1		Main Chip	ESP32-C6FH4 Chip
2	Core & Performance	Processor	Single-core Xtensa® 32-bit LX7 processor with a maximum operating frequency of 160MHz
3		SROM	320KB
4		ROM	448KB
5	Wireless Communication Capability	Wireless Connectivity & Bluetooth	Supports 2.4GHz band 802.11 b/g/n/ax (Wi-Fi 6) protocol Supports Bluetooth 5.0 and BLE (Bluetooth Low Energy)
6			
7		Communication Interfaces	Supports multiple communication protocols including SPI, UART, I2C, I2S, RMT, TWAI, PWM, Motor Control PWM, and SDIO
8	BLE Radio	Operating Channel Center Frequency Range	2402MHz to 2480MHz
9		RF Transmit Power Range	-15.0dBm to 20.0dBm
10	Wi-Fi RF Specifications	Operating Channel Center Frequency Range	2412MHz to 2484MHz
11		Wireless Standard	Complies with IEEE 802.11b/g/n/ax standard (Wi-Fi 6)
12		Modulation Schemes	Supports multiple modulation schemes: BPSK, QPSK, 16-QAM, 64-QAM, and 256-QAM
13		Gain	3dbi
14		Operating Frequency	2400-2500MHZ
15		Cable Length	120mm
16		Coaxial Cable Diameter	5mm
17	Antenna Characteristics	Antenna Interface	IPEX Generation 1 (IPEX-1)
18		Voltage Standing Wave Ratio (VSWR)	≤1.8
19		Antenna Efficiency	35-80%
20		Polarization	Vertical Polarization
21		Radiation Pattern	Omnidirectional
22		Feed Impedance	50Ω
23		Power Handling Capacity	33dbm

24	Package Type	Dimensions	18×23.7×1.6mm
25		Wi-Fi Communication Distance	130m
26	Electrical Characteristics	BT Communication Distance	70m
27		Operating Voltage	3.3V
28		Operating Temperature	-40°C ~ +105°C

6 Electrical Characteristics

6.1 Power Consumption Parameters

No.	Mode	Current	Power
1	Operating Power Consumption (3.3V)	80mA	264mW

6.2 Absolute Maximum Ratings

No.	Item	Description	Min	Max	Unit
1	VBUS	USB Interface Supply Voltage	-0.3	6.5	V
2	VDD	Module Interface Supply Voltage	3.0	3.6	V
3	Tstore	Storage Temperature	-40	+150	°C

6.3 Recommended Operating Conditions

No.	Item	Description	Min	Typ	Max	Unit
1	VBUS	USB Interface Supply Voltage	1.4	5	5.5	V
2	VDD	Module Interface Supply Voltage	3.0	3.3	3.6	V
3	T _A	Ambient Temperature	-40	-	+105	°C

7 Mechanical Characteristics

7.1 Module Dimensions

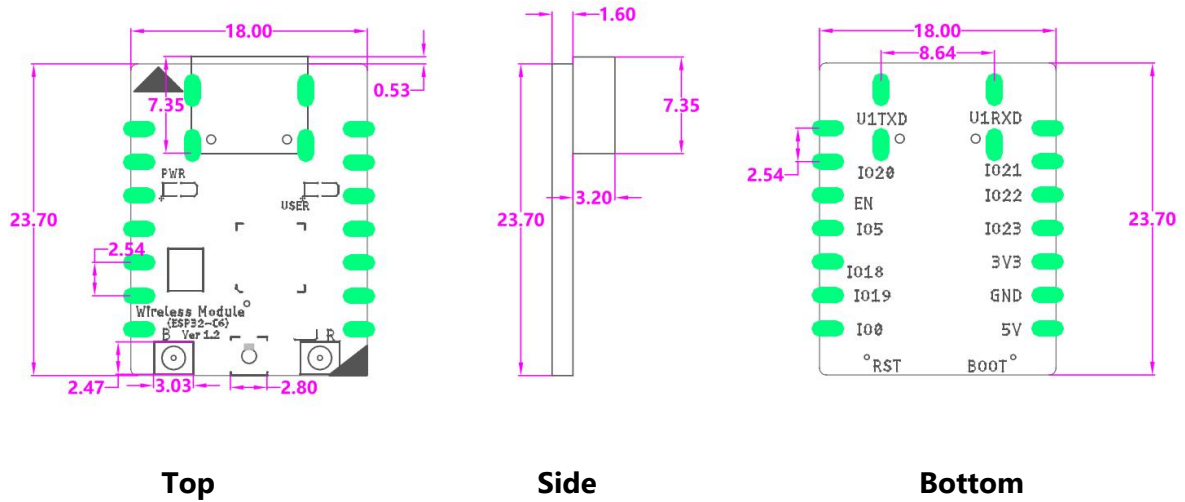


Figure 5:Outline Dimensions(Unit:mm)

7.2 Layout Recommendations

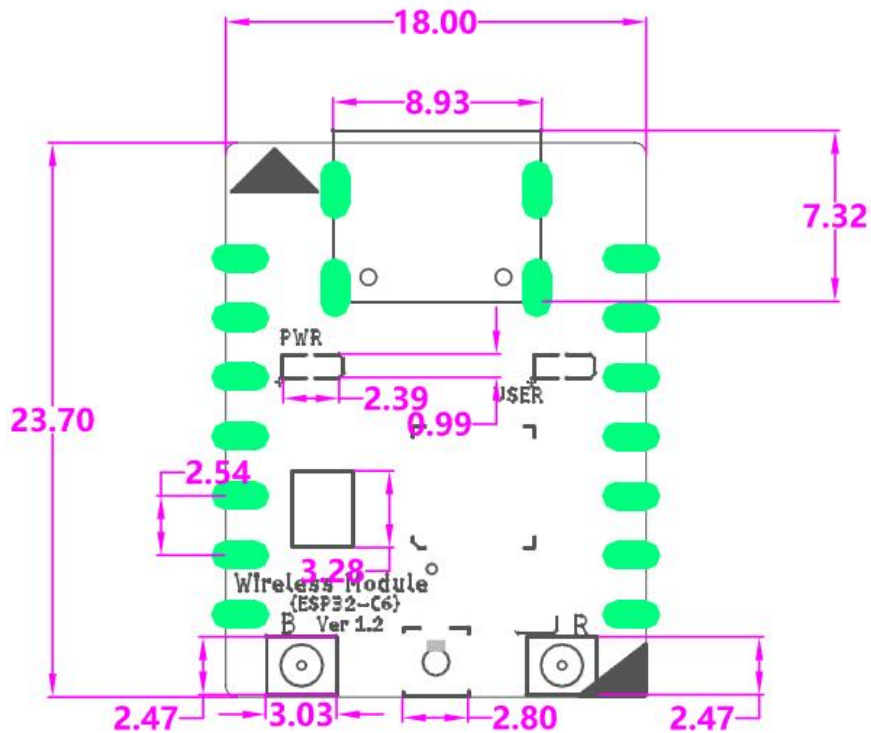


Figure 6:PCB Layout (Unit:mm)

8 Related Documents & Resources

- [ESP32-C6FH4 Datasheet](#)
- [Wireless module for Crowpanel Advanced Series](#)

9 Revision History

Date	Version	Release Notes
2026/1/2	V1.0	Initial Release