M5STICKC PLUS

M5STACK

2020

V0.01

1.OUTLINE

StickC PLUS is ESP32 board which based on ESP32-PICO-D4 module, with one LED and one button The board is made of PC+ABC.

1.1 Hardware Composition

The hardware of M5StickC PLUS: ESP32-PICO-D4 module, TFT screen, IMU, IR transmitter, Red LED, Button, GROVE interface, TypeC-to-USB interface, Power Management chip and battery.

StickT Add infrared camera**.**

ESP32- PICO-D4 is a System-in-Package (SiP) module that is based on ESP32, providing complete Wi-Fi and Bluetooth functionalities. The module integrates a 4-MB SPI flash. ESP32-PICO-D4 integrates all peripheral components seamlessly, including a crystal oscillator, flash, filter capacitors and RF matching links in one single package.

TFT Screen is a 1.14-inch color screen driven by Sitronix's ST7789 with a resolution of 135 x 240. Operating voltage range is 2.5~3.3V

IMU The MPU-6886 is a 6-axis MotionTracking device that combines a 3-axis gyroscope and a 3-axis accelerometer in a small 3 mm x 3 mm x 0.75 mm 24-pin LGA package.

Power Management chip is X-Powers's AXP192. The operating voltage range is 2.9V~6.3V and the charging current is 1.4A.

M5StickC PLUS equips ESP32 with everything needed for programming, everything needed for operation and development

2. PIN DESCRIPTION

2.1. USB INTERFACE

M5CAMREA Configuration Type-C type USB interface, support USB2.0 standard communication protocol.

2.2. GROVE INTERFACE

4p disposed pitch of 2.0mm M5CAMREA GROVE interfaces, internal wiring and GND, 5V, GPIO32, GPIO33 connected.

3. FUNCTIONAL DESCRIPTION

This chapter describes the ESP32-PICO-D4 various modules and functions.

3.1. CPU AND MEMORY

ESP32-PICO-D4 contains two low-power Xtensa® 32-bit LX6 MCU. On-chip memory comprising:

- 448-KB of ROM, and the program starts for the kernel function calls
- For a 520 KB instruction and data storage chip SRAM (including flash memory 8 KB RTC)
- RTC flash memory of 8 KB SRAM, when the RTC can be started in Deep-sleep mode, and for storing data accessed by the main CPU
- RTC slow memory, of 8 KB SRAM, can be accessed by the coprocessor in Deep-sleep mode
- Of 1 kbit of eFuse, which is a 256 bit system-specific (MAC address and a chip set); the remaining 768 bit reserved for user program, these Flash program include encryption and chip ID

3.2. STORAGE DESCRIPTION

3.2.1. External Flash and SRAM

ESP32 support multiple external QSPI flash and static random access memory (SRAM), having a hardware-based AES encryption to protect the user programs and data.

- ESP32 access external QSPI Flash and SRAM by caching. Up to 16 MB external Flash code space is mapped into the CPU, supports 8-bit, 16-bit and 32-bit access, and can execute code.
- Up to 8 MB external Flash and SRAM mapped to the CPU data space, support for 8-bit, 16-bit and 32-bit access. Flash supports only read operations, SRAM supports read and write operations.

ESP32-PICO-D4 4 MB of integrated SPI Flash, the code can be mapped into CPU space, support for 8-bit, 16-bit and 32-bit access, and can execute code. Pin GPIO6 ESP32 of, GPIO7, GPIO8, GPIO9, GPIO10 and GPIO11 for connecting module integrated SPI Flash, not recommended for other functions.

3.3. CRYSTAL

- ESP32-PICO-D4 integrates a 40 MHz crystal oscillator.

3.4. RTC MANAGEMENT AND LOW POWER CONSUMPTION

ESP32 uses advanced power management techniques may be switched between different power saving modes. (See Table 5).

- *Power saving mode*

  - Active Mode: RF chip is operating. Chip may receive and transmit a sounding signal.

  - Modem-sleep mode: CPU can run, the clock may be configured. Wi-Fi / Bluetooth baseband and RF

  - Light-sleep mode: CPU suspended. RTC and memory and peripherals ULP coprocessor operation. Any wake-up event (MAC, host, RTC timer or external interrupt) will wake up the chip.

  - Deep-sleep mode: only the RTC memory and peripherals in a working state. Wi-Fi and Bluetooth connectivity data stored in the RTC. ULP coprocessor can work.

  - Hibernation Mode: 8 MHz oscillator and a built-in coprocessor ULP are disabled. RTC memory to restore the power supply is cut off. Only one RTC clock timer located on the slow clock and some RTC GPIO at work. RTC RTC clock or timer can wake up from the GPIO Hibernation mode.

- *Deep-sleep mode*

  - related sleep mode: power save mode switching between Active, Modem-sleep, Light-sleep mode. CPU, Wi-Fi, Bluetooth, and radio preset time interval to be awakened, to ensure connection Wi-Fi / Bluetooth.

  - Ultra Low-power sensor monitoring methods: the main system is Deep-sleep mode, ULP coprocessor is periodically opened or closed to measure sensor data. The sensor measures data, ULP coprocessor decide whether to wake up the main system.

Functions in different power consumption modes: TABLE 5

Power consumption mode	Active	Modem-sleep	Light-sleep	Deep-sleep	Hibernation
Sleep mode	Associated sleep mode			Ultra low-power Sensor measures data	-
CPU	open	open	pause	close	close
Wi-Fi/Bluetooth Radio	open	open	close	close	close
RTC memory	open	open	open	open	close
ULP coprocessor	open	open	open	open/close	close

4. ELECTRICAL CHARACTERISTICS

4.1. LIMIT PARAMETERS

Table 8: Limiting values

Symbol	Parameter	Min	Max	Unit
VDD33	Power supply voltage	3.0	3.6	V
I_{output}[1]	Cumulative IO output current	-	1,100	mA
T_{store}	Storage temperature	–40	150	°C

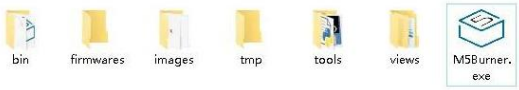
1. V_{IO} to the power supply pad, Refer ESP32 Technical Specification Appendix IO_MUX, as SD_CLK of Power supply for VDD_SDIO.

UIFlow Quick Start

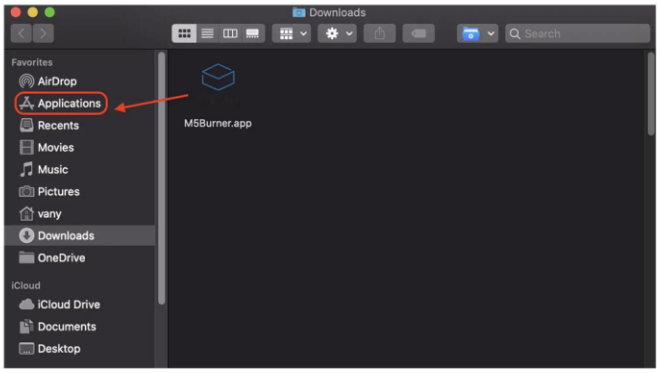
> This tutorial applies to M5StickC and M5StickC PLUS

Burning tool

> Please click the button below to download the corresponding M5Burner firmware burning tool according to your operating system. Unzip and open the application.

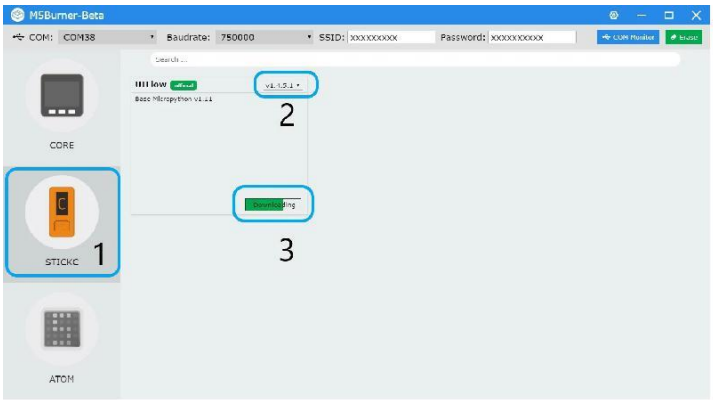


> Note: After the installation of MacOS users, please put the application in the Application folder, as shown in the figure below.

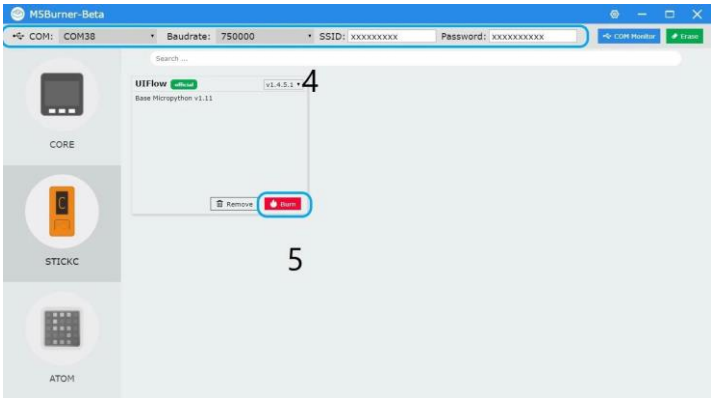


Firmware burning

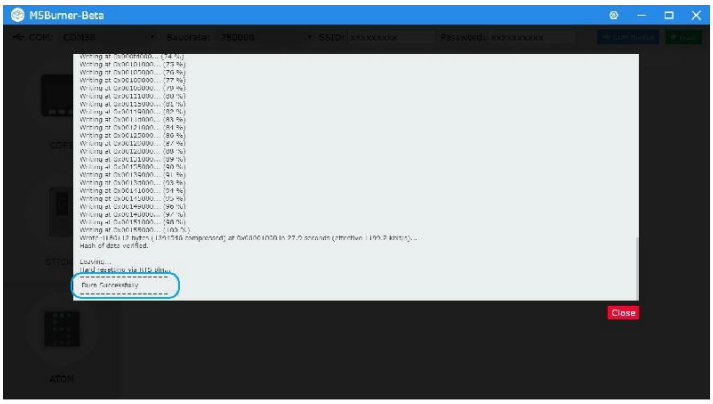
1.Double-click to open the Burner burning tool, select the corresponding device type in the left menu, select the firmware version you need, and click the download button to download.



2.Then connect the M5 device to the computer through the Type-C cable, select the corresponding COM port, the baud rate can use the default configuration in M5Burner, in addition, you can also fill in the WIFI that the device will be connected to during the firmware burning stage information. After configuration, click "Burn" to start burning.



> 3.When the burning log prompts Burn Successfully , it means that the firmware has been burned.



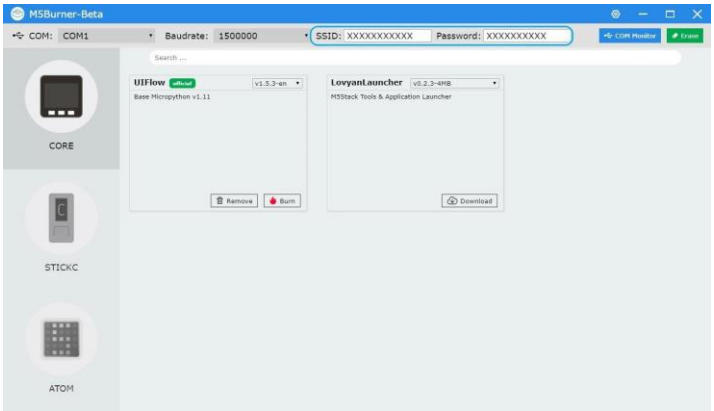
> When first burning or the firmware program runs abnormally, you can click "Erase" to erase the flash memory. In the subsequent firmware update, there is no need to erase again, otherwise the saved Wi-Fi information will be deleted and the API Key will be refreshed.

Configure WIFI

> UIFlow provides both offline and web version of the programmer. When using the web version, we need to configure a WiFi connection for the device. The following describes two ways to configure WiFi connection for the device (Burn configuration and AP hotspot configuration).

Burn configuration WiFi(recommend)

> UIFlow-1.5.4 and versions above can write WiFi information directly through M5Burner.

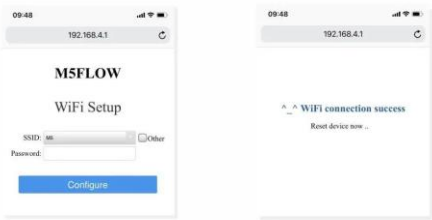


AP hotspot configuration WiFi

1. Press and hold the power button on the left to turn on the machine. If WiFi is not configured, the system will automatically enter the network configuration mode when it is turned on for the first time. Suppose you want to re-enter the network configuration mode after running other programs, you can refer to the operation below. After the UIFlow Logo appears at startup, quickly click the Home button (center M5 button) to enter the configuration page. Press the button on the right side of the fuselage to switch the option to Setting, and press the Home button to confirm. Press the right button to switch the option to WiFi Setting, press the Home button to confirm, and start the configuration.

2. After successfully connecting to the hotspot with your mobile phone, open the mobile phone browser to scan the QR code on the screen or directly access **192.168.4.1**, enter the page to fill in your personal WIFI information, and click Configure to record your WiFi information. The device will restart automatically after successfully configuring and enter programming mode.

Note: Special characters such as "space" are not allowed in the configured WiFi information.



Network Programming Mode and API KEY

Enter network programming mode

Network programming mode is a docking mode between M5 device and UIFlow web programming platform. The screen will show the current network connection status of the device. When the indicator is green, it means that you can receive program push at any time. Under default situation, after the first successful WiFi network configuration, the device will automatically restart and enter the network programming mode. If you do not know how to re-enter the programming mode after running other applications, you can refer to the following operations.

restarting, press button A in the main menu interface to select the programming mode and wait till the right indicator of the network indicator to turn green in the programming mode page. Access UIFlow programming page by visiting flow.m5stack.com on a computer browser.

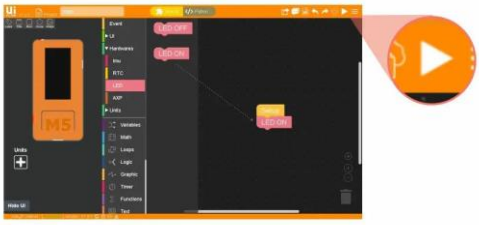
API KEY Pairing

API KEY is the communication credential for M5 devices when using UIFlow web programming. By configuring the corresponding API KEY on the UIFlow side, the program can be pushed for the specific device. The user needs to visit flow.m5stack.com in the computer web browser to enter the UIFlow programming page. Click the setting button in the menu bar at the upper right corner of the page, enter the API Key on the corresponding device, select the hardware used, click OK to save and wait till it prompts successfully connecting.

Light up LED

Complete the above steps, then you can start programming with UIFlow.
The following will show you a simple program to drive M5StickC to light

> up the LED indicator. (1. Drag the LED to light up the program block. 2. Splice to the Setup initialization program. 3 Click the Run button in the upper right corner)



UIFlow Desktop IDE

> UIFlow Desktop IDE is an offline version of UIFlow programmer which does not require network connection, and can provide you with responsive program push experience. Please click the corresponding version of **UIFlow-Desktop-IDE** to download according to your operating system .

Windows10

MacOS

Linux

USB programming mode

> Unzip the downloaded UIFlow Desktop IDE archive and double-click to run the application.

After the app starts, it will automatically detect whether your computer has a USB driver (CP210X), click Install, and follow the prompts to finish installation. (M5StickC does not require a CP210X driver, so users can choose to install or skip)

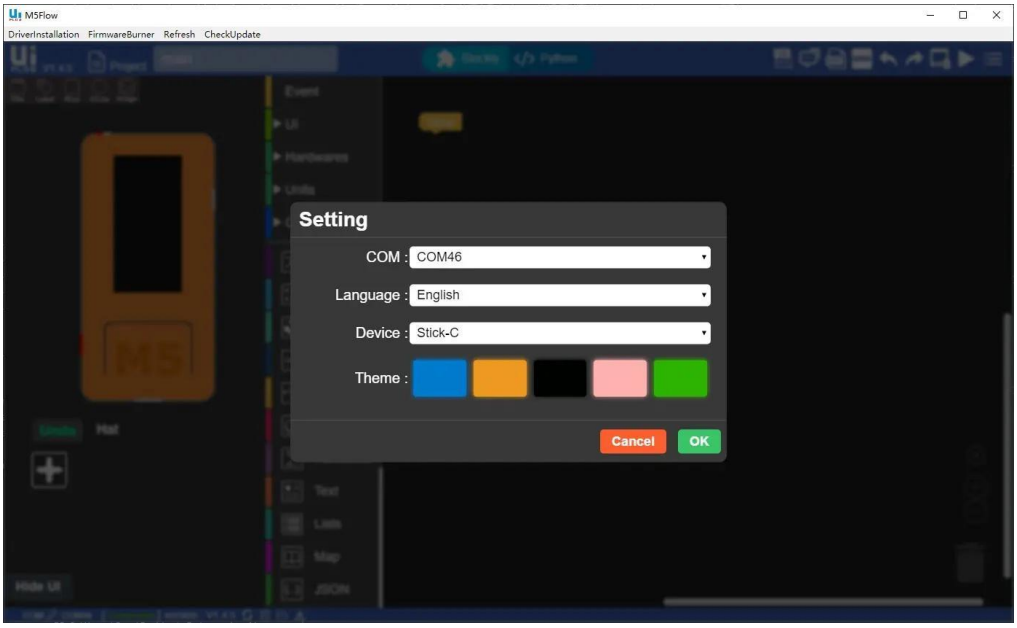
After the app starts, it will automatically detect whether your computer has a USB driver (CP210X), click Install, and follow the prompts to finish installation. (M5StickC does not require a CP210X driver, so users can choose to install or skip)

After the driver installation is complete, it will automatically enter the UIFlow Desktop IDE and automatically pop up the configuration box. At this time, connect the M5 device to the computer through the Tpye-C data cable.

Using UIFlow Desktop IDE requires M5 device with UIFlow firmware and enter ** USB programming mode **.

> Click the power button on the left side of the device to restart, after entering the menu, quickly click the right button to select **USB mode**.

> Select the corresponding port, and the programming device, click OK to connect.



BLE UART

Function Description

> Establish Bluetooth connection and enable Bluetooth passthrough service.

- **Init ble uart name** Initialize settings, configure Bluetooth device name.
- **BLE UART Writre** Send data using BLE UART.
- **BLE UART remain cache** Check the number of bytes of BLE UART data.
- **BLE UART read all** Read all data in BLE UART cache.
- **BLE UART read characters** Read n data in BLE UART cache.

Instructions

Establish Bluetooth passthrough connection and send on / off control LED.

Related Links

- M5StickC IoT Getting Started Tutorial
- UIFlow Block introduction

FCC Statement

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and(2) This device must accept any interference received, including interference that may cause undesired operation. Exposure Statement Exposure Statement Exposure Statement Exposure Statement Note: This equipment has been tested and found to comply with the limits for a Class B digital device,
pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
—Reorient or relocate the receiving antenna.
—Increase the separation between the equipment and receiver.
—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
—Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement:
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment .This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.

Press and hold the side power button for two seconds to start the device. Press and hold for more than 6 seconds to turn off the device. Switch to the photo mode through the Home screen, and the avatar that can be obtained through the camera is displayed on the tft screen.The USB cable must be connected when working, and the lithium battery is used for short-term storage to prevent power failure