Flash Download Tool

User Guide

Related Product

ESP32 series
ESP8266 series
ESP32-S2 series
ESP32-C3 series
ESP32-S3 series

Version 1.4
Espressif Systems
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About This Guide

This document describes how to download and configure firmware on Espressif modules, using Espressif's Flash Download Tool. It also lists some frequently asked questions and answers. This document is applicable to Flash Download Tool V3.9.0 and later versions.

Release notes

Date	Version	Release notes
2018.08	V1.0	Initial release.
2019.03	V1.1	• Updated Sections 3.2.2.5, 3.5, 5.1, and Appendix A; • Added Section 4.1.3; • Removed Section 5.6.
2020.04	V1.2	• Update a typo in Section 4.3; • Update the description of the note in Section 4.3.
2020.07	V1.3	• Added feedback links.
2021.12	V1.4	• Added description of mass production mode. • Updated description of encryption configuration. • Updated ways of selecting chips. • Deleted RFConfig Chapter. • Simplified document structure. • Deleted description of flash size configuration. • Deleted description of spi auto set configuration. • Deleted description of GPIO configuration interface. • Support download over USB. • Simplified document description. • Updated document format.

Documentation Change Notification

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Certification

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1. Preparation

The software and hardware resources required for downloading firmware to flash are listed below.

- Hardware:
  - 1 x module to which firmware is downloaded
  - 1 x PC (Windows 7, Windows 10)
- Software:

  Download Tool: *Flash Download Tool* (For the detailed structure of this tool, please refer to Appendix A.)

2. Tool Overview

2.1. User Interface

Open the Flash Download Tool package, double-click the .exe file to enter the main interface of the tool, as shown in the figure below:

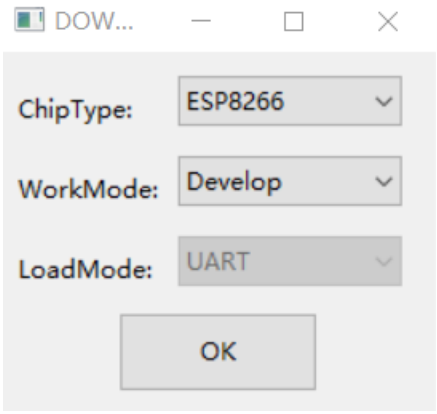


Figure 2-1. Flash Download Tool Main Interface

ChipType: select the chip type according to what product you use.

WorkMode: work mode of the tool. Below are the differences between the two modes supported currently – Develop and Factory modes.

- Developer mode uses the absolute path of the firmware and only allows flashing firmware to one chip at a time.
- Factory mode uses a relative path. It is recommended to place the firmware to flash in the bin directory of this tool package. It will be automatically saved locally when closed after configuration.
- Selecting Factory mode leads you to a locked interface in order to prevent misoperation by your mouse. Please click the **LockSettings** button to enable editing.

LoadMode: Download interface. Currently, ESP8266, ESP8285, and ESP32 only support UART, and other chip types support both UART and USB.

2.2. SPIDownload Tab

2.2.1. Configuration Description

- **Download Path Config**

  You can configure the firmware loading path and downloading address (in hexadecimal format), such as 0x1000.

- **SPI Flash Config**
  - **SPI SPEED**: SPI boot rate.

- **SPI MODE**: SPI boot mode.
- **DETECTED INFO**: flash & crystal oscillator information that are detected automatically.
- **DoNotChgBin**: If it is enabled, the tool flashes the original content of the bin file. If not enabled, the tool updates the firmware according to the **SPI SPEED**, **SPI MODE** configuration on the interface before flashing.
- **CombineBin** button: combines all the selected firmware in **Download Path Config** into one firmware. If **DoNotChgBin** is enabled, combine the original firmwares. If **DoNotChgBin** is not enabled, combine them according to the **SPI SPEED** and **SPI MODE** configuration. Any unused areas between firmware files will be filled with 0xff. The combined firmware will be saved as *./combine/target.bin*. Each click of this button will overwrite the previous firmware.

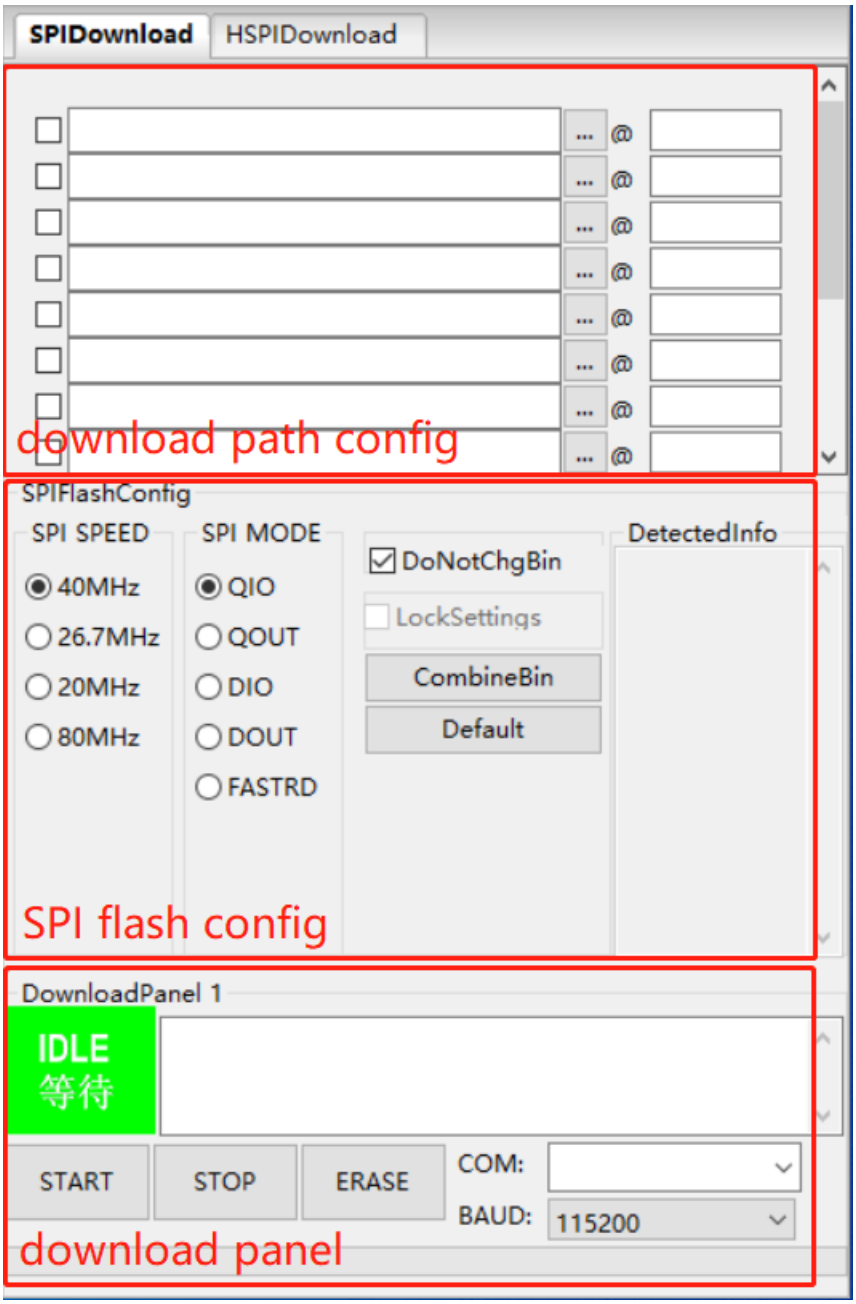


Figure 2-2. SPIDownload Tab

- **Default** button: restores the SPI configuration to the default values.

- **Download Panel**
  - **START**: start downloading
  - **STOP**: stop downloading
  - **ERASE**: erase the entire flash
  - **COM**: serial port used for downloading
  - **BAUD**: baud rate

2.3. HSPIDownload Tab

The **SPIDownload** tab is needed only for the ESP8266 series of chips that connect to external flash via HSPI. It has the same interface as the **HSPIDownload** tab, so please refer to Section 2.2 SPIDownload Tab for interface description.

2.4. FactoryMultiDownload Tab

- **Factory** mode uses the relative path. By default, the tool loads the firmware from the bin folder of the tool directory. Whereas, **Develop** mode uses the absolute path. The advantage of the **Factory** mode is that as long as the firmware to flash remains in the bin folder of the tool directory, path problems will not occur when the tool package is copied to other factory computers.
- In **Factory** mode, the tool enables **LockSettings** by default. When **LockSettings** is enabled, firmware **download path config** and **SPI flash config** cannot be configured. This is to prevent production line workers from accidentally clicking and causing errors. (When factory managers need to configure these settings, they can click **LockSettings** to unlock.)

Figure 2-3. FactoryMultiDownload Tab

The **download path config** and **SPI flash config** section on the **FactoryMultiDownload** are basically the same as those on the **SPIDownload** tab. Please refer to Section 2.2 SPIDownload Tab for descriptions. Do not forget to configure the serial port number and baud rate of each download panel.

3. Download Example

This chapter takes the ESP32 series as an example to demonstrate how to perform both regular and encrypted download operations. At present, all chips series support regular download, and only ESP32 supports encrypted download. Other chip series will support encrypted download later.

3.1. Regular Download Example

1. Set the device to download mode:
   - ESP32, ESP32-S2, ESP32-S3, ESP8266: pull GPIO0 low to enter the download mode.
   - ESP32-C3: pull GPIO9 low and GPIO8 high to enter the downloading mode.
2. Open the download tool, set **ChipType** to ESP32, **WorkMode** to Develop, and **LoadMode** to UART as shown in the figure below. Then, click **OK**

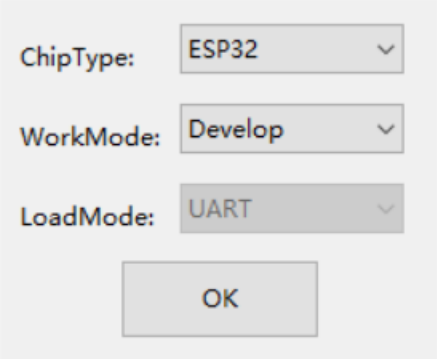


Figure 3-1. Selecting Device — ESP32 Download Tool

3. In the appeared download page, enter the path to the bin file and the address where it should be downloaded, check the box before the path, and select **SPI SPEED**, **SPI MODE**, **COM**, and **BAUD** according to your actual needs.
4. Click **START** to start downloading. During the download process, the tool will read the flash information and the chip's MAC address.
5. After the download is complete, the tool interface is shown in Figure 3-2.

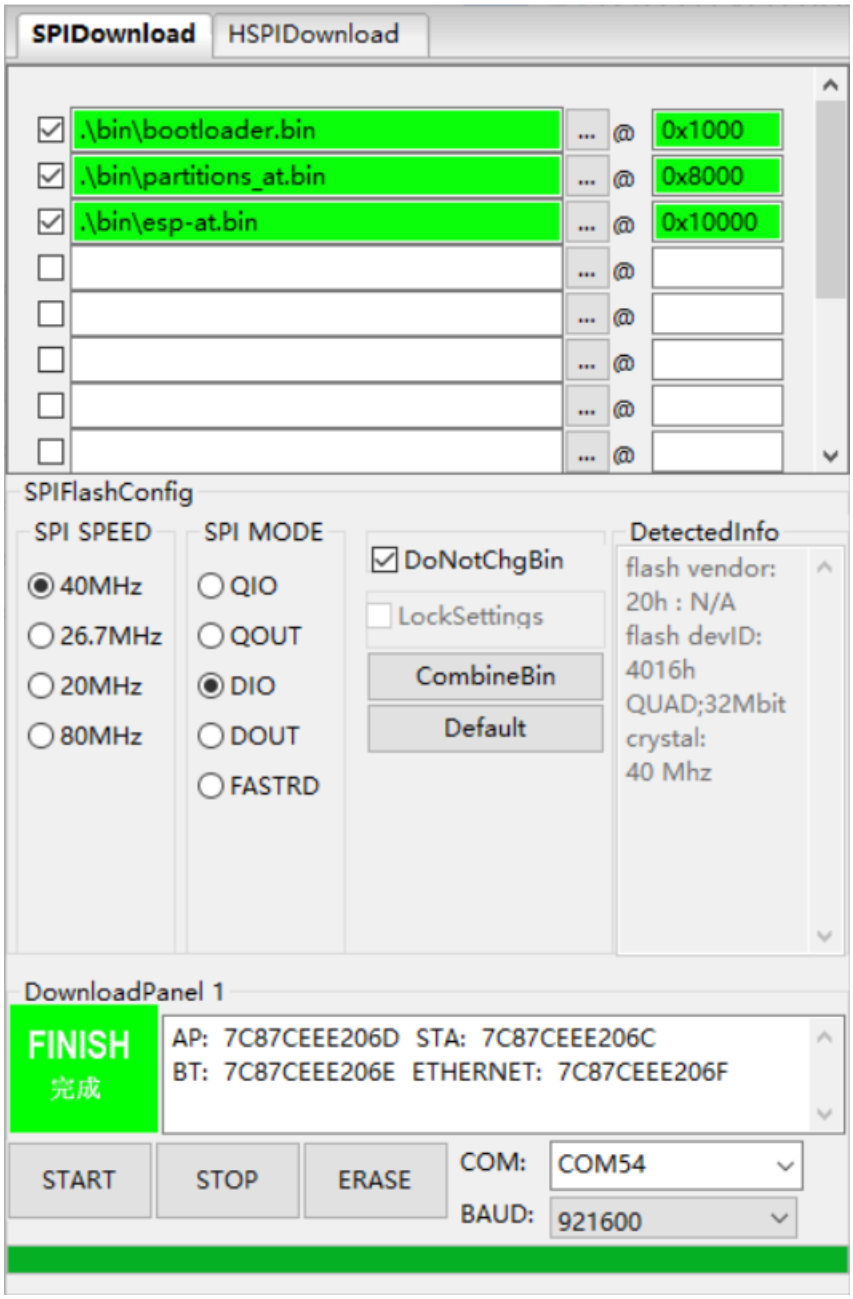


Figure 3-2. Download Completed

3.2. Enable Encryption for Firmware Downloading

To configure the encryption function, open the configuration file *./configure/esp32/security.conf* in Notepad. If there is no such file when you open it for the first time, restart the tool and open the file again. The following options are available to be configured (True: enable; False: disable):

- [SECURE BOOT]

  secure boot related configurations:

  - secure_boot_en = False (Disable secure boot)

- [FLASH ENCRYPTION]

  flash encryption related configurations:

- flash_encryption_en = False (Disable flash encryption)
- reserved_burn_times = 3 (How many times [3 in this case] are reserved for the flashing operation.)

- [ENCRYPTION KEYS SAVE]

  encryption key related configurations:

  - keys_save_enable = False (Disable saving the key. It is disabled by default.)
  - encrypt_keys_enable = False (Disable encrypting the key.)
  - encrypt_keys_aeskey_path = (If you encrypt the key, please fill in the key file here, such as ./my_aeskey.bin)

- [DISABLE FUNC]

  flash encryption related configurations:

  - jtag_disable = False
  - dl_encrypt_disable = False
  - dl_decrypt_disable = False
  - dl_cache_disable = False

- There will be a prompt message (shown below) when the tool is running. Check if the message is correct. The figure below shows the prompt message of enabling both flash encryption and secure boot:

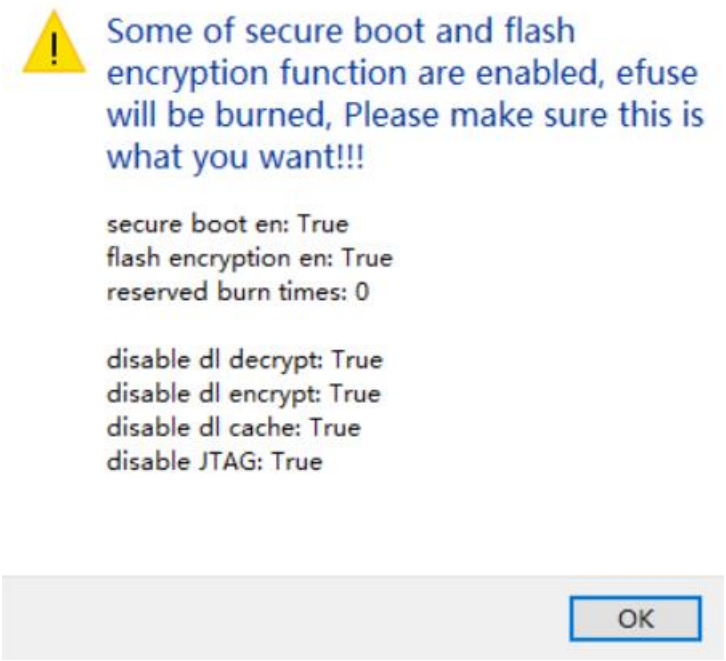


Figure 3-3. Prompt Message of Enabling Flash Encryption and Secure Boot

- During the firmware flashing process, the key and other information will be flashed into the chip's eFuse. After the flashing process is completed, "**FINISH/完成**" will be displayed.

Note:

Prior to downloading, the tool verifies the eFuse information, so as to prevent re-downloading to and damaging the encrypted module.

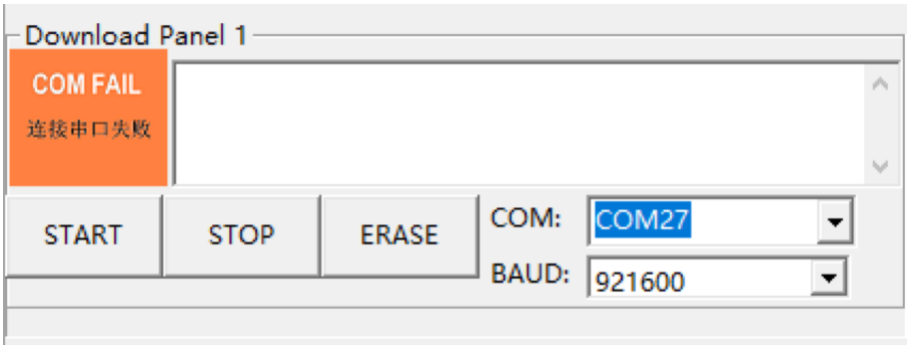
4. FAQ

4.1. COM Related Errors

1. I cannot find the serial port that I am using in the *COM* drop-down menu when I open the Flash Download Tool.

   A: First go to the device manager and check if the serial port has been successfully installed. If not, check the driver for any possible issues.

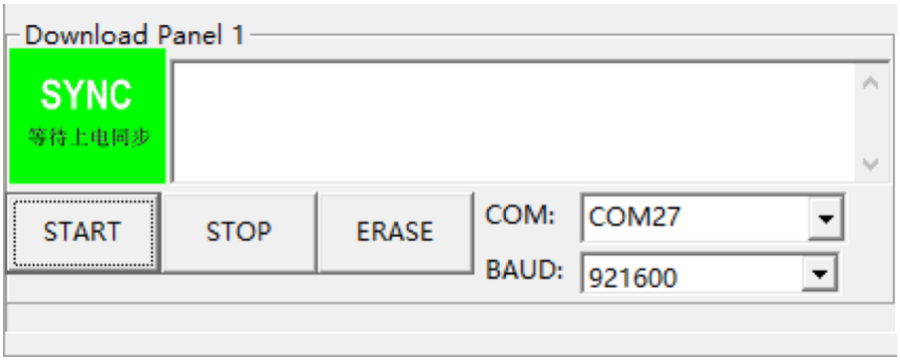
2. I get the *"COM FAIL/连接串口失败"* error message, as shown in the Figure below:



   A: Firstly, make sure the selected COM is correct; Then, check if the COM is already occupied by another thread.

4.2. Synchronization Related Errors

1. The Flash Download Tool is stuck at the step shown in the figure below. How can I fix this?



   A: This may happen for the reasons given below.

   - Hardware: The module is not in download mode.
   - Software: The module selected in the tool is not the one you are actually using.

4.3. eFuse Related Errors

1. I click the **START** button, and get the error shown in the figure below.

A: You will get the *"ESP8266 Chip efuse check error esp_check_mac_and_efuse"* message when there are errors related to the eFuse. The possible causes are as follows:

- The eFuse is OK, but the module selected in the tool is not the one that is actually being used. In this situation, please select the module type based on your actual case.
- There are problems with the eFuse of the module. In this case, please contact Espressif to obtain the required esptool.exe and operating instructions. Also, send the data that is read from eFuse to Espressif for further debugging.

4.4. Download Related Errors

1. Errors occur during downloading.

   A: Please check the following:

   - The TX/RX of the module is not used by other software programs.
   - The module flash size is no less than the size of firmware to be downloaded.
   - If there is an MD5 verification error, erase the entire flash and try downloading again.

4.5. Operation Related Errors

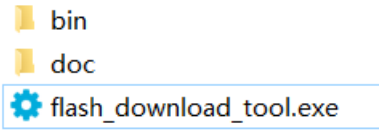
1. The module crashes when powered on again after the firmware has been downloaded.

   A: If the downloaded firmware works fine, then please check the following:

   - The module selected in the tool is not the one you are actually using.
   - The selected flash boot mode is wrong.
   - The selected flash download mode is wrong.

Appendix A. Contents of the Flash Download Tool Folder

The figure below shows what the Flash Download Tool folder contains.



- doc folder: stores instruction documentation
- bin folder: stores firmware to be flashed
- flash_download_tool.exe: executable file of the Flash Download Tool.

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