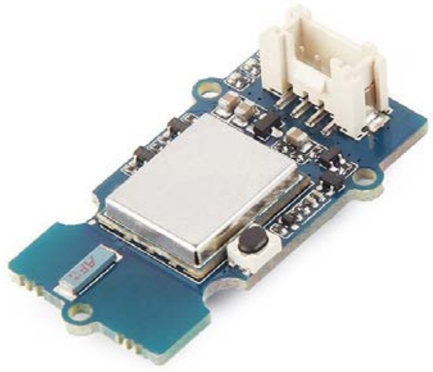
Grove - UART Wi-Fi

Introduction



Grove - UART WiFi is a serial transceiver module featuring the ubiquitous ESP8266 IoT SoC. With integrated TCP/IP protocol stack, this module lets your micro-controller interact with WiFi networks with only a few lines of code. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning you can send simple text commands to control the device. The SoC features integrated WEP, WPA/WPA2, TKIP, AES, and WAPI engines, can act as an access point with DHCP, can join existing WiFi networks and has configurable MAC and IP addresses.

Features

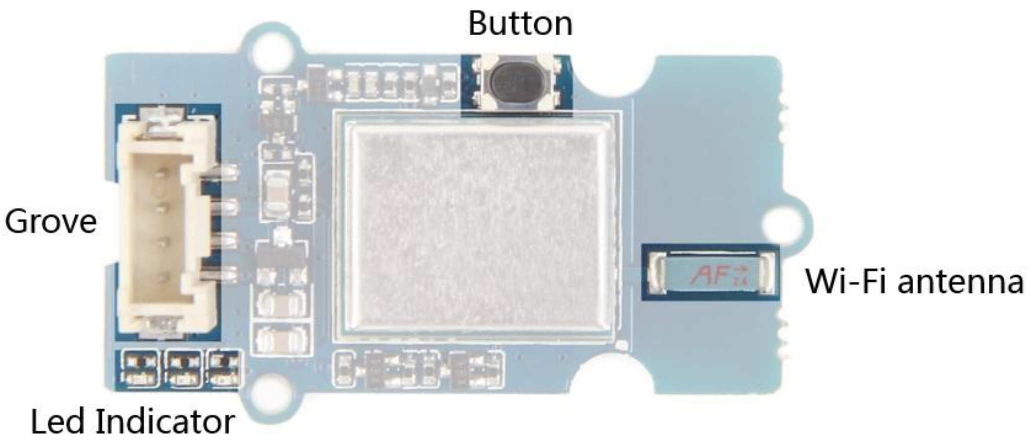
- Grove 4-pin connector (RX,TX,VCC,GND)
- 802.11 b/g/n protocol (2.4GHz)
- WiFi Direct (P2P), soft-AP
- Supports three modes: AP, STA and AP+STA coexistence mode
- Integrated TCP/IP protocol stack
- LwIP (lightweight IP)
- Integrated low power 32-bit CPU could be reprogrammed as an application processor
- Integrated temperature sensor
- Serial UART Interface
- Multi-queue QoS management
- Wake up and transmit packets in < 2ms
- Metal shielding
- On-board ceramic antenna
- Reset switch

Tip

More details about Grove modules please refer to Grove System

Hardware Overview

Here is block diagram of Grove - UART WiF module which consists of following parts.



- Grove - Used to connect to a processor through socket on a base board such as a Seeeduino or Grove Base Shield.
- WiFi antenna - Antenna for ESP8266(Module model)
- Button - With multi-functions
  - Reset - Press down and release quickly.
  - Set ESP8266(Module model) into UART boot mode - Press and hold button until centred red LED indicator light on.
- Led Indicator - Used to indicate working status and for operations by user.
  - Left - a blue LED indicator - Controlled by user through command “AT+LEDON” and “AT+LEDOFF”.
  - Middle - a red LED indicator - light on while Wifi connected or go into UART boot mode
  - Right - a green LED indicator - light on while power on.

Specifications

- Input voltage: 3V / 5V
- Baud Rate: 115200
- Based on ESP8266 ESP-06 SoC
- AT Firmware: esp_iot_sdk_v1.1.0 + Seeed modifications:

    - 2x additional AT commands to control blue Link LED.
    - Register red WiFi LED to the ESP8266 wifi state LED.
- AT command set
- SDIO 1.1/2.0, SPI, UART
- Five power states: OFF, DEEP_SLEEP, SLEEP, WAKEUP and ON.
- Standby power consumption of < 1.0mW (DTIM=3)
- Integrated TR switch, balun, LNA, power amplifier and matching network
- Integrated PLLs, regulators, DCXO and power management units
- +19.5dBm output power in 802.11b mode
- Power down leakage current of <10uA
- Hardware accelerators for CCMP (CBC-MAC, counter mode), TKIP (MIC, RC4), WAPI (SMS4), WEP (RC4), CRC
- WPA/WPA2 PSK, and WPS driver
- A-MPDU & A-MSDU aggregation & 0.4ms guard interval
- Dimensions: 25.43mm x 20.35mm

Ultra-low power technology

The ESP8266 was designed to achieve very low energy consumption with patented power management technology that reduces non-essential functions and regulates sleep patterns. There are five power states:

- OFF
- DEEP_SLEEP - the real-time clock runs but all other parts of the chip are closed
- SLEEP - consumes less than 12uA with only real-time clock and watchdog running. The chip will wake on MAC, host, RTC or external interrupt.
- WAKEUP - the system is changing from a sleep to on state. Crystal oscillator and PLL are enabled.
- ON - consumes less than 1.0mW (DTIM = 3) or 0.5mW (DTIM = 10).

The Real-time clock can be programmed to wake the ESP8266 within a specified period of time.

The higher the DTIM period, the longer the device may sleep and therefore the more power the device may potentially save.

To meet the power requirements of mobile applications and wearable electronics, to reduce the overall power consumption, the PA output power can be customised in the firmware.

Application Ideas

- Home automation
- Sensor networks
- Mesh networking
- Wearable electronics
- Baby monitor
- Network camera
- Industrial wireless control
- WiFi beacons
- Smart power plug
- Location-aware applications

Getting Started

After this section, you can make **Grove - UART WiFi** run with only few steps.

Preparations

Now we are making a demo for wireless access point(AP) scan which require following modules.

- Seeeduino Lite
- Grove - OLED Display 1.12

If this is your first time using Seeeduino Lite, please refer to Seeeduino Lite's wiki

Seeeduino Lite is compatible with Arduino which works as simple as Arduino.

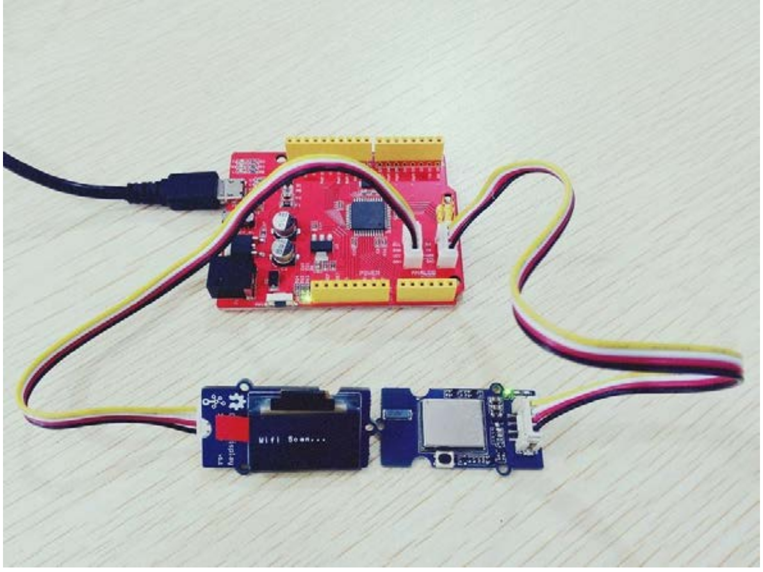
If this is your first time using Arduino, Please put hand on here to start your Arduino journey.

Connecting hardware

Seeeduino Lite got Grove socket for connecting two module mentioned above: Grove - OLED Display 1.12 and Grove - Uart Wi-Fi.

They are:

- Grove - OLED Display 1.12 - connection to I2C socket
- Grove - UART Wifi - connection to Serial socket * As shown below:

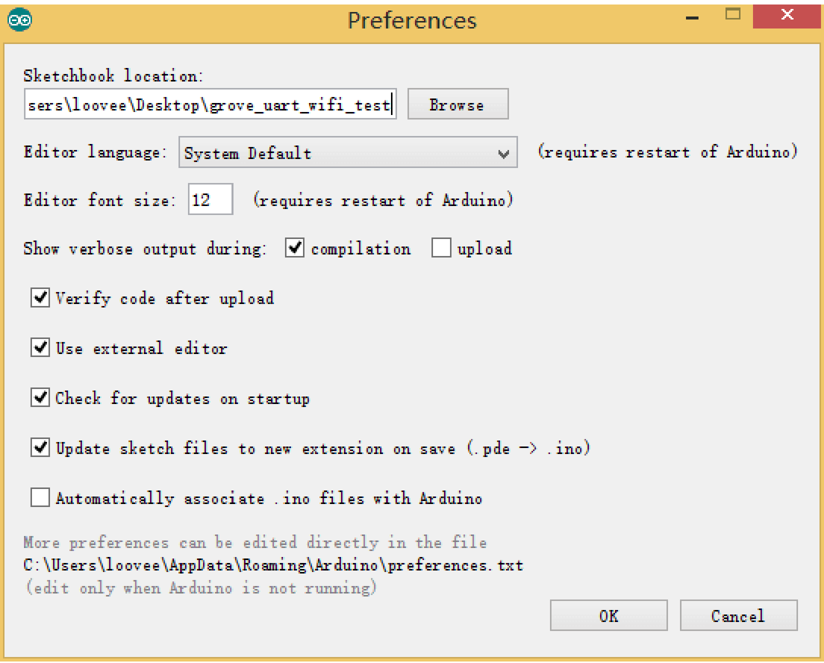


Download

Click here to download testing code and decompress it to any folders(e.g. Drive D or desktop)

Now you need simple configurations for Arduino sketchbook.

Launch Arduino IDE and click File>Preferences and add absolute location for downloaded testing code at Sketchbook location .



Preferences

Sketchbook location:

sers\loovee\Desktop\grove_uart_wifi_test

Editor language: System Default (requires restart of Arduino)

Editor font size: 12 (requires restart of Arduino)

Show verbose output during: ☑ compilation □ upload

☑ Verify code after upload

☑ Use external editor

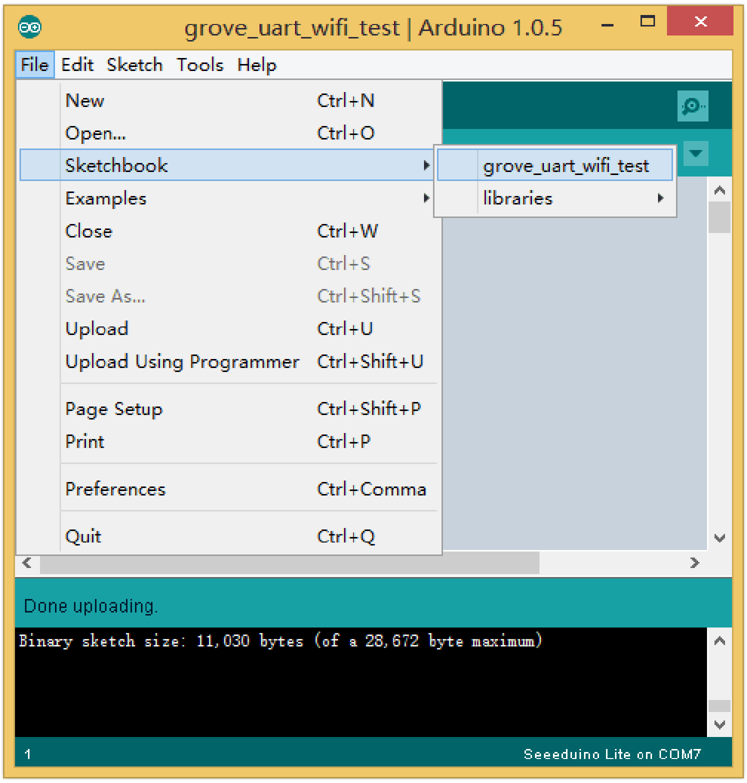
☑ Check for updates on startup

☑ Update sketch files to new extension on save (.pde -> .ino)

□ Automatically associate .ino files with Arduino

More preferences can be edited directly in the file
C:\Users\loovee\AppData\Roaming\Arduino\preferences.txt
(edit only when Arduino is not running)

After configurations, please restart Arduino, click File>Sketchbook and choose grove_uart_wifi_wiki after which testing code will show up.



Done uploading.

```
Binary sketch size: 11,030 bytes (of a 28,672 byte maximum)
```

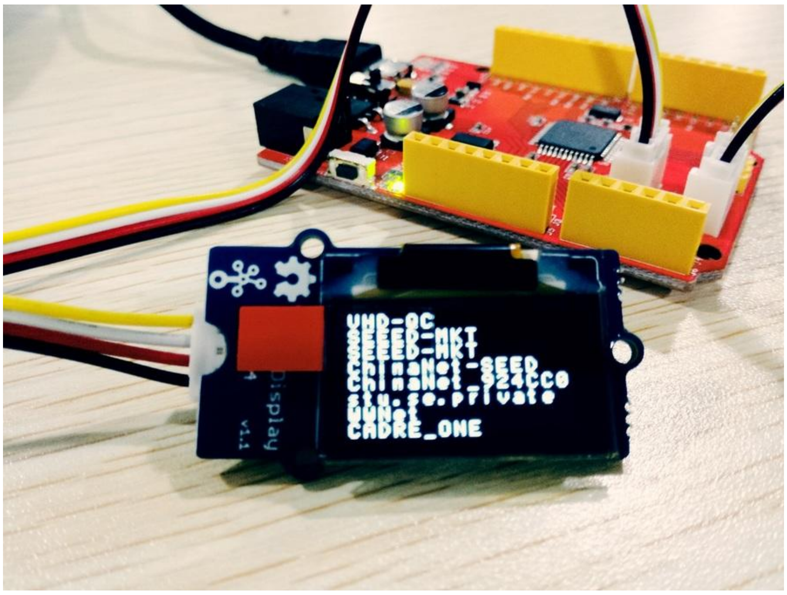
1 Seeeduino Lite on COM7

Click Tools>Board to choose Seeeduino Lite and select respective serial port.

Now click Upload(CTRL+U) to burn testing code. Please refer to here for any error prompt and you can also add comment on forum

Review Results

After upload completed, you can see AP identifier on OLED display.Following AP identifiers are found in our office.



Firmware update

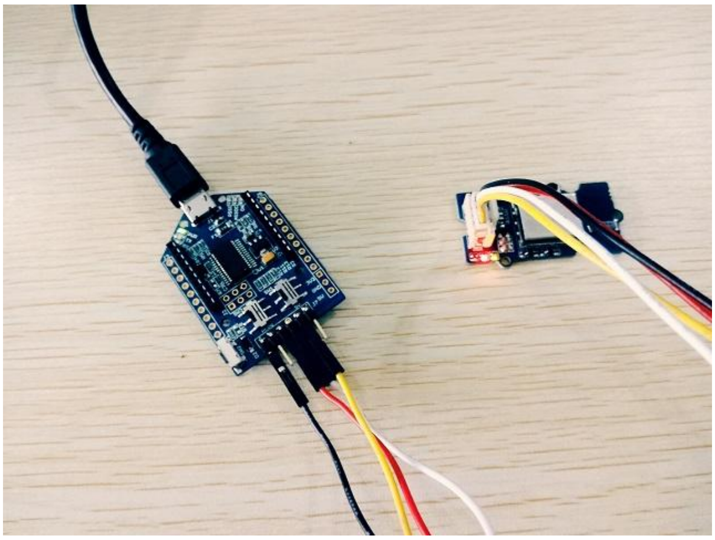
Our module board got a firmware burned into it for factory settings, you can burn other firmware to it if you like. Click here to download source code of factory setting firmware.

Preparations

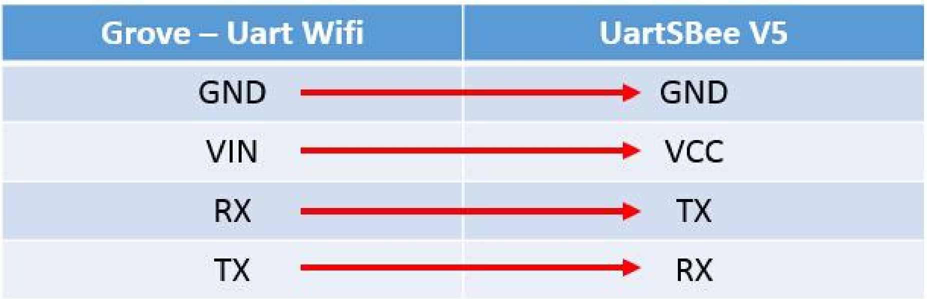
- A USB to serial converter is required for firmware updating, you can choose UartSBee V5 we offered if you don’t know where to get one.
- A Grove-Jump converting cable is required and we also offered for sale. Click here to check.
- A micro USB cable(type A to type C) is required.

Connecting hardware

1.Connect one end of Grove-Jump converting cable with grove socket on Grove - Uart Wifi and connect other end with UartSBee V5 which shown as following.



2.Then connecting cables like following figure:



Grove – Uart Wifi	UartSBee V5
GND →	GND
VIN →	VCC
RX →	TX
TX →	RX

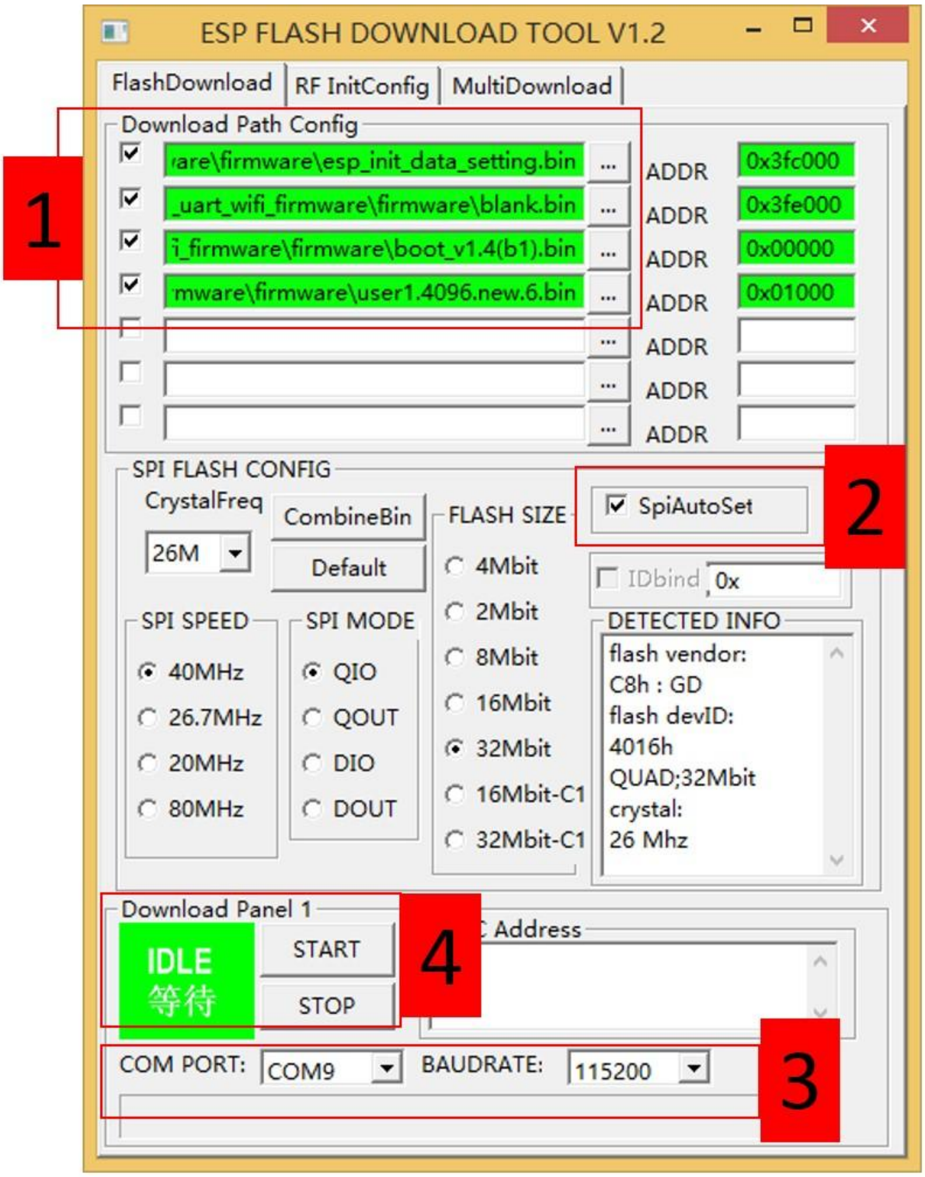
Download burning tools

- FLASH DOWNLOAD TOOLS
- Bin files of firmware

Operation steps

Now make sure you have downloaded burning software and bin file of firmware. Let us start burning to board.

- Press and hold button until red LED indicator light on which indicate it is ready to burn firmware.
- Start executable files in FLASH DOWNLOAD TOOLS files (double click) to make configurations like following steps:



ESP FLASH DOWNLOAD TOOL V1.2

Download Path Config

☑ ıare\firmware\esp_init_data_setting.bin ADDR 0x3fc000
☑ _uart_wifi_firmware\firmware\blank.bin ADDR 0x3fe000
☑ i_firmware\firmware\boot_v1.4(b1).bin ADDR 0x00000
☑ mware\firmware\user1.4096.new.6.bin ADDR 0x01000
□ ADDR
□ ADDR
□ ADDR

SPI FLASH CONFIG

CrystalFreq: 26M

FLASH SIZE: ○ 4Mbit ○ 2Mbit ○ 8Mbit ○ 16Mbit ● 32Mbit ○ 16Mbit-C1 ○ 32Mbit-C1

☑ SpiAutoSet

□ IDbind 0x

SPI SPEED: ● 40MHz ○ 26.7MHz ○ 20MHz ○ 80MHz

SPI MODE: ● QIO ○ QOUT ○ DIO ○ DOUT

DETECTED INFO
flash vendor:
C8h : GD
flash devID:
4016h
QUAD;32Mbit
crystal:
26 Mhz

Download Panel 1: IDLE 等待

COM PORT: COM9 BAUDRATE: 115200

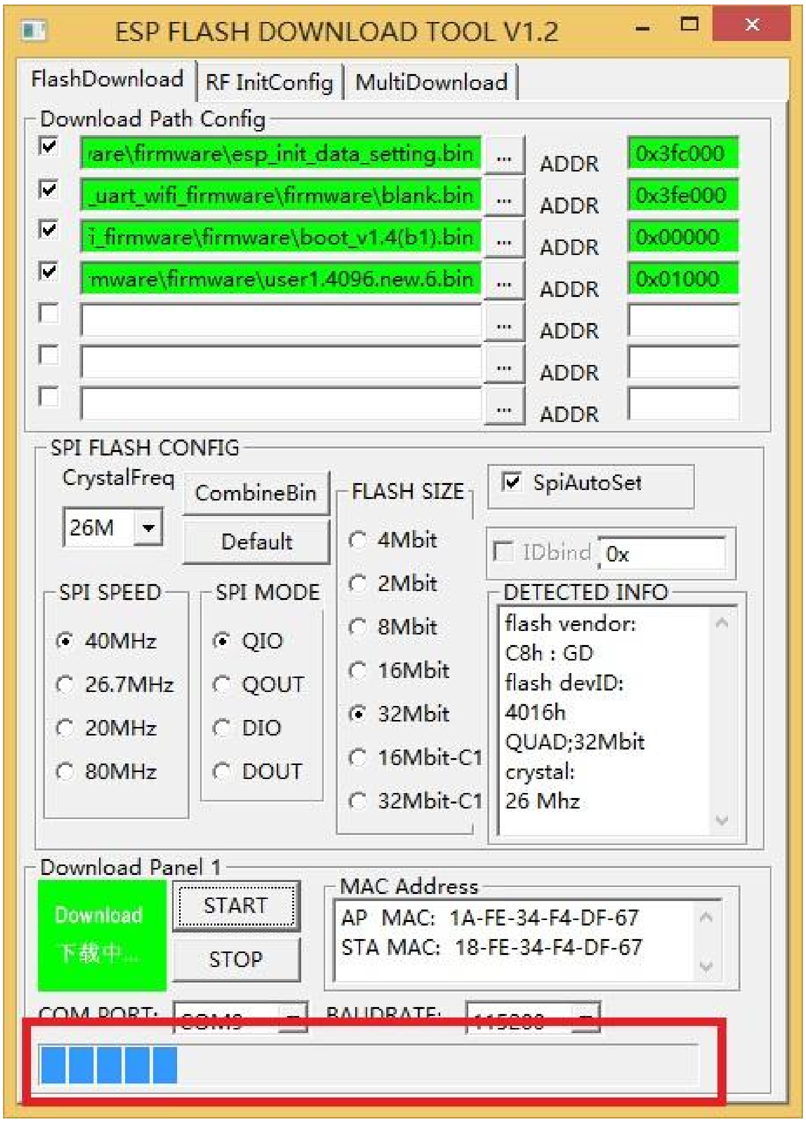
1. Choose desired files from firmware bin file downloaded.

2. Check SpiAutoSet.

3. Choose respective COM port and BAUDRATE.

Click to START to burn firmware

- Progress bar will be displayed in firmware-burning process.



ESP FLASH DOWNLOAD TOOL V1.2

FlashDownload | RF InitConfig | MultiDownload

Download Path Config

☑	/are\firmware\esp_init_data_setting.bin	...	ADDR	0x3fc000
☑	_uart_wifi_firmware\firmware\blank.bin	...	ADDR	0x3fe000
☑	i_firmware\firmware\boot_v1.4(b1).bin	...	ADDR	0x00000
☑	mware\firmware\user1.4096.new.6.bin	...	ADDR	0x01000
□		...	ADDR	
□		...	ADDR	
□		...	ADDR	

SPI FLASH CONFIG

CrystalFreq: 26M

CombineBin

Default

FLASH SIZE: ○ 4Mbit ○ 2Mbit ○ 8Mbit ○ 16Mbit ● 32Mbit ○ 16Mbit-C1 ○ 32Mbit-C1

☑ SpiAutoSet

□ IDbind 0x

SPI SPEED: ● 40MHz ○ 26.7MHz ○ 20MHz ○ 80MHz

SPI MODE: ● QIO ○ QOUT ○ DIO ○ DOUT

DETECTED INFO
flash vendor:
C8h : GD
flash devID:
4016h
QUAD;32Mbit
crystal:
26 Mhz

Download Panel 1

Download
下载中...

START

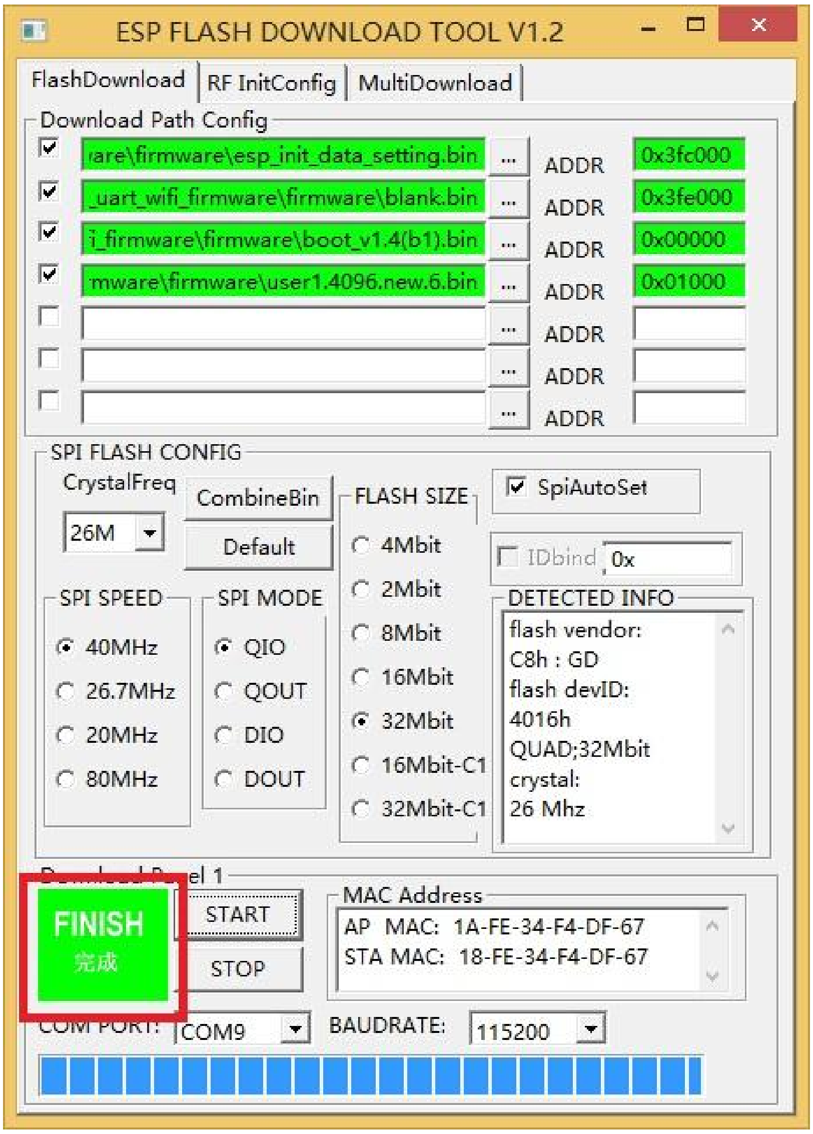
STOP

MAC Address
AP MAC: 1A-FE-34-F4-DF-67
STA MAC: 18-FE-34-F4-DF-67

COM PORT: COM3

BAUDRATE: 115200

- Finally, firmware-burning is done.



Download Path Config

☑	are\firmware\esp_init_data_setting.bin	ADDR	0x3fc000
☑	_uart_wifi_firmware\firmware\blank.bin	ADDR	0x3fe000
☑	i_firmware\firmware\boot_v1.4(b1).bin	ADDR	0x00000
☑	mware\firmware\user1.4096.new.6.bin	ADDR	0x01000
□		ADDR	
□		ADDR	
□		ADDR	

SPI FLASH CONFIG

CrystalFreq: 26M

FLASH SIZE: ○ 4Mbit ○ 2Mbit ○ 8Mbit ○ 16Mbit ● 32Mbit ○ 16Mbit-C1 ○ 32Mbit-C1

☑ SpiAutoSet

□ IDbind 0x

SPI SPEED: ● 40MHz ○ 26.7MHz ○ 20MHz ○ 80MHz

SPI MODE: ● QIO ○ QOUT ○ DIO ○ DOUT

DETECTED INFO

flash vendor:
C8h : GD
flash devID:
4016h
QUAD;32Mbit
crystal:
26 Mhz

MAC Address

AP MAC: 1A-FE-34-F4-DF-67
STA MAC: 18-FE-34-F4-DF-67

COM PORT: COM9

BAUDRATE: 115200

AT Commands

Using Espressif Systems ESP8266 AT Instruction Set Version 0.24 with SeeedStudio additions.

Basic AT Commands

Command	Description
AT	Test AT startup
AT+RST	Restart module
AT+GMR	View version info
AT+GSLP	Enter deep-sleep mode
ATE	Enable/Disable AT commands echo

Command	Description
AT+RESTORE	Factory Reset
AT+UART	UART configuration(Deprecated)
AT+UART_CUR	UART current configuration (Won’t save to Flash)
AT+UART_DEF	UART default configuration (Save to Flash)
AT+SLEEP	Sleep mode
AT+RFPOWER	Set RF TX Power
AT+RFVDD	Set RF TX Power according to VDD33

WiFi AT Commands

Command	Description
AT+CWMODE	WIFI mode (Deprecated)
AT+CWMODE_CUR	Current WIFI mode (Won’t save to Flash)
AT+CWMODE_DEF	Default WIFI mode (Save to Flash)
AT+CWJAP	Connect to AP (Deprecated)
AT+CWJAP_CUR	Current Connect to AP (Won’t save to Flash)
AT+CWJAP_DEF	Default Connect to AP (Save to Flash)
AT+CWLAP	Lists available APs
AT+CWQAP	Disconnect from AP
AT+CWSAP	Configure softAP (Deprecated)
AT+CWSAP_CUR	Configure current softAP (Won’t save to Flash)
AT+CWSAP_DEF	Configure default softAP (Save to Flash)
AT+CWLIF	List stations connected to softAP
AT+CWDHCP	Enable/Disable DHCP (Deprecated)
AT+CWDHCP_CUR	Current Enable/Disable DHCP (Won’t save to Flash)
AT+CWDHCP_DEF	Default Enable/Disable DHCP (Save to Flash)
AT+CWAUTOCONN	Connect to AP automatically when power on
AT+CIPSTAMAC	Set station mac address (Deprecated)
AT+CIPSTAMAC_CUR	Set station mac address (Won’t save to Flash)
AT+CIPSTAMAC_DEF	Set station mac address (Save to Flash)
AT+CIPAPMAC	Set softAP mac address (Deprecated)

Command	Description
AT+CIPAPMAC_CUR	Set softAP mac address (Won’t save to Flash)
AT+CIPAPMAC_DEF	Set softAP mac address (Save to Flash)
AT+CIPSTA	Set station IP address (Deprecated)
AT+CIPSTA_CUR	Set station IP address (Won’t save to Flash)
AT+CIPSTA_DEF	Set station IP address (Save to Flash)
AT+CIPAP	Set softAP IP address (Deprecated)
AT+CIPAP_CUR	Set softAP IP address (Won’t save to Flash)
AT+CIPAP_DEF	Set softAP IP address (Save to Flash)
AT+CWSTARTSMART	Start SmartConfig
AT+CWSTOPSMART	Stop SmartConfig

TCP/IP AT Commands

Command	Description
AT+CIPSTATUS	Get connection status
AT+CIPSTART	Establish TCP connection or register UDP port
AT+CIPSEND	Send data
AT+CIPSENDEX	Send data, if or “\0” is met, data will be sent
AT+CIPSENDBUF	Write data into TCP-send-buffer
AT+CIPBUFRESET	Reset segment ID count
AT+CIPBUFSTATUS	Check status of TCP-send-buffer
AT+CIPCHECKSEQ	Check if a specific segment is sent or not
AT+CIPCLOSE	Close TCP/UDP connection
AT+CIFSR	Get local IP address
AT+CIPMUX	Set multiple connections mode
AT+CIPSERVER	Configure as server
AT+CIPMODE	Set transmission mode
AT+SAVETRANSLINK	Save transparent transmission link to Flash
AT+CIPSTO	Set timeout when ESP8266 runs as TCP server
AT+CIUPDATE	Upgrade firmware through network
AT+PING	Ping an IP address or hostname

Seeed AT Commands

Command	Description
AT+LEDON	Turn the blue LINK led on
AT+LEDOFF	Turn the blue LINK led off