WiFi Module Instruction

Contents

Note:The manual will be released after granted the FCC authorization.

1. Overview

1.1 Product Name: WIFI module

Trade Mark: GEEETECH

Model No.: ESP8266

1.2 Main Features

ESP8266 is an integrated and systematic solution to WiFi network. Users can use mobile devices as the station to connect to softAP port of ESP8266 so as to control it by via router network connectivity. It is easy to add ESP8266 to any microcontroller-based design via the UART port and upload and download data to the cloud server. Via the cloud, users could utilize mobile devices to monitor the working status of the microcontroller and send instructions to it.

ESP8266 WiFi module works as the network interface between 3D printer and mobile devices. This WiFi module, adhering to the 802.11 network protocol, supports the communication between 3D printer and the Geeetech self-developed 3D printing App --- EasyPrint 3D. In addition, other network endpoints based on the 802.11 network protocol could be compatible with this WiFi module.

1.3 The Structure of ESP8266 WiFi Module

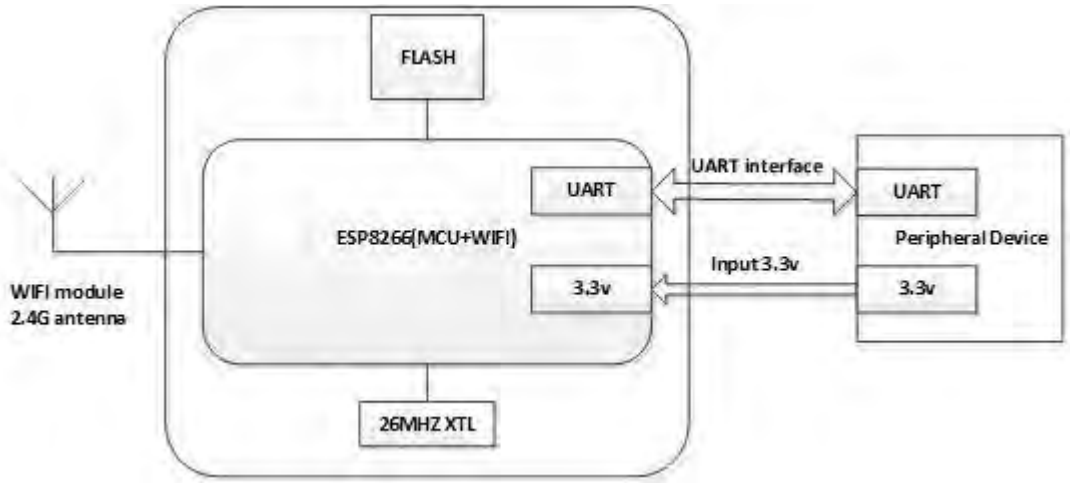

Figure 1. Functional Block Diagram

ESP8266 WiFi module comes with a built-in Tensilica L106, 32 bit microcontroller, having ultra-low power 16 bit RSIC. The speed of CPU clock is at

80MHZ, with its upper limit as 160MHZ. ESP8266 uses the external SPI Flash to store user program, with the memory of 1MB. Based on an external crystal, the crystal oscillator of ESP8266 could generate Radio Frequency clock to drive the mixer to down-convert the radio frequency signal and transform it as digital signal. The orthogonal baseband signal would be up-scaled to 2.4GHz. ESP8266 supports TCP/IP protocol, 802.11 b/g/n/e/I WLAN MAC protocol and the Wi-Fi Direct standard. The two universal asynchronous receiver transmitters of the hardware could communicate with the microcontroller in a convenient way.

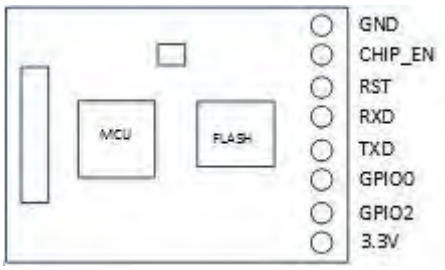

Figure 2. Interface Definition

The pin assignments as shown in Figure 1-1

Pin	Name	Type	Function
1	GND	P	Ground wire
2	CHIP_EN	I/O	Chip Enable Terminal:The chip works normally at the high level, and closes at the low level with low current 。
3	RST	I/O	External reset signal （works normally at low level）
4	RXD	I/O	The RX pin of UART，the TX pin of external circuit
5	TXD	I/O	The TX pin of UART，theRX pin of external circuit
6	GPIO0	I/O	FLASH start at the high level; System upgrade at the low level (able to upgrade internal firmware via the serial port)
7	GPIO2	I/O	
8	3.3V	P	Digital power supply 3.3V

1.4 Applications

ESP 8266 WiFi module can be apply to different fields, such as 3D printer,

domestic appliances, home automation, smart socket and lamp, industrial wireless control system, sensor networks, wearables, wireless position sensing devices, etc.

1.5 Operating Environment

1.6 Operating requirements

a. Stable voltage for the power supply module
b. The upper limit voltage for GPIO is 3.6V. In case that the voltage goes beyond 3.6V, you need the buck circuit to drive ESP8266 WiFi module. Or there would be damages for the GPIO interface.
c. If you choose to use LDO to transform the voltage, make surethat the input and output voltages are large enough. The decoupling capacitor should be place beside the module and the equivalent resistance should be low enough. When using DC-DC to power up the module, please, if necessary, add the LC filter circuit.
d. Since the RF of ESP8266 WiFi module and the digital circuit are of high integrity, and high-level current is needed for FR self-calibration when the power is on, please ensure that the current could reach 5000 Ma to avoid instantaneous voltage drop.
e. We don't recommend you to use un-calibrated battery to power up the module, since the FR circuit would be affected by temperature and voltage fluctuation.

2. How to use ESP8266 WiFi Module

2.1 Define the Interface between ESP8266 WiFi Module and 3D Printer's Control Board

- Connect the Server

Instruction format	Connect to srd;devicename;serverIP;
Description	Inform the WiFi module of the user name and password, the router's name and the IP address of the server. Need to reset the WiFi module before sending this instruction.

- Log on to the Server

Instruction Format	deviceord;login\r\n
Description	Inform the WiFi module to log in with the user name and password

- Enter the Configuration Mode

Instruction format	set ap\r\n

Instruction format	get name ssid:password; serverIP;\r\n

- Data Transmission

ESP8266 WiFi module adopts the transparent pass-through approach to transmit data. However, the transmission speed of WiFi module is limited. So the data packages could only be transmitted one by one.

Transmit one data package:

Instruction format	xxxxxxxx\n
Description	Xxxxxxxx as the content; "\n"as the end signal. WiFi module regards xxxxxx as one data package.

- The Network Disconnection Situation

When the network is disconnected (in case of weak WiFi signal or abnormal logout), WiFi module will send one instruction to the control board every 3 seconds.

The instruction is as follows:

Instruction format	
Description	When the network is disconnected, WiFi module will send one instruction to the control board every 3 seconds. Meanwhile, the control board should restart the WiFi module. Send the reconnection command, if necessary.

- Complete the gcode. Instruction

  1) M20 reads SD card file list.

  2) Print the select SD card gcode file.

  3) Send gcode file to SD card.

Inquire temp	M105
	ok B:16.8 /0.0 T0:17.5 /0.0 T1:0.0 /0.0 T2:0.0 /0.0 F0:200 S:100 @:0 B@:0.
Home X axis	N79 G28 X0*101
	X:280.000.ok
Home Y axis	N80 G28 Y0*98
	Y:160.000.ok
Home Z axis	N81 G28 Z0*96
	Z:157.000.ok
Home all the axes	N82 G28*41
	X:280.000.Y:160.000.Z:157.000.ok
Move X axis by -1mm	N86 G91*47 N87 G1 X-1 F4800*25 N88 G90*32
	ok ok ok
Move X axis by 1mm	N101 G91*17 N102 G1 X1 F4800*8 N103 G90*18
	ok ok ok
Move Y axis by -1mm	N110 G91*17 N111 G1 Y-1 F4800*38 N112 G90*18
	ok ok ok
Move Z axis by -1mm	N113 G91*18 N114 G1 Z-1 F100*29 N115 G90*21
	ok ok ok
	.N116 G91*23 N117 G1 E-10 F1800*9

Move the extruder by -10mm	N118 G90*24
	ok ok ok
Set printing speed as 141%	N119 M220 S141*109
	ok
Set fan speed as 230（0~255）	N180 M106 S230*111
	ok
Switch off the fan	N181 M107*45
	ok
Set hotbed temp as 55℃	N182 M140 S55*94
	ok
Set the temp of T0 (Extruder 1) as 200℃	N184 M104 T0 S200*46
	ok
Inquire device info	N11 M115*22
	FIRMWARE_NAME:V1.08 PROTOCOL_VERSION:V1.0 MACHINE_TYPE:D200 EXTRUDER_COUNT:2 UUID:16S1123D2000010.
Switch off/ Enter the idle mode	N15 M81*46
	ok
Switch on/ Wake up	N15 M80*46
	ok
Delete SD card file	N15 M30*46
	ok
List SD card	N15 M20*46
	Return to the file list, ok Return a “end” command as “list end”
Select file and start SD print	N15 M23 foot.gcode(file name) *46
	ok
Start/resume SD print	N15 M24*46
	ok
Pause SD print	N15 M25*46
	ok
Disable motor	

Enable Motor	
Inquire the status of 3D printer	M21
	printer_priile:xxxx.gcode;precent:60%;used_time:20mm; printer_pae:xxxx.gcode;precent:60%;used_time:20mm; printer_idle;
Notifications upon finishing printing	printer_fi:xxx.gcode;used_time:60mm;
Notifications when filament runs out	printer_ lament;

Event: finish printing, pause, filament running out/ fracturing, 3D printer is on-line, 3D printer is off-line; printing, etc.

2.2 Define the Interactive Interface between ESP8266 WiFi module and the Server

- Log in

Instruction format	yy_xxx:nnnn;login
Description	User name: password

- Users connect the 3D printer with the server

Instruction format	xxx;call;yyy
Description	User xxx visits 3D printer yyy: Inform the WiFi module of 3D printer that the data returned will be transferred to user xxx.

- Inquire on-line devices

Instruction format	xxx;get live
Description	Xxx represents that the user is inquiring which 3D printers are online.

- Data transmission

Instruction format	xxx;senddata;yyy;nnnnnnnn

Description	xxx，yyy represents the users of mobile App or 3D printer (WiFi module).Xxx sends data “nnnnnn” to yyy. The server will transfer the data to yyy.

- User traverses all the files on the server

Users, based on the path, visit the corresponding file in the same way as http URL, for instance, images.

Instruction format	xxx; server browse;
Description	User xxx requests to traverse all the files of the given path on the server.
eg.	get browse;./3D/gcode
Return	+./3D/gcode - ./3D/gcode /body.gcode - ./3D/gcode /body.jpg + ./3D/gcode/image - ./3D/gcode/image/test.jpg (+ refers to the folder, — the files)

- Upload a given file from the server to the 3D printer

Instruction format	xxx; server send file;filename
Description	User xxx requests to send the file, whose path and name are “filename” to user yyy (3D printer)

- Regular report to the mobile App about the uploading progress

Instruction format	server send file progress;yyy;10%;filename
Description	

2.3 Define the Interactive Interface between ESP8266 WiFi Module and the mobile (Config. mode)

- Configure SSID, password, IP address

Instruction format	http://192.168.4.1:80/ssid:zzz;password:yyyy;server:xxx.xxx.xxx.xxx
Description	To simplify the encoding job of html5, the data is placed after URL to send to WiFi module.

2.4 The Interface between Database and the Console

The database adopts Sqitle3.

- Define the user format in the database

Format	user (password TEXT,friend0 TEXT)
Description	1）user is a form name in the database. In each line of the form, there are 2 character strings: password, friend0. “Password” consists of “user name: password”. “Friend 0” represents good friend. 2）The “printer_” before user name represents the printer’s login name.

- Administrator

  Administrator is defined according to the user format.

- Administrator obtains the detailed user info list

Format	user form	
Description	To obtain the detailed user info list, administrator needs to log in at first.	
eg.	user form	
Return	Format	User word: friend\n
	eg.	

- Administrator adds user name and password

Format	name: word : friend
Description	Administrator adds user name and password
Return	

- Administrator deletes user name and password

Format	User name
Description	Administrator deletes user name and password
eg.	user printer_123456
Return	Success or fail

- Users change passwords

Format	Old passwoassword

Description	Change password, including ordinary user and administrator.
eg.	pab
Return	Succ

2.5 Define the Interface for Uploading Files

- Upload files to the TF card built in the 3D printer.

The format of data package:

Format	M210 SD0 file name; file offset; file length; binary file data; check digit\n
Description	M210 is a gcodeinstrution；the following parameters are similar to the function fwrite in the programming language C；\n is the terminator. The file content could be gcode, UI images, bin files, txt files for config., etc. Check CRC16
Return	Success or fail
eg.	

	ushort crc16(byte[] d, intlen)
	{
	byte b = 0 ;
	ushortcrc = 0xff00 ;
	inti, j;
	for (i = 0 ; i<len; i ++)
	{
	for (j = 0 ; j < 8 ; j ++)
	{
	b = (byte)(((d[i] << j) & 0x80) ^ ((crc& 0x8000) >> 8));
	crc<<= 1;
	if (b != 0)
	crc ^= 0x1021 ;
	}
	}
	crc = (ushort)~crc;
	return crc;
	}

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.

The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.

FCC ID: **2ANHN- ESP8266**

This device is intended only for OEM integrators under the following conditions:

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and

2) This device and its antenna(s) must not be co-located with any other transmitters except in accordance with FCC multi-transmitter product procedures. Referring to the multi-transmitter policy, multiple-transmitter(s) and module(s) can be operated simultaneously without C2P.

3) For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change.

USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of 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.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains FCC ID: **2ANHN- ESP8266** ". If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15

of 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.