

# ESP8266 Serial WIFI Module

From ITEAD Wiki

## Contents

- 1 Overview
- 2 Features
- 3 Electronic Characteristics
- 4 Hardware
- 5 Schematic
- 6 Application Notes
- 7 AT Commands
- 8 Download
- 9 Instruction
- 10 Useful Link

## Overview

ESP8266 offers a complete and self-contained Wi-Fi networking solution, allowing it to either host the application or to offload all Wi-Fi networking functions from another application processor.

When ESP8266 hosts the application, and when it is the only application processor in the device, it is able to boot up directly from an external flash. It has integrated cache to improve the performance of the system in such applications, and to minimize the memory requirements.

Alternately, serving as a Wi-Fi adapter, wireless internet access can be added to any microcontroller-based design with simple connectivity through UART interface or the CPU AHB bridge interface.

ESP8266 on-board processing and storage capabilities allow it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. With its high degree of on-chip integration, which includes the antenna switch balun, power management converters, it requires minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area.

Sophisticated system-level features include fast sleep/wake context switching for energy-efficient VoIP, adaptive radio biasing for low-power operation, advance signal processing, and spur cancellation and radio co-existence features for common cellular, Bluetooth, DDR, LVDS, LCD interference mitigation.

Go shopping ESP8266 Serial WIFI Module(IM140905002)  
(<http://imall.iteadstudio.com/im140905002.html>)



## Features

- 802.11 b/g/n protocol
- Wi-Fi Direct (P2P), soft-AP
- Integrated TCP/IP protocol stack
- Integrated TR switch, balun, LNA, power amplifier and matching network
- Integrated PLL, regulators, and power management units
- +19.5dBm output power in 802.11b mode
- Integrated temperature sensor
- Supports antenna diversity
- Power down leakage current of < 10uA
- Integrated low power 32-bit CPU could be used as application processor
- SDIO 2.0, SPI, UART
- STBC, 1×1 MIMO, 2×1 MIMO
- A-MPDU & A-MSDU aggregation & 0.4μs guard interval
- Wake up and transmit packets in < 2ms
- Standby power consumption of < 1.0mW (DTIM3)

## Electronic Characteristics

### 1.Current Consumption

The following current consumption is based on 3.3V supply, and 25°C ambient, using internal regulators. Measurements are done at antenna port without SAW filter. All the transmitter's measurements are based on 90% duty cycle, continuous transmit mode.

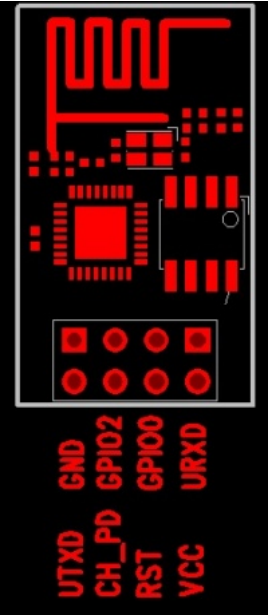
Mode	Min	Typ	Max	Unit
Transmit 802.11b, CCK 1Mbps, POUT=+19.5dBm		215		mA
Transmit 802.11b, CCK 11Mbps, POUT=+18.5dBm		197		mA
Transmit 802.11g, OFDM 54Mbps, POUT =+16dBm		145		mA
Transmit 802.11n, MCS7, POUT=+14dBm		135		mA
Receive 802.11b, packet length=1024 byte, -80dBm		60		mA
Receive 802.11g, packet length=1024 byte, -70dBm		60		mA
Receive 802.11n, packet length=1024 byte, -65dBm		62		mA
Standby		0.9		mA
Deep sleep		10		uA
Power save mode DTIM 1		1.2		mA
Power save mode DTIM 3		0.86		mA
Total shutdown		0.5		uA

2.RF Performance

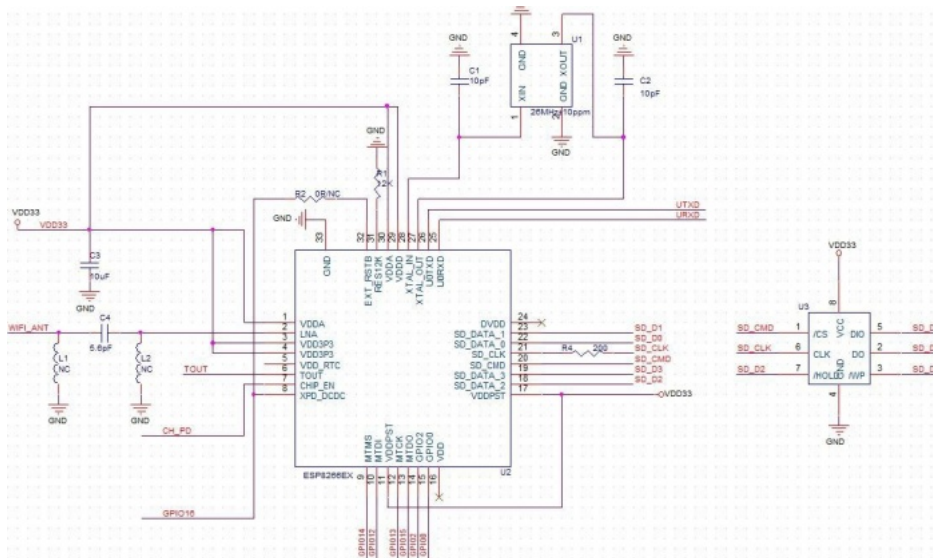
The following are measured under room temperature conditions with 3.3V and 1.1V power supplies.

Description	Min	Typical	Max	Unit
Input frequency	2412		2484	MHz
Input impedance		50		Ω
Input reflection			-10	dB
Output power of PA for 72.2Mbps	14	15	16	dBm
Output power of PA for 11b mode	17.5	18.5	19.5	dBm
Sensitivity				
CCK, 1Mbps		-98		dBm
CCK, 11Mbps		-91		dBm
6Mbps (1/2 BPSK)		-93		dBm
54Mbps (3/4 64-QAM)		-75		dBm
HT20, MCS7 (65Mbps, 72.2Mbps)		-71		dBm

Hardware



Schematic



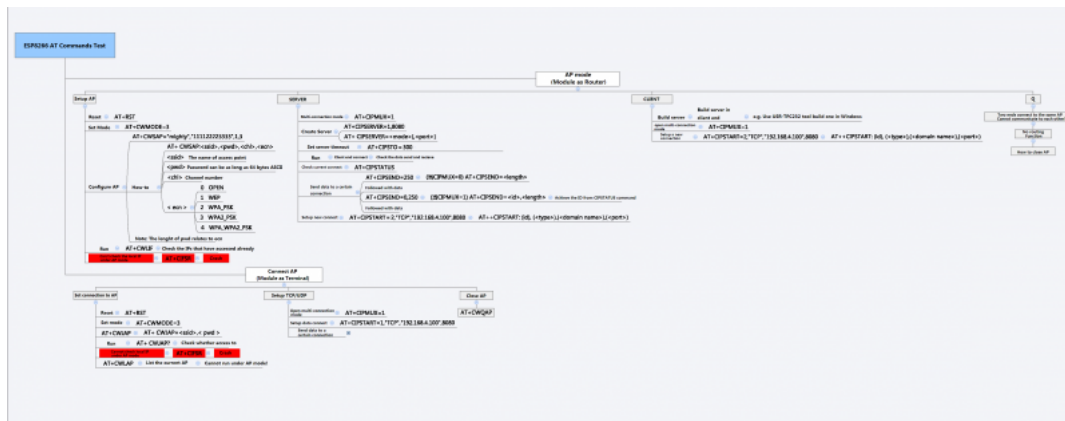
## Application Notes

- Smart power plugs
- Home automation
- Mesh network
- Industrial wireless control
- Baby monitors
- IP Cameras
- Sensor networks
- Wearable electronics
- Wi-Fi location-aware devices
- Security ID tags
- Wi-Fi position system beacons

## AT Commands

### Format

- Baud rate at 57600
- x is the commands



(Click the picture to zoom in)

Set	Inquiry	Test	Execute
AT+<x>=<...>	AT+<x>?	AT+<x>=?	AT+<x>
AT+CWMODE=<mode>	AT+CWMODE?	AT+CWMODE=?	-
Set the network mode	Check current mode	Return which modes supported	-

### Commands

- carefully there are must be no any spaces between the " and IP address or port

Commands	Description	Type	Set/Execute	Inquiry	test	Parameters and Examples
AT	general test	basic	-	-	-	-
AT+RST	restart the module	basic	-	-	-	-
AT+GMR	check firmware version	basic	-	-	-	-
AT+CWMODE	wifi mode	wifi	AT+CWMODE=<mode>	AT+CWMODE?	AT+CWMODE=?	1= Sta, 2= AP, 3=both, Sta is the default mode of router, AP is a normal mode for devices
AT+CWJAP	join the AP	wifi	AT+ CWJAP =<ssid>,<pwd>	AT+ CWJAP?	-	ssid = ssid, pwd = wifi password
AT+CWLAP	list the AP	wifi	AT+CWLAP			
AT+CWQAP	quit the AP	wifi	AT+CWQAP	-	AT+CWQAP=?	
AT+ CWSAP	set the parameters of AP	wifi	AT+ CWSAP= <ssid>,<pwd>,<chl>,<ecn>	AT+ CWSAP?		ssid, pwd, chl = channel, ecn = encryption; eg. Connect to your router: AT+CWJAP="www.electrodragon.com","helloworld" and check if connected: AT+CWJAP?
AT+CWLIF	check join devices' IP	wifi	AT+CWLIF	-	-	
AT+ CIPSTATUS	get the connection status	TCP/IP	AT+ CIPSTATUS			<id>,<type>,<addr>,<port>,<tetype>= client or serv mode
AT+CIPSTART	set up TCP or UDP connection	TCP/IP	1)single connection (+CIPMUX=0) AT+CIPSTART= <type>,<addr>,<port>; 2) multiple connection (+CIPMUX=1) AT+CIPSTART= <id>,<type>,<addr>,<port>	-	AT+CIPSTART=?	id = 0-4, type = TCP/UDP, addr = IP address, port= port; eg. Connect to another TCP server, set multiple connection first: AT+CIPMUX=1; connect: AT+CIPSTART=4,"TCP","X1.X2.X3.X4",9999
AT+CIPMODE	set data transmission mode	TCP/IP	AT+CIPMODE=<mode>	AT+CIPSEND?		0 not data mode, 1 data mode; return "Link is builde
AT+CIPSEND	send data	TCP/IP	1)single connection(+CIPMUX=0) AT+CIPSEND=<length>; 2) multiple connection (+CIPMUX=1) AT+CIPSEND= <id>,<length>		AT+CIPSEND=?	eg. send data: AT+CIPSEND=4,15 and then enter the data.
AT+CIPCLOSE	close TCP or UDP connection	TCP/IP	AT+CIPCLOSE=<id> or AT+CIPCLOSE		AT+CIPCLOSE=?	
AT+CIFSR	Get IP address	TCP/IP	AT+CIFSR		AT+ CIFSR=?	
AT+ CIPMUX	set mutiple connection	TCP/IP	AT+ CIPMUX=<mode>	AT+ CIPMUX?		0 for single connection 1 for multiple connection

Commands	Description	Type	Set/Execute	Inquiry	test	Parameters and Examples
AT+ CIPSERVER	set as server	TCP/IP	AT+ CIPSERVER= <mode>[,<port> ]			mode 0 to close server mode, mode 1 to open; port = port; eg. turn on as a TCP server: AT+CIPSERVER=1,8888, check the self server IP address: AT+CIFSR=?
AT+ CIPSTO	Set the server timeout	AT+CIPSTO= <time>	AT+CIPSTO?		<time>0~28800 in second	
+IPD	received data					For Single Connection mode(CIPMUX=0): + IPD, <len>: For Multi Connection mode(CIPMUX=1): + IPD, <id>, <len>: <data>

## Download

- File:0a-esp8266ex\_datasheet\_en.pdf
- File:esp8266\_at\_instruction\_set\_en\_v1.5.4\_0.pdf
- File:ESP8266 Specifications(Chinese).pdf
- File:ESP8266\_AT\_Commands\_Chinese.pdf

## Instruction

### Upgrading ESP8266 Firmware

#### How to upgrade ESP8266 firmware?

We use NodeMCU flasher here, the download links:

- English version:** <https://github.com/nodemcu/nodemcu-flasher>

**Note: use nodemcu flasher to flash Firmware to ESP8266, its default firmware is Lau language. If you want to flash AT Commands firmware, go to ESP8266 forum to get one.**

- Chinese version:** File:ESP8266Flasher-x86-v0.9.2.3.zip

1. Connect your ESP8266 module as follows:

- Vcc = 3.3V (needs around 300-400mA peak)
- Gnd = -ve ground
- CH\_PD = Chip enable so always +ve
- RST = Leave floating or ground to reset
- GPIO0 = Normally floating but this needs to be grounded when you start the update.
- GPIO2 = high level
- UTXD = Tx data connect to RX on FTDI/Serial interface
- URXD = Rx data connect to TX of FTDI/Serial interface

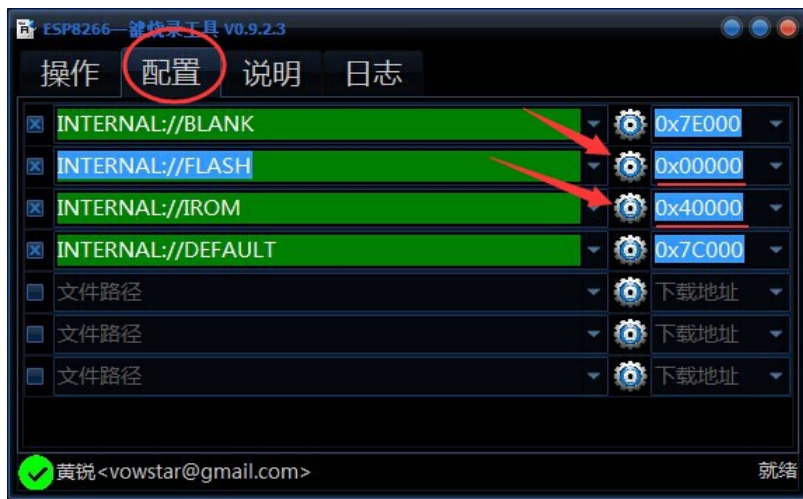
**English Version: Please refer to the NodeMCU flasher user guide.**

**Chinese Version: Please see the next step below**

2. Open the software, choose the right COM and click the button that is circled in the following picture. When a tick appears in the bottom-left corner, it suggests that the firmware upgrade successfully.



3. This software contains an **existing firmware**, but if you want to upgrade other ESP8266 firmware, please click the button that is circled in the following picture, and only two file paths are available to choose.



### Other ways of ESP8266 firmware upgrading

- [https://www.ukhas.net/wiki/esp8266\\_firmware\\_update](https://www.ukhas.net/wiki/esp8266_firmware_update)
- <http://taylorcoffelt.com/article/1>

## Useful Link

Reference:

- <https://nurdspace.nl/ESP8266>
- <http://www.electrodragon.com/w/Wi07c>

Example

- <http://www.instructables.com/id/Using-the-ESP8266-module/>
- The ESP8266 Becomes a Terrible Browser - <http://hackaday.io/project/3072/instructions>
- New Working GCC for ESP8266 - <http://www.esp8266.com/viewtopic.php?f=9&t=224>
- <http://blog.iteadstudio.com/esp8266-use-android-phone-to-control-itead-rboard/>
- SDK for ESP8266 - <http://hackaday.com/2014/10/25/an-sdk-for-the-esp8266-wifi-chip/>
- An ESP8266 Based Smartmeter - <http://hackaday.com/2014/10/25/an-sdk-for-the-esp8266-wifi-chip/>

Demos for ESP8266

- <https://github.com/itead/ITEADLIB-ESP8266>

Library for ESP8266

- [https://github.com/itead/ITEADLIB\\_Arduino\\_WeeESP8266](https://github.com/itead/ITEADLIB_Arduino_WeeESP8266)

Retrieved from "[https://www.itead.cc/wiki/index.php?title=ESP8266\\_Serial\\_WIFI\\_Module&oldid=4914](https://www.itead.cc/wiki/index.php?title=ESP8266_Serial_WIFI_Module&oldid=4914)"

- This page was last modified on 21 June 2016, at 03:37.
- This page has been accessed 471,169 times.