



## rfsolutions ESP-07S WiFi Module User Manual

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## **rfsolutions ESP-07S WiFi Module**



### **FCC STATEMENT**

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.
2. This device must accept any interference received, including interference that may cause undesired operation.

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

Please notice that if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains FCC ID: 2AHMR-ESP07S" any similar wording that expresses the same meaning may be used.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator & your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

The module is limited to OEM installation ONLY.

The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.

The module is limited to installation in mobile application;

A separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and difference antenna configurations.

There is requirement that the grantee provide guidance to the host manufacturer for compliance with Part 15B requirements.

ESP-07S User Manual

### **Important European compliance information for module datasheets**

This RF Solutions radio module meets the essential requirements of the European Radio Equipment Directive 2014/53/EU and has been tested to European Harmonised Standards and CE marked where space allows. A copy of the EU Declaration of Conformity can be located on the RF Solutions Website, [www.rfsolutions.co.uk/certification-i59](http://www.rfsolutions.co.uk/certification-i59)

When using the module in an end product, continued compliance can only be assured by incorporating the module in accordance with RF Solutions specific installation instructions and in accordance with the published information on the RF Solutions product data sheet. The antenna gain specification must be adhered to at all times.

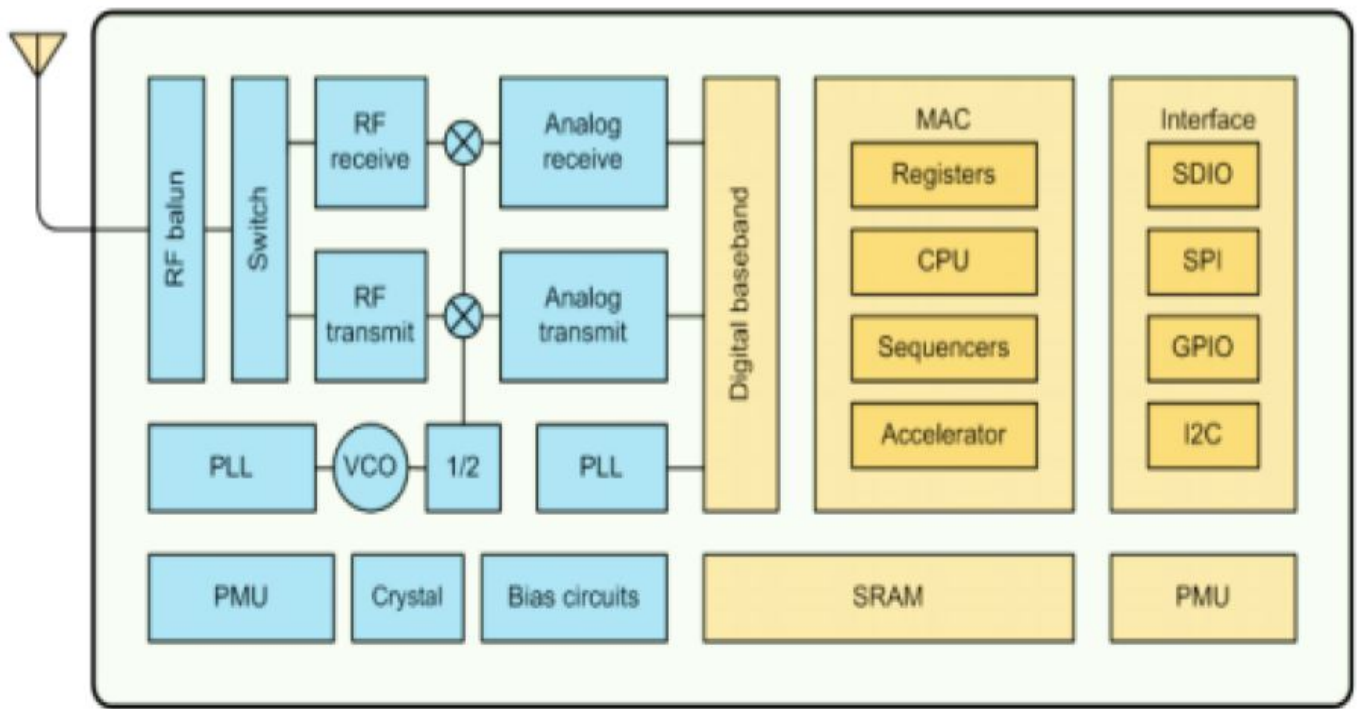
Article 3.1a and 3.1b of the EU Radio Equipment Directive 2014/53/EU should be assessed in the final product. Failure to follow this guidance may result in a non-compliant product being placed on the European Market, for which RF Solutions cannot accept any responsibility. Further guidance may be obtained from RF Solutions Technical Support. Charges may apply to customer specific product evaluation.

### **Preambles**

ESP-07S WiFi module is developed by AI-Thinker Co., Ltd, core processor ESP8266 in smaller sizes of the module encapsulates Tensilica L106 integrates industry-leading ultra low power 32-bit MCU micro, with the 16-bit short mode, clock speed support 80 MHz, 160 MHz, supports the RTOS, integrated Wi-Fi MAC/BB/RF/PA/LNA, on-board antennas.

The module supports standard IEEE802.11 b/g/n agreement, complete TCP/IP protocol stack. Users can use the add modules to an existing device networking, or building a separate network controller.

ESP8266 is high integration wireless SOCs, designed for space and power constrained mobile platform designers. It provides unsurpassed ability to embed Wi-Fi capabilities within other systems, or to function as a standalone application, with the lowest cost, and minimal space requirement.



**Figure 1 ESP8266EX Functional Block Diagram**

ESP8266EX offers a complete and self-contained Wi-Fi networking solution; it can be used to host the application or to offload Wi-Fi networking functions from another application processor.

When ESP8266EX hosts the application, it boots up directly from an external flash. It has integrated cache to improve the performance of the system in such applications.

Alternately, serving as a Wi-Fi adapter, wireless internet access can be added to any micro Controller based design with simple connectivity (SPI/SDIO or I2C/UART interface).

ESP8266EX is among the most integrated WiFi chip in the industry; it integrates the antenna switches, RF balun, power amplifier, low noise receive amplifier, filters, power management modules, it requires minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area.

ESP8266EX also integrates an enhanced version of Tensilica's L106 Diamond series 32-bit processor, with on-chip SRAM, besides the Wi-Fi functionalities. ESP8266EX is often integrated with external sensors and other application specific devices through its GPIOs; codes for such applications are provided in examples in the SDK.

#### Features

- 802.11 b/g/n
- Integrated low power 32-bit MCU
- Integrated 10-bit ADC
- Integrated TCP/IP protocol stack
- Integrated TR switch, balun, LNA, power amplifier and matching network
- Integrated PLL, regulators, and power management units
- Supports antenna diversity
- Wi-Fi 2.4 GHz, support WPA/WPA2
- Support STA/AP/STA+AP operation modes

- Support Smart Link Function for both Android and iOS devices
- SDIO 2.0, (H) SPI, UART, I2C, I2S, IRDA, PWM, GPIO
- STBC, 1×1 MIMO, 2×1 MIMO
- A-MPDU & A-MSDU aggregation and 0.4s guard interval
- Deep sleep power <10uA, Power down leakage current < 5uA
- Wake up and transmit packets in < 2ms
- Standby power consumption of < 1.0mW (DTIM3)
- +20dBm output power in 802.11b mode
- Operating temperature range -40C ~ 85C

### Parameters

Table 1 below describes the major parameters.

Table 1 Parameters

| Categories          | Items                       | Values   |
|---------------------|-----------------------------|--|
| WiFi Paramters      | WiFi Protocles              | 802.11 b/g/n   |
|                     | Frequency Range             | 2.4GHz-2.5GHz (2400M-2483.5M)  |
| Hardware Paramaters | Peripheral Bus              | UART/HSPI/I2C/I2S/Ir Remote Contorl                                      |
|                     |                             | GPIO/PWM   |
|                     | Operating Voltage           | 3.0~3.6V   |
|                     | Operating Current           | Average value: 80mA  |
|                     | Operating Temperature Range | -40°~125°  |
|                     | Ambient Temperature Range   | Normal temperature   |
|                     | Package Size                | 18mm*20mm*3mm  |
|                     | External Interface          | N/A  |
| Software Parameters | Wi-Fi mode                  | station/softAP/SoftAP+station  |
|                     | Security                    | WPA/WPA2   |
|                     | Encryption                  | WEP/TKIP/AES   |
|                     | Firmware Upgrade            | UART Download / OTA (via network) / download and write firmware via host |
|                     | Ssoftware Development       | Supports Cloud Server Development / SDK for custom firmware development  |
|                     | Network Protocols           | IPv4, TCP/UDP/HTTP/FTP   |
|                     | User Configuration          | AT Instruction Set, Cloud Server, Android/iOS APP                        |

### Pin Descriptions

There are altogether 16 pin counts, the definitions of which are described in Table 2 below.

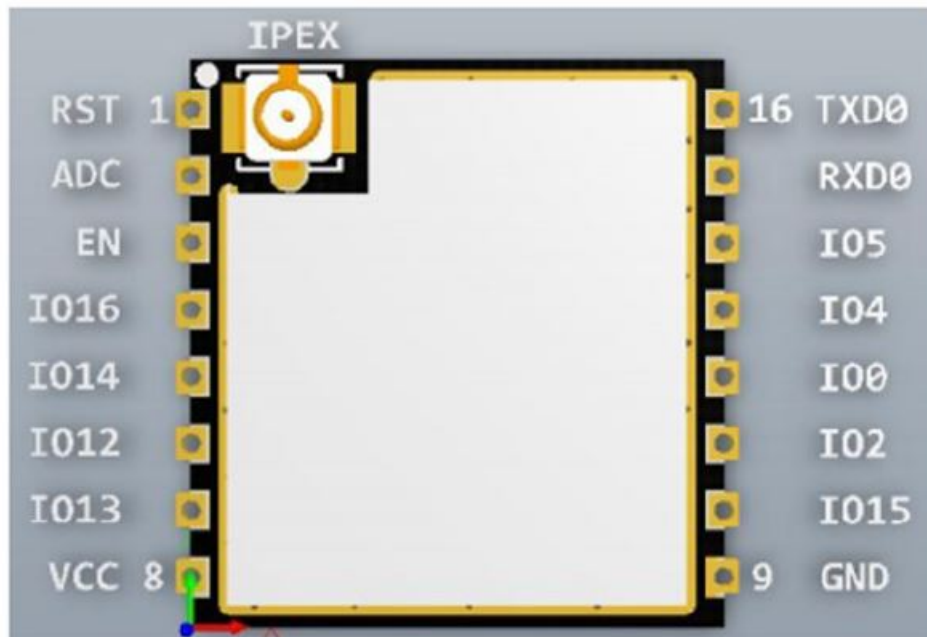


Table 2 ESP-07S pin description

Table 2 ESP-07S pin description

| Pin number | Pin name | function   |
|------------|----------|--|
| 1          | RST      | Reset module   |
| 2          | ADC      | A/d conversion result. Input voltage range 0~1V, value range: 0~1024 |
| 3          | EN       | Chip enable pin. Active high   |
| 4          | GPIO16   | GPIO16; can be used to wake up the chipset from deep sleep mode      |
| 5          | GPIO14   | GPIO14; HSPI_CLK   |
| 6          | GPIO12   | GPIO12; HSPI_MISO  |
| 7          | GPIO13   | GPIO13; HSPI_MOSI; UART0_CTS   |
| 8          | VCC      | 3.3V power supply (VDD)  |
| 9          | GND      | GND  |
| 10         | GPIO15   | GPIO15; MTDO; HSPICS; UART0_RTS                                      |
| 11         | GPIO2    | GPIO2; UART1_TXD   |
| 12         | GPIO0    | GPIO0  |
| 13         | GPIO4    | GPIO4  |
| 14         | GPIO5    | GPIO5  |
| 15         | RXD0     | UART0_RXD; GPIO3   |
| 16         | TXD0     | UART0_TXD; GPIO1   |

## Interfaces

Table 3 Descriptions of Interfaces



Table 3 Descriptions of Interfaces

| Interface         | Pin Name  | Description   |
|-------------------|---|---|
| HSPI              | IO12(MISO),<br>IO13(MOSI)<br>IO14(CLK),<br>IO15(CS) | SPI Flash , display screen, and MCU can be connected using HSPI interface   |
| PWM               | IO12(R),<br>IO15(G),<br>IO13(B)                     | Currently the PWM interface has four channels, but users can extend the channels according to their own needs. PWM interface can be used to control LED lights, buzzers, relays, electronic machines, and so on.  |
| IR Remote Control | IO14(IR_T),<br>IO5(IR_R)                            | The functionality of Infrared remote control interface can be implemented via software programming. NEC coding, modulation, and demodulation are used by this interface. The frequency of modulated carrier signal is 38KHz.  |
| ADC               | TOUT  | ESP8266EX integrates a 10-bit analog ADC. It can be used to test the power supply voltage of VDD3P3 (Pin3 and Pin4) and the input power voltage of TOUT (Pin 6). However, these two functions cannot be used simultaneously. This interface is typically used in sensor |
|                   |   | products.   |
| I2C               | IO14(SCL),<br>IO2(SDA)                              | I2C interface can be used to connect external sensor products and display screens, etc.   |



|      |  |  |
|------|--|--|
| UART | UART0:<br>TXD(U0TXD),<br>RXD(U0RXD),<br>IO15(RTS),<br>IO13(CTS)<br><br>UART1:<br>IO2(TXD)  | Devices with UART interfaces can be connected with the module.<br>Downloading: U0TXD+U0RXD or GPIO2+U0RXD<br>Communicating: UART0: U0TXD, U0RXD, MTDO (U0RTS), MTCK (U0CTS)<br>Debugging: UART1_TXD (GPIO2) can be used to print debugging information.<br><br>By default, UART0 will output some printed information when the device is powered on and is booting up. If this issue exerts influence on some specific applications, users can exchange the inner pins of UART when initializing, that is to say, exchange U0TXD, U0RXD with U0RTS, U0CTS. |
| I2S  | I2S Input :<br><br>IO12 (I2SI_DATA) ;<br>IO13 (I2SI_BCK );<br>IO14 (I2SI_WS);<br><br>I2S Output: :<br><br>IO15 (I2SO_BCK );<br>IO3 (I2SO_DATA);<br>IO2 (I2SO_WS ). | I2S interface is mainly used for collecting, processing, and transmission of audio data.   |

#### Pin Mode

Table 4 Pin Mode

| Mode       | GPIO15 | GPIO0 | GPIO2 |
|------------|--------|-------|-------|
| UART       | low    | low   | high  |
| Flash Boot | low    | high  | high  |

#### Antenna interface

ESP-07S Modules through the IPEX interface to connect to external antenna.

The antenna must be in line with the 802.11g/802.11b IEEE standard, and the antenna parameters are shown in the following table:

Table 5 Antenna parameters

| Rating          | Value         |
|-----------------|---------------|
| Frequency range | 2.4~2.4825GHz |
| impedance       | 50Ω           |

## Package information and OEM installation method

The external size of the ESP-07S WiFi module is 16mm\*17mm\*3mm, as is illustrated in Figure 4 below:

Figure 3 Top View of ESP-07s WiFi Module



Figure 4 Dimensions of ESP-07s WiFi Module

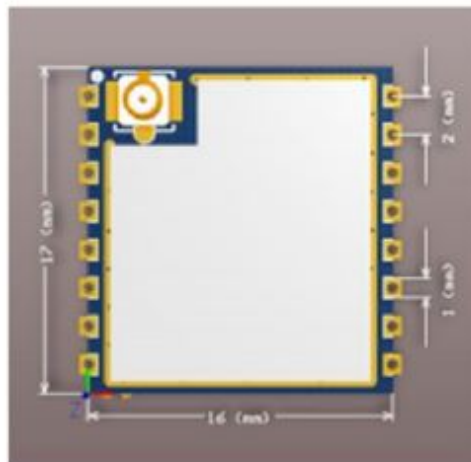


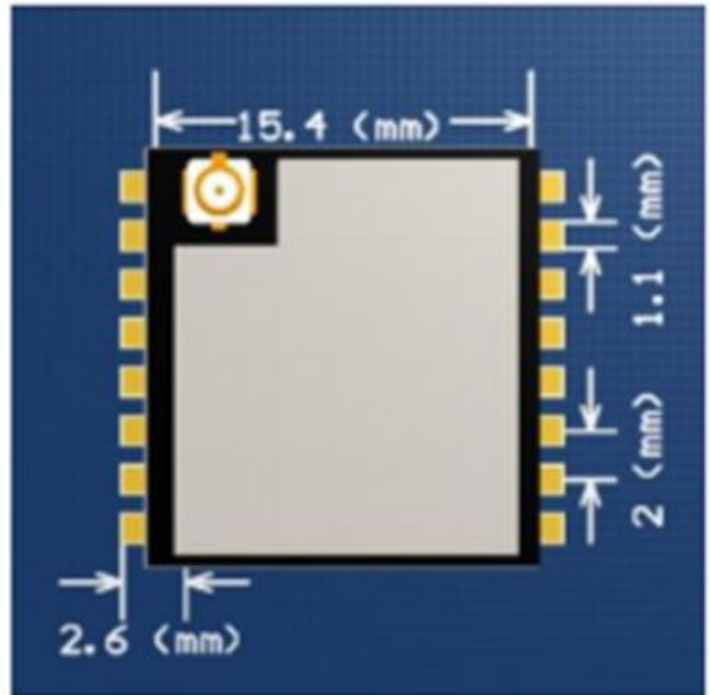
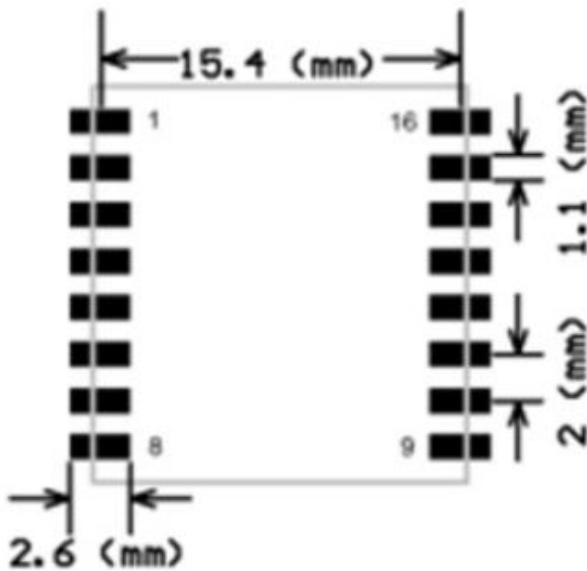
Table 5 Dimensions of ESP-07s WiFi Module

| Length | width | Height | PAD Size(Bottom) | Pin Pitch |
|--------|-------|--------|------------------|-----------|
| 16mm   | 17mm  | 3 mm   | 1 mm x 1.2 mm    | 2mm       |

## Package information

ESP-07S use a half hole patch package, Module PCB Footprint shown in the following figure:

### Figure 5 Module PCB Footprint

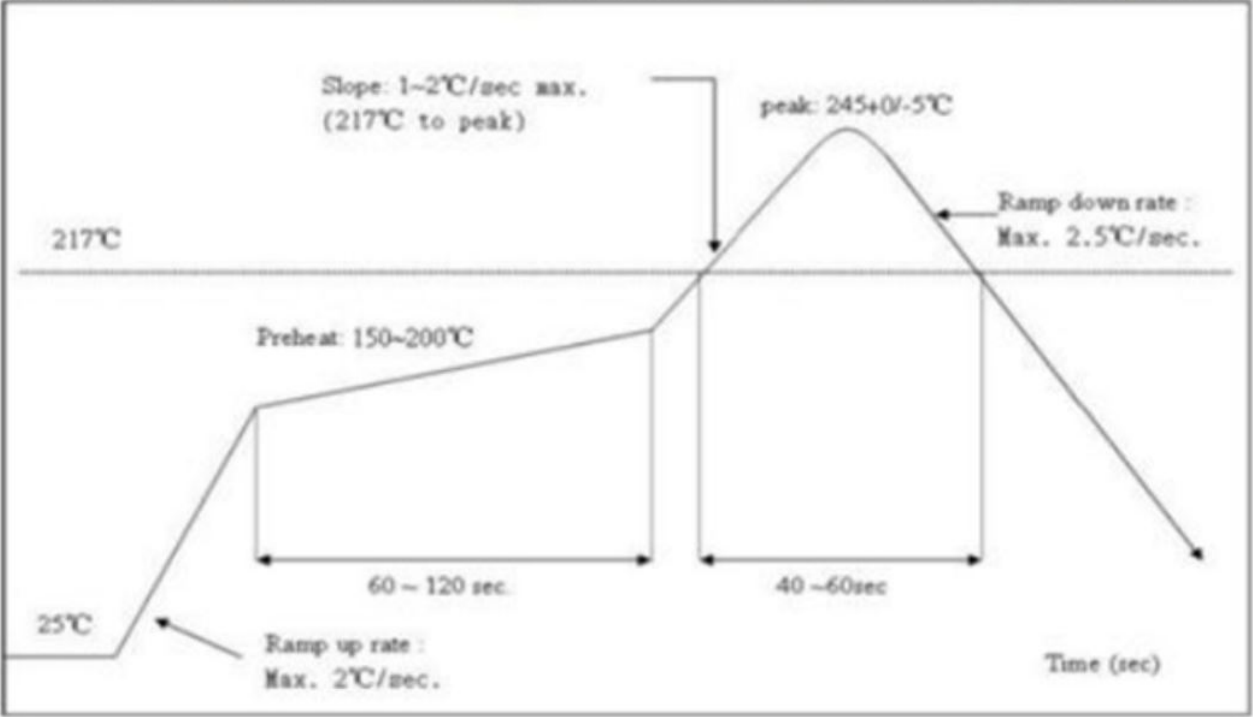


## OEM installation method

Using ESP-07S module Please reference in front of the package information in the Layout on the main board for OEM factory. Please pay more attention Module's direction and the antenna close to the edge of board is better, the Components and layout should not be on the bottom of antenna then soldering the module. When the module be soldering cannot in the environment of high temperature. We recommend the reflow soldering temperature curves is shown in figure 6:

### Figure 6 Recommend reflow soldering temperature curves

Refer to IPC/JEDEC standard: Peak Temperature : <250°C : Number of Times: ≤2 times :



Absolute Maximum Ratings

Table 6 Absolute Maximum Ratings

| Rating                        | Condition           | Value        | Unit |
|-------------------------------|---------------------|--------------|------|
| Storage Temperature           |                     | -40 to 125   | ℃    |
| Maximum Soldering Temperature |                     | 260          | ℃    |
| Supply Voltage                | IPC/JEDEC J-STD-020 | +3.0 to +3.6 | V    |

Recommended Operating Conditions

Table 7 Recommended Operating Conditions

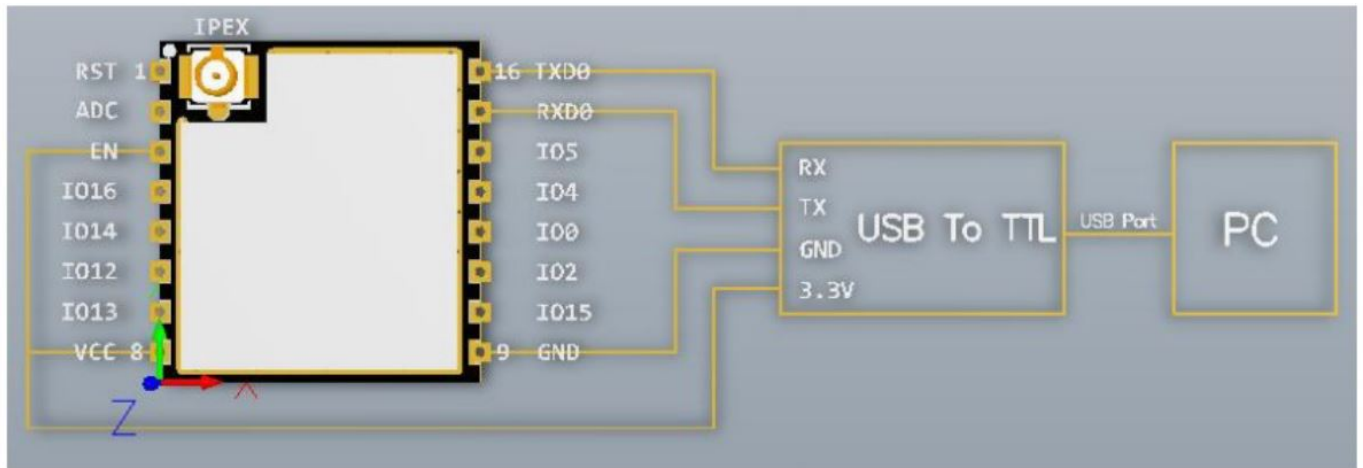
| Operating Condition   | Symbol | Min | Typ | Max | Unit |
|-----------------------|--------|-----|-----|-----|------|
| Operating Temperature |        | -40 | 20  | 125 | ℃    |
| Supply voltage        | VDD    | 3.0 | 3.3 | 3.6 | V    |

AT command Testing

Hardware connection

As shown in Figure 7, ESP-07S via a USB to TTL Tool connected to the computer, software tool through the serial port on the computer can be AT instruction test

Figure 7 ESP-07S connect with computer



## AT commend

Espressif AT instruction set functions and methods of use

AT commands set is divided into: Basic AT commands, WiFi related AT commands, TCP / IP AT

## AT Command Description

**Table 8 Each Command set contains four types of AT commands.**

| Type    | Command Format | DescriPtion  |
|---------|----------------|--|
| Test    | AT+<x>=?       | Query the Set command or internal parameters and its range values. |
| Query   | AT+<x>?        | Returns the current value of the parameter.                        |
| Set     | AT+<x>=<...>   | Set the value of user-defined parameters in commands and run.      |
| Execute | AT+<x>         | Runs commands with no user-defined parameters.                     |

## Notes:

1. Not all AT Command has four commands.
2. [] = default value, not required or may not appear
3. String values require double quotation marks, for example: AT+CWSAP="ESP756290","21030826",1,4
4. Baudrate = 115200
5. AT Commands has to be capitalized, and end with "/r/n"

## Basic AT Command Set

The ESP8266 wireless WiFi modules can be driven via the serial interface using the standard AT commands. Here is a list of some basic AT commands that can be used.

**Table 9 basic AT commands**

| Basic       |  |
|-------------|--|
| Command     | Description  |
| AT          | Test AT startup  |
| AT+RST      | Restart module   |
| AT+GMR      | View version info  |
| AT+GSLP     | Enter deep-sleep mode  |
| ATE         | AT commands echo or not  |
| AT+RESTORE  | Factory Reset  |
| AT+UART     | UART configuration, <span style="color: red;">[@deprecated]</span> |
| AT+UART_CUR | UART current configuration   |
| AT+UART_DEF | UART default configuration, save to flash                          |
| AT+SLEEP    | Sleep mode   |
| AT+RFPOWER  | Set maximum value of RF TX Power                                   |
| AT+RFVDD    | Set RF TX Power according to VDD33                                 |

## Simplified Declaration of Conformity (RED)

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DO NOT

Discard with normal waste, please recycle.

ROHS Directive 2011/65/EU and amendment 2015/863/EU

Specifies certain limits for hazardous substances.

WEEE Directive 2012/19/EU



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Documents / Resources

|   |  |
|---|--|
|  | <p><a href="#">rfsolutions ESP-07S WiFi Module</a> [pdf] User Manual<br/>ESP-07S, WiFi Module, ESP-07S WiFi Module</p>         |
|  | <p><a href="#">rfsolutions ESP-07S WiFi Module</a> [pdf] User Manual<br/>ESP-07S, WiFi Module, ESP-07S WiFi Module, Module</p> |

References

- [🌐 Domainverkauf](#)
- [📶 RF Solutions | Remote control systems, RF Modules, Antennas](#)
- [📶 RF Solutions Product Certifications](#)