



# ESP-15F Datasheet

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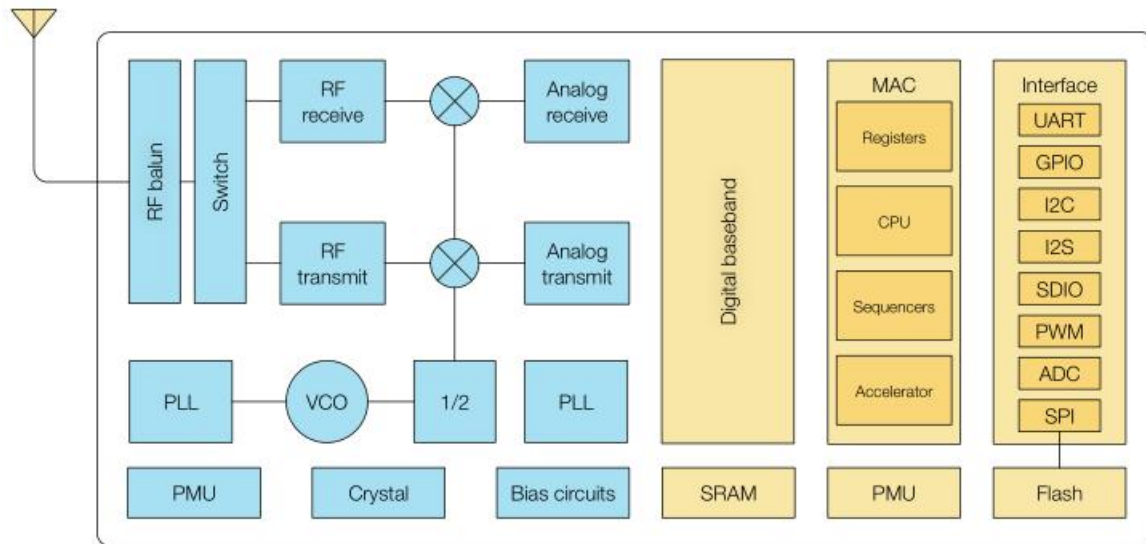
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## 1、 Product overview

The ESP-15F WiFi module was developed by Ai-Thinker Technology. The core processor of the module ESP8266 integrates the industry-leading Tensilica L106 ultra-low-power 32-bit micro MCU in a smaller package with 16-bit reduced mode. The main frequency supports 80 MHz and 160 MHz, supports RTOS, and integrates Wi-Fi MAC / BB / RF / PA / LNA.

The ESP-15F WiFi module supports the standard IEEE802.11 b/g/n protocol, a complete TCP/IP protocol stack. Users can use this module to add networking capabilities to existing devices or to build separate network controllers.

The ESP8266 is a high-performance wireless SOC that offers maximum utility at the lowest cost and unlimited possibilities for embedding WiFi functionality into other systems.



ESP8266 has a complete and self-contained Wi-Fi network function, which can be used independently or run as a slave on other host MCUs. When ESP8266 is applied independently, it can be started directly from external flash. The built-in cache memory helps improve system performance and optimizes the storage system.

Another case is that ESP8266 can be used as a Wi-Fi adapter only through SPI / SDIO interface or UART interface, and can be applied to any microcontroller-based design.

ESP8266's powerful on-chip processing and storage capabilities make it possible to integrate sensors and other application-specific equipment through the GPIO port, greatly reducing the cost of early development.

## Features

- n Complete 802.11b / g / n Wi-Fi SoC module
- n The core is Tensilica L106 low power 32-bit MCU, frequency supports 80 MHz and 160 MHz, supports RTOS
- n Built-in 10-bit high-precision ADC
- n Only support UART interface
- n DIP-8 package for easy welding
- n Integrated Wi-Fi MAC / BB / RF / PA / LNA
- n Support multiple sleep modes, deep sleep current as low as 20uA
- n UART baud speed up to 4Mbps
- n Embedded Lwip protocol stack
- n Support STA / AP / STA + AP operation mode
- n Smart Config (APP) / AirKiss (WeChat) support for Android and IOS
- n Support serial local upgrade and remote firmware upgrade (FOTA)
- n General AT commands can be used easy and quickly
- n Support for second development, integration of Windows、Linux development environment

## Parameters

Figure 1 Main Parameter

Mdel	ESP-15F
Package	DIP-8
Size	41.3*24.1*6.6(±0.2)MM(L*W*H, Height is subject to pin header)
Antenna	FPCB Antenna
Frequency Range	2402 ~ 2480MHz
Operating Temperature	-20 °C ~ 70 °C
Storage Environment	-40 °C ~ 125 °C , < 90%RH
Power supply range	Voltage: 5V, Current>800mA
Interface	UART
I0	3
UART Baut	Support 110 ~ 4608000 bps , default:115200 bps
Security	WEP/WPA-PSK/WPA2-PSK
SPI Flash	Default: 32Mbit

## 2、 Electrical parameter

### Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	
Storage temperature	VDD	4.75	5.0	5.25	V	
I/O	$V_{IL}/V_{IH}$	-	-0.3/0.75V <sub>I/O</sub>	-	0.25V <sub>I/O</sub> /3.6	V
	$V_{OL}/V_{OH}$	-	N/0.8V <sub>I/O</sub>	-	0.1V <sub>I/O</sub> /N	V
	$I_{MAX}$	-	-	-	12	mA

### Power Consumption

The following power consumption data were obtained from the tests with a 3.3V power supply and a voltage stabilizer, in 25°C ambient temperature.

n All measurements are done at the antenna interface without the SAW filter.

n All data are based on 90% duty cycle and measured in continuous transmission mode.

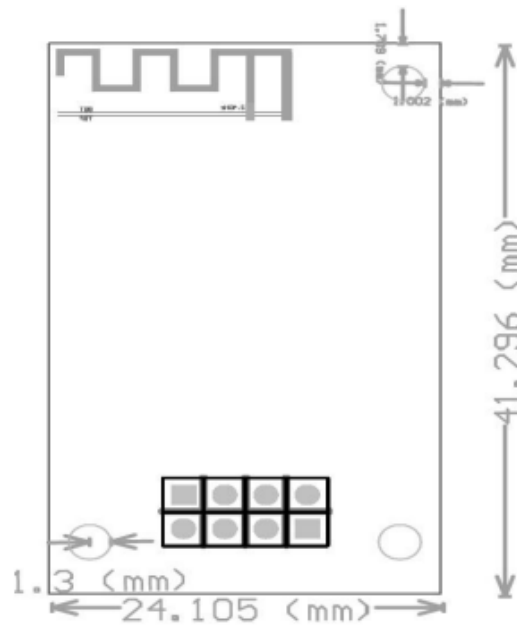
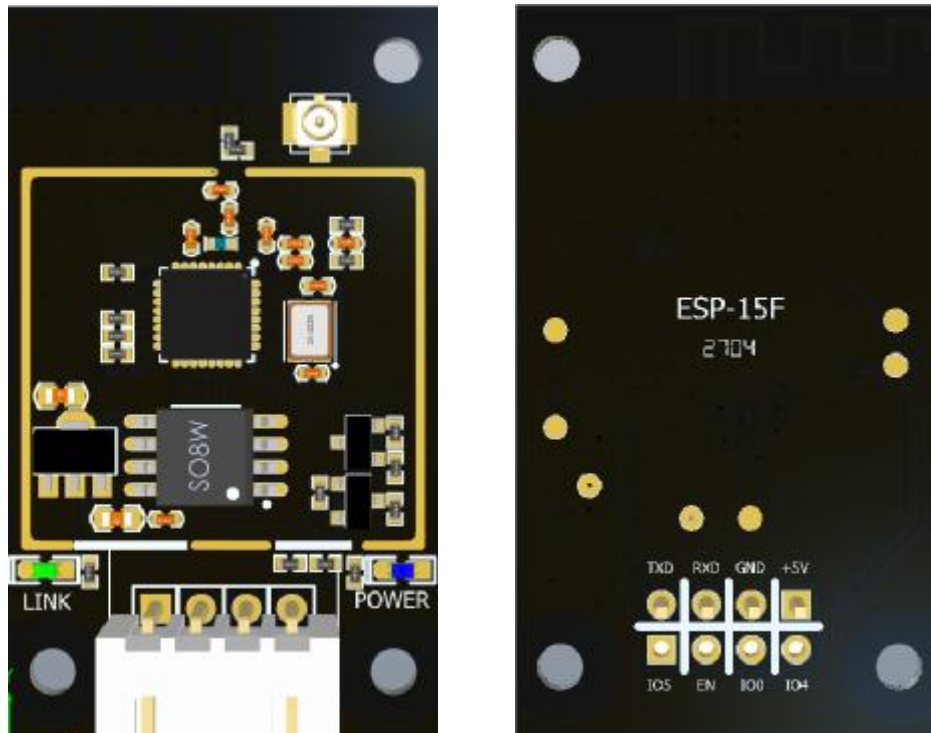
Mode	Min	Typ	Max	Unit
Tx 802.11b, CCK 11Mbps, POUT=+17dBm	-	170	-	mA
Tx 802.11g, OFDM 54Mbps, POUT=+15dBm	-	140	-	mA
Tx 802.11n, MCS7, POUT=+13dBm	-	120	-	mA
Rx 802.11b, 1024 bytes packet length, -80dBm	-	50	-	mA
Rx 802.11g, 1024 bytes packet length, -70dBm	-	56	-	mA
Rx 802.11n, 1024 bytes packet length, -65dBm	-	56	-	mA
Modem-Sleep <sup>①</sup>	-	20	-	mA
Light-Sleep <sup>②</sup>	-	2	-	mA
Deep-Sleep <sup>③</sup>	-	20	-	uA
Power Off	-	0.5	-	uA



**Note:**

- n** Modem-sleep is used when such applications as PWM or I2S require the CPU to be working. In cases where Wi-Fi connectivity is maintained and data transmission is not required, the Wi-Fi Modem circuit can be shut down to save power, according to 802.11 standards (such as U-APSD). For example, in DTIM3, when ESP8266EX sleeps for 300ms and wakes up for 3ms to receive Beacon packages from AP, the overall average current consumption is about 20mA.
- n** During Light-Sleep, the CPU may be suspended in applications like Wi-Fi switch. Without data transmission, the Wi-Fi Modem circuit can be turned off and CPU suspended to save power according to the 802.11 standard (U-APSD).  
E.g. in DTIM3, to maintain a sleep 300ms-wake 3ms cycle to receive AP's Beacon packages, the current is about 0.9mA.
- n** Deep-Sleep does not require Wi-Fi connection to be maintained. For application with long time lags between data transmission, e.g. a temperature sensor that checks the temperature every 100s, sleep 300s and waking up to connect to the AP (taking about 0.3~1s), the overall average current is less than 1mA.

### 3、 Appearance size



## 4、 Pin definition

ESP-15F has 16 interfaces, As the pin diagram, the pin function definition table is the interface definition.



ESP-15F Pin diagram

Table Pin function definition

No.	Name	Function
1	RST	Reset, active low
2	ADC	A/D conversion, Input voltage range 0~1V, the value range is 0~1024.
3	EN	Chip Enabled Pin, Active High
4	IO16	Connect with RST pin to wake up Deep Sleep
5	IO14	HSPI_CLK/IR_T/I2C_CLK/I2SI_WS
6	IO12	HSPI_MISO
7	IO13	HSPI_MOSI/UART0_CTS
8	VCC	3.3V ; output current of external power supply is recommended over 500mA
9	GND	Ground
10	IO15	HSPI_CS/U0_RTS/I2SO_BCK
11	IO2	U1_TXD/I2C_SDA/I2SO_WS
12	IO0	GPIO0; download mode: external pull low, running mode: floating or external pull high
13	IO4	GPIO4
14	IO5	IR_R

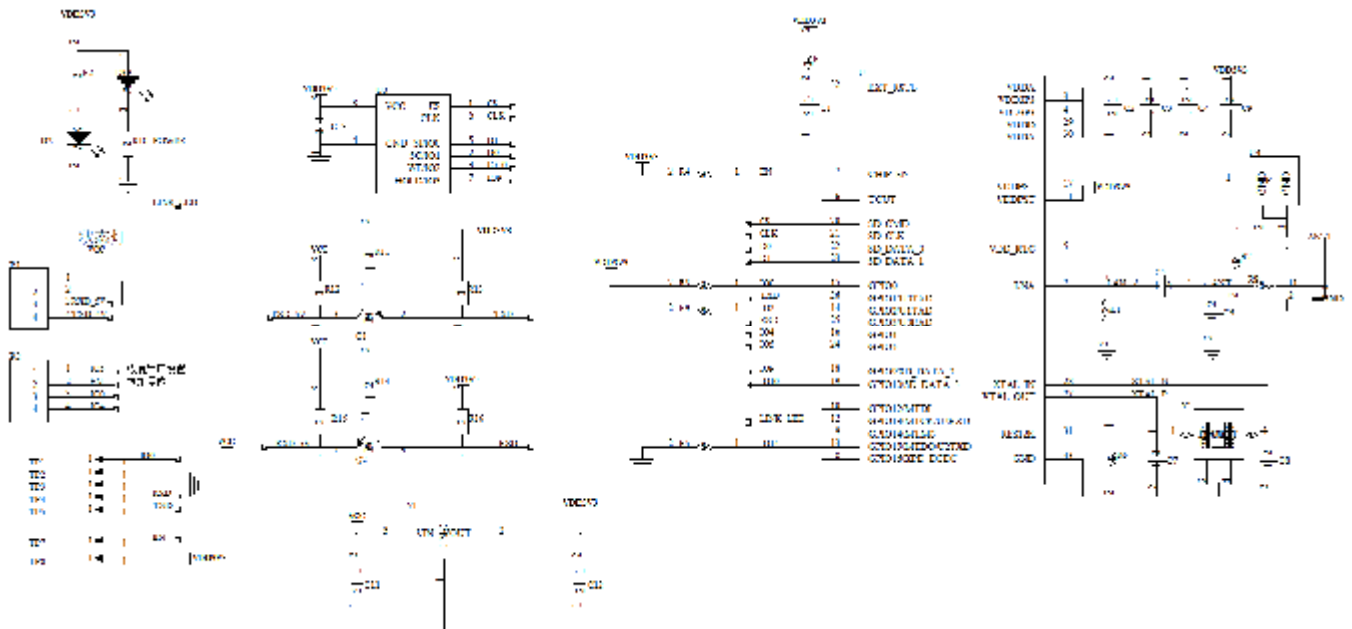
15	RX	RX receive
16	TX	TX transmit

Table Description of the ESP series module boot mode

Mode	CH_PD(EN)	RST	GPIO15	GPIO0	GPIO2	TXD0
Download mode	High	High	Low	Low	High	High
Running mode	High	High	Low	High	High	High

Note: Some of the pins inside the module had been pulled up or pulled down, Please refer to the schematic diagram.

## 5、Schematics



## OEM/Integrators Installation Manual

### Important Notice to OEM integrators

1. This module is limited to OEM installation ONLY.
2. This module is limited to installation in mobile or fixed applications, according to Part 2.1091(b).
3. The separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations.
4. For FCC Part 15.31 (h) and (k): The host manufacturer is responsible for additional testing to verify compliance as a composite system. When testing the host device for compliance with Part 15 Subpart B, the host manufacturer is required to show compliance with Part 15 Subpart B while the transmitter module(s) are installed and operating. The modules should be transmitting and the evaluation should confirm that the module's intentional emissions are compliant (i.e. fundamental and out of band emissions). The host manufacturer must verify that there are no additional unintentional emissions other than what is permitted in Part 15 Subpart B or emissions are complaint with the transmitter(s) rule(s). The Grantee will provide guidance to the host manufacturer for Part 15 B requirements if needed.

### End Product Labeling

When the module is installed in the host device, the FCC/IC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text: “Contains FCC ID: 2ATPO-ESP-15F ”

The FCC ID can be used only when all FCC compliance requirements are met.

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC/IC authorization is no longer considered valid and the FCC ID/IC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC/IC authorization.

### Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user’s manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

### Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

## FCC WARNING

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, and (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.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide 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.

To maintain compliance with FCC's RF Exposure guidelines, This equipment should be installed and operated with minimum distance between 20cm the radiator your body: Use only the supplied antenna.

FCC ID: 2ATPO-ESP-15F