

# WM171 User Manual



REV:1.0

2017.6

## FCC STATEMENT

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

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.

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.

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: 2AMU6-WM171" 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 minimum distance 20cm between the radiator and your body .

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End user must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. The portable device is designed to meet the requirements for exposure to radio waves established by the Federal Communications Commission (USA). These requirements set a SAR limit of 1.6 W/kg averaged over one gram of tissue. The highest SAR value reported under this standard during product certification for use when properly worn on the body

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.

## WM171 User Manual

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

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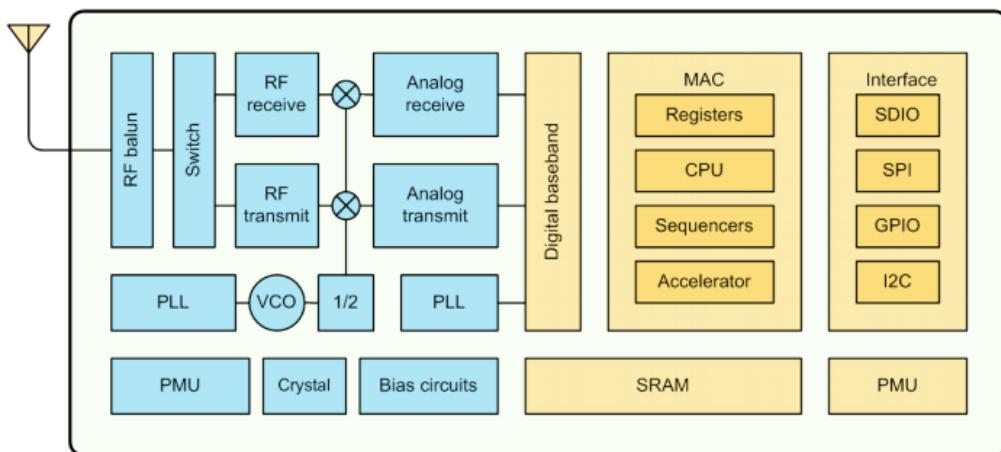
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# 1. Preambles

WM171 Wi-Fi module is developed by NTX Embedded, core processor in smaller sizes of the module encapsulates Tensilica L106 integrates industry-leading ultralow 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.

The core processor 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 The core processor Functional Block Diagram**

The core processor 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 core processor 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).

The core processor is among the most integrated Wi-Fi 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.

The core processor also integrates an enhanced version of Tensilica's L106 Diamond series 32-bit processor, with on-chip SRAM, besides the Wi-Fi functionalities. The core processor 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.

### 1.1. 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, 1x1 MIMO, 2x1 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)
- +23.6dBm output power in 802.11n mode
- Operating temperature range -40C ~ 85C

## 1.2. Parameters

Table 1 below describes the major parameters.

**Table 1 Parameters**

Categories	Items	Values
WiFi Parameters	Wi-Fi Protocols	802.11 b/g/n
	Frequency Range	2.4GHz-2.5GHz (2412MHz-2462MHz)
Hardware Parameters	Peripheral Bus	UART/HSPI/I2C/I2S/Ir Remote Control
		GPIO/PWM
	Operating Voltage	3.3V
	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
	Software 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

## 2. Pin Descriptions

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

Figure 2 WM171 pinout

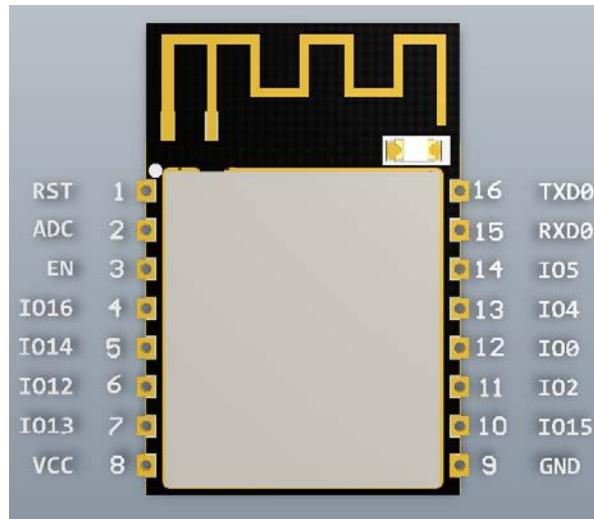


Table 2 WM171 pin description

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

## 2.1. Interfaces

**Table 3 Descriptions of Interfaces**

Interface	Pin Name	Description
HSPI	IO12(MISO), IO13(MOSI) IO14(CLK), IO15(CS)	SPI Flash , display screen, and MCU can be connected using HSPI interface
PWM	IO12(R), IO15(G), 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), 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	The core processor 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), IO2(SDA)	I2C interface can be used to connect external sensor products and display screens, etc.
UART	UART0: TXD(U0TXD), RXD(U0RXD), IO15(RTS), IO13(CTS) UART1: IO2(TXD)	<p>Devices with UART interfaces can be connected with the module.</p> <p>Downloading: U0TXD+U0RXD or GPIO2+U0RXD</p> <p>Communicating: UART0: U0TXD, U0RXD, MTDO (U0RTS), MTCK (U0CTS)</p> <p>Debugging: UART1_TXD (GPIO2) can be used to print debugging information.</p> <p>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.</p>
I2S	<p>I2S Input :</p> <p>IO12 (I2SI_DATA) ;</p> <p>IO13 (I2SI_BCK) ;</p> <p>IO14 (I2SI_WS);</p> <p>I2S Output: :</p> <p>IO15 (I2SO_BCK) ;</p> <p>IO3 (I2SO_DATA);</p> <p>IO2 (I2SO_WS ).</p>	I2S interface is mainly used for collecting, processing, and transmission of audio data.

## 2.2. Pin Mode

**Table 4 Pin Mode**

Mode	GPIO15	GPIO0	GPIO2
<b>UART</b>	low	low	high
<b>Flash Boot</b>	low	high	high

## 2.3. Antenna interface

WM171 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	2412MHz-2462MHz
Impedance	50Ω

### 3. Package information and OEM installation method

The external size of the WM171 WiFi module is 16mm\*17mm\*3mm, as is illustrated in Figure 4 below:

Figure 3 Top View of WM171 WiFi Module



Figure 4 Dimensions of WM171 WiFi Module

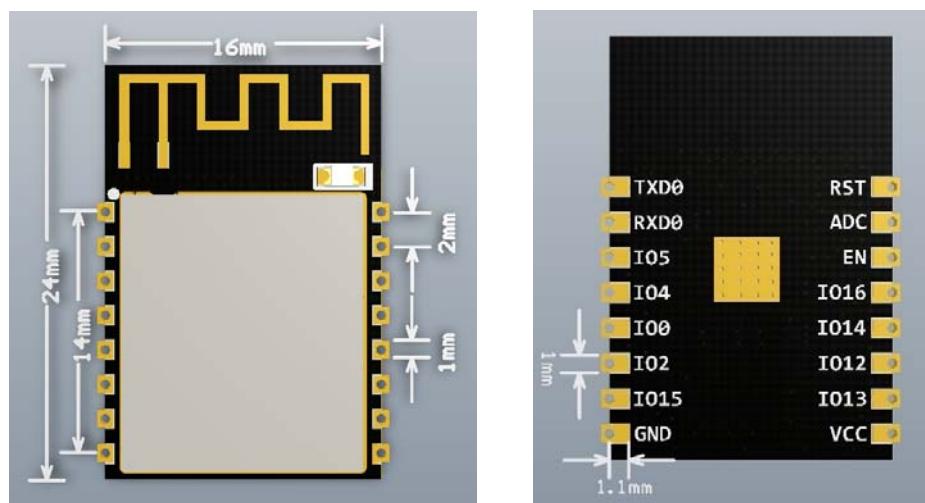


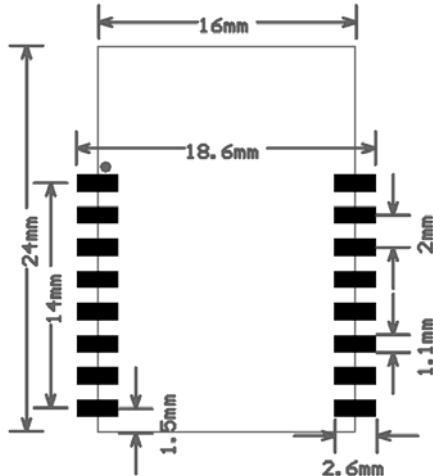
Table 5 Dimensions of WM171 WiFi Module

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

### 3.1. Package information

WM171 use a half hole patch package, Module PCB Footprint shown in the following figure:

**Figure 5 Module PCB Footprint**

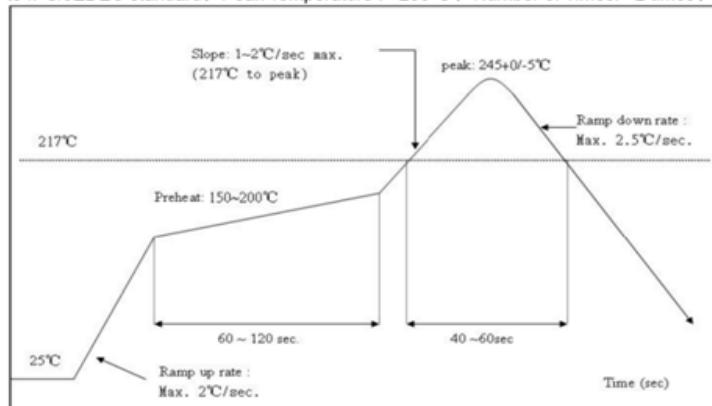


### 3.2. OEM installation method

Using WM171 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 can't 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:



## 4. Absolute Maximum Ratings

Table 6 Absolute Maximum Ratings

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

### 4.1 Recommended Operating Conditions

Table 7 Recommended Operating Conditions

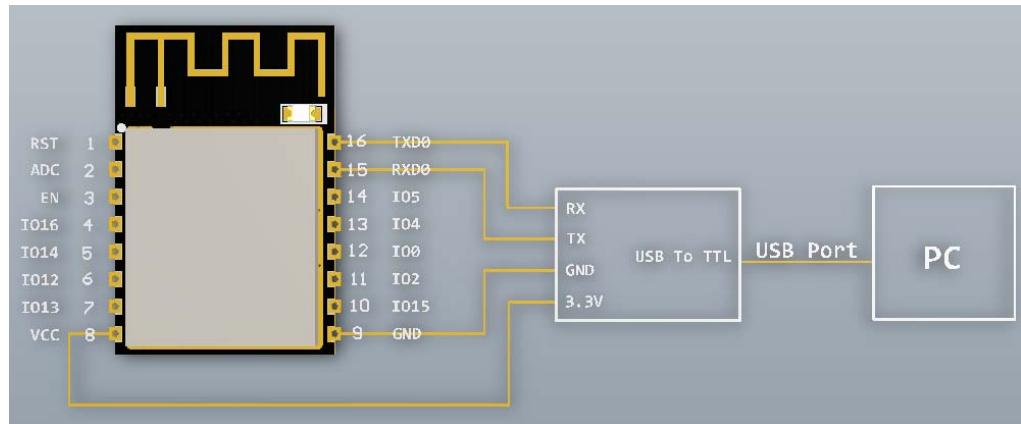
Operating Condition	Symbol	Min	Typ	Max	Unit
Operating Temperature		-40	20	125	°C
Supply voltage	VDD	3.0	3.3	3.6	V

### 4.2. AT command Testing

#### 1. Hardware connection

As shown in Figure 7, WM171 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 WM171 connect with computer



## 4.3. AT command

WM171 at instruction set functions and methods of use

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

### 4.3.1. 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"

### 4.3.2. Basic AT Command Set

The core processor 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

#### AT – Test AT startup

The type of this command is "executed". It's used to test the setup function of your wireless WiFi module.

AT - Test AT startup	
Response	OK
Parameters	null

**AT+RST – Restart module**

The type of this command is "executed". It's used to restart the module.

AT+RST - Restart module	
<b>Response</b>	OK
<b>Parameters</b>	null

**AT+GMR – View version info**

This AT command is used to check the version of AT commands and SDK that you are using, the type of which is "executed".

AT+GMR - View version info	
<b>Response</b>	<a href="#"><u>&lt;AT version info&gt;</u></a> <a href="#"><u>&lt;SDK version info&gt;</u></a> <a href="#"><u>&lt;compile time&gt;</u></a>  OK
<b>Parameters</b>	<a href="#"><u>&lt;AT version info&gt;</u></a> information about AT version <a href="#"><u>&lt;SDK version info&gt;</u></a> information about SDK version <a href="#"><u>&lt;compile time&gt;</u></a> time of the bin was compiled

**AT+GSLP – Enter deep-sleep mode**

This command is used to invoke the deep-sleep mode of the module, the type of which is "set". A minor adjustment has to be made before the module enter this deep sleep mode, i.e., connect XPD\_DCDC with EXT\_RSTB via **OR**.

AT+GSLP=<time>	
<b>Response</b>	<time> OK
<b>Parametes</b>	The time unit of <time> is ms. The core processor will wake up after deep sleep <time> ms.

**ATE – AT commands echo**

This command ATE is an AT trigger command echo. It means that entered commands can be echoed back to the sender when ATE command is used. Two parameters are possible. The command returns "OK" in normal cases and "ERROR" when a parameter other than 0 or 1 was specified.

ATE - AT commands echo	
<b>Response</b>	OK
<b>Parameters</b>	ATE0: Switch echo off ATE1: Switch echo on

**AT+RESTORE – Factory reset**

This command is used to reset all parameters saved in flash (according to appendix), restore the factory default settings of the module. The chip will be restarted when this command is executed.

AT+RESTORE - Factory reset	
<b>Response</b>	OK
<b>Notes</b>	Restore factory default settings. The chip will restart.

Detailed instruction test, please refer to the core processor AT Instruction Set, can be downloaded to shun official website.