

# **AW-01 User 's Manual**

## **Overview**

This article describes the meaning, syntax, response and examples of the AT commands of the Starcom AW-01 series products.

The command set is mainly divided into: system control AT commands, Wi-Fi function AT commands, and TCP/IP related AT commands.

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## **1. General Description**

AW-01 is a UART-WiFi module based on Lianshengde W600 developed by Shenzhen Xingtong Zhilian Technology Co., Ltd. This series of modules supports standard 802.11 b/g/n protocol and has a built-in complete TCP/IP protocol stack .

AW-01 Series Modules integrates Cortex-M3 CPU, Flash, RF Transceiver, CMOS PA, Baseband control. It applies multi interfaces such as SDIO, SPI, UART, GPIO, I<sup>2</sup>C, PWM, I<sup>2</sup>S, 7816 etc. It applies multi encryption and decryption protocol such as PRNG (Pseudo Random Number Generator), SHA1, MD5, RC4, DES, 3DES, AES, CRC etc.

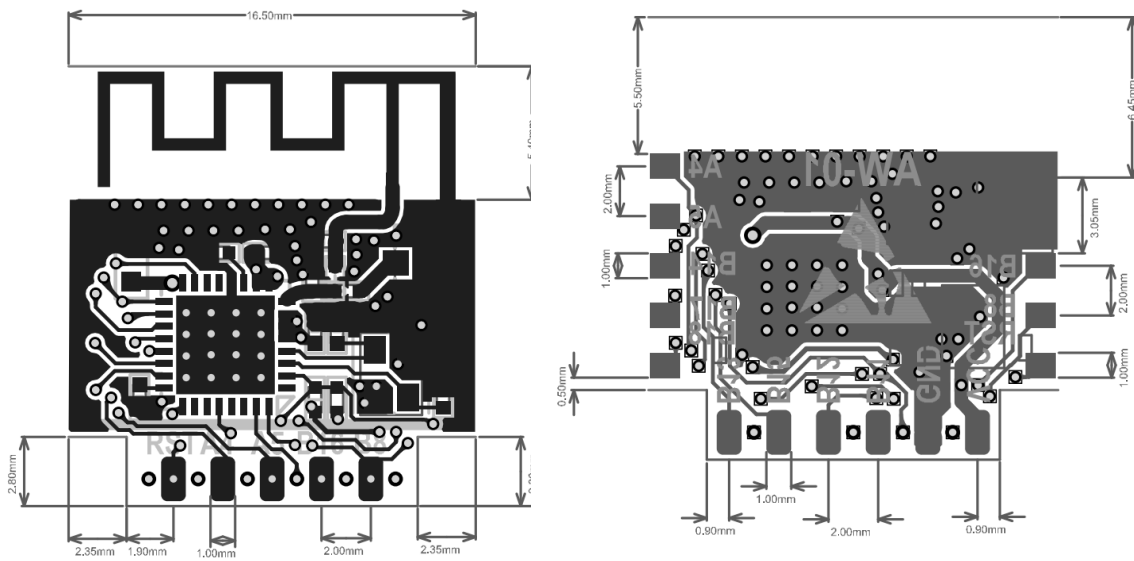
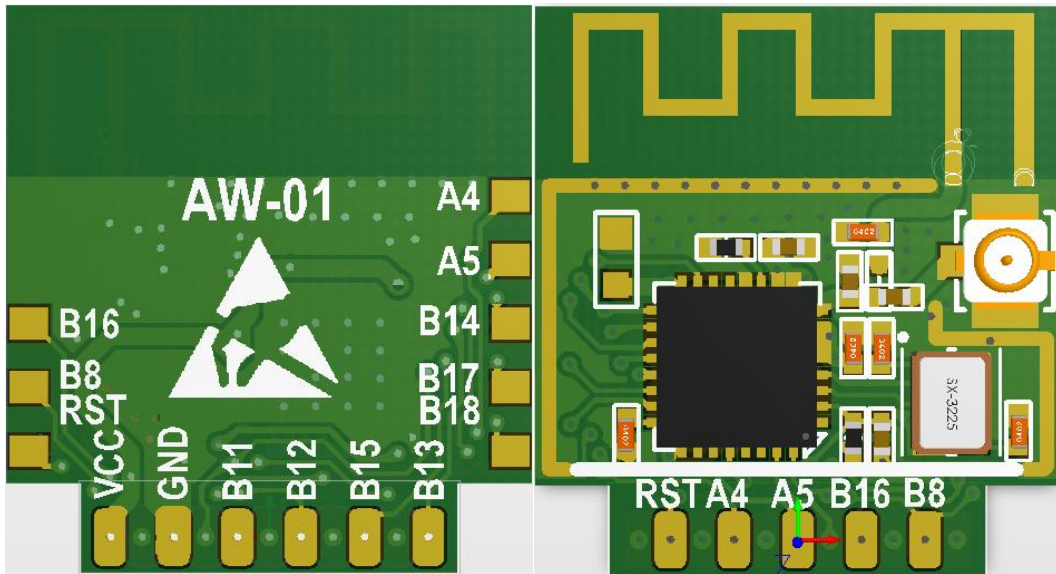
AW-01 Series Modules are an embedded Wi-Fi SoC Module which is complying with IEEE802.11b/g/n (1T1R) international standard and which supports multi interface, multi-protocol. It can be easily applied to smart appliances, smart home, health care, smart toy, and wireless audio & video, industrial and other IoT field.

## **Product Features**

- Integrated 288KB RAM;
- Integrated 1MB FLAS
- Integrated 2 UART interface, support RTS/CTS, baud rate: 1200bps~2Mbps
- Integrated one high speed SPI controller,operating frequency: 0~50MH
- Integrated I<sup>2</sup>S controller, support full duplex and codec from 32KHz to 192KH
- Integrated one I<sup>2</sup>C controller, support data transmission rate 100/400Kbp
- Integrated PWM controller, support 5 channel PWM output or 2 channels PWM input capture. Max output frequency is 20MHz and max input frequency is 20MHz;
- Integrated 7816 interface, support ISO-7816-3 T=0/1, EVM2000 protocol and UART protocol
- Integrated encrypted hardware accelerator,support PRNG(Pseudo random Number Generator), SHA1, MD5, RC4, DES, 3DES, AES, CRC;
- Support 20/40M bandwidth;
- Support Keil and eclipse development environment;

## 2. Module Interface

## 2.1 Package Size



Module	Package	Antenna	Size	layer
AW-01	SMT14\DIP-11	PCB	16.5*17.8*3 ( $\pm 0.2$ ) mm	2

## 2.2 Pin Definition

Num	Pin name	Type	Explain
1	VCC	P	IO 电源, 典型值 3.3V
2	PB8	I/O	PWM5、H_SPI_CK、SDIO_CK、I <sup>2</sup> S_M_SCL、GPIOPB_8
3	GND	P	GND
4	PB16	I/O	PWM_2、SPI(M/S)_CK、I <sup>2</sup> S_S_RL、GPIOPB_16 、HSPI_CK
5	PB11	I/O	H_SPI_DI、SDIO_DAT2、I <sup>2</sup> C_SCL、GPIOPB_11 、UART1_RX
6	PA5	I/O	PWM_0、SPI(M/S)_DI、I <sup>2</sup> S_M_EXTCLK、GPIOPA_5 、UART0_RX
7	PB12	I/O	H_SPI_DO、SDIO_DAT3、I <sup>2</sup> C_DAT、GPIOPB_12 、UART1_TX
8	PA4	I/O	PWM_4、SPI(M/S)_DO、I <sup>2</sup> S_M_SCL、GPIOPA_4、UART0_TX
9	PB15	I/O	PWM_3、SPI(M/S)_CS、I <sup>2</sup> S_S_SCL、GPIOPB_15 、H_SPI_CS
10	RST	I	RESET 复位
11	PB13	I/O	PWM_2、I <sup>2</sup> C_SCL、SDIO_CMD、GPIOPB_13
12	PA4	I/O	PWM_4、SPI(M/S)_DO、I <sup>2</sup> S_M_SCL、GPIOPA_4、UART0_TX
13	PA5	I/O	PWM_0、SPI(M/S)_DI、I <sup>2</sup> S_M_EXTCLK、GPIOPA_5 、UART0_RX
14	PB14	I/O	PWM_4、I <sup>2</sup> C_DAT、I <sup>2</sup> S_S_SDA、GPIOPB_14 、H_SPI_INT
15	PB17	I/O	PWM_1、SPI(M/S)_DI、UART1_RX、GPIOPB_17 、H_SPI_DI
16	PB18	I/O	PWM_0、SPI(M/S)_DO、UART1_TX、GPIOPB_18、H_SPI_DO
17	PB16	I/O	PWM_2、SPI(M/S)_CK、I <sup>2</sup> S_S_RL、GPIOPB_16 、HSPI_CK
18	PB8	I/O	PWM5、H_SPI_CK、SDIO_CK、I <sup>2</sup> S_M_SCL、GPIOPB_8
19	RST	I	RESET 复位

### 3. Electrical characteristics

### 3.1 Limit parameter

Table 3-1 Limit parameter

parameter	Name	Main	Type	MAX	Unit
Supply Voltage	VDD	3.0	3.3	3.6	V
Input logic level low	V <sub>IL</sub>	-0.3		0.8	V
Input logic level high	V <sub>IH</sub>	2.0		VDD+0.3	V
Input pin Capacitance	C <sub>pad</sub>			2	pF
Output logic level low	V <sub>OL</sub>			0.4	V
Output logic level high	V <sub>OH</sub>	2.4			V
Maximum Driving Capability	I <sub>MAX</sub>			24	mA
Storage temperature range	T <sub>STR</sub>	-40°C		+125°C	°C
Operating Temperature Range	T <sub>OPR</sub>	-40°C		+85°C	°C

### 3.2 Transmit Power

Table 3-2 Transmit Power

Mode	Type	Unit
Send IEEE802.11b, CCK 11Mbps, POUT = +19 dBm	230	mA
Send IEEE802.11g, OFDM 54Mbps, POUT = +13.5 dBm	210	mA
Send IEEE802.11n, OFDM MCS7, POUT = +12dBm	210	mA
Receive IEEE802.11b/g/n	100-110	mA

### 3.3 Wi-Fi Radio Characteristics



Parameters	Type	Unit
Input frequency	2.4GHz~2.4835MHz	
Nominal power		
72.2 Mbps PA	12	dBm
11b Mode PA	19	dBm
Sensitivity		
DSSS, 1 Mbps	-95	dBm
CCK, 11 Mbps	-86	dBm
OFDM, 6 Mbps	-89	dBm
OFDM, 54 Mbps	-73	dBm
HT20, MCS0	-89	dBm
HT20, MCS7	-71	dBm
HT40, MCS0	-85	dBm
HT40, MCS7	-68	dBm
Adjacent Channel Rejection		
OFDM, 6 Mbps	32	dB
OFDM, 54 Mbps	15	dB
HT20, MCS0	29	dB
HT20, MCS7	10	dB

## 4. Hardware Guide

### 4.1 Typical Applications

Note: You can't use USB to TTL 3.3V or 5V power supply, it is recommended to use two dry batteries or after conversion through the LDO 3.3V, it is strongly recommended to buy a new development board.

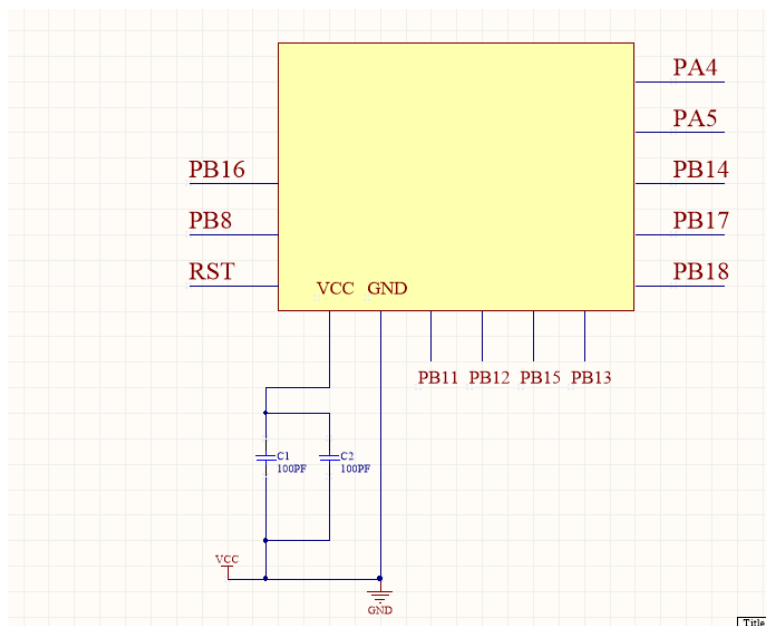


图 4.1 典型应用

## 4.2 GPIO Level Conversion

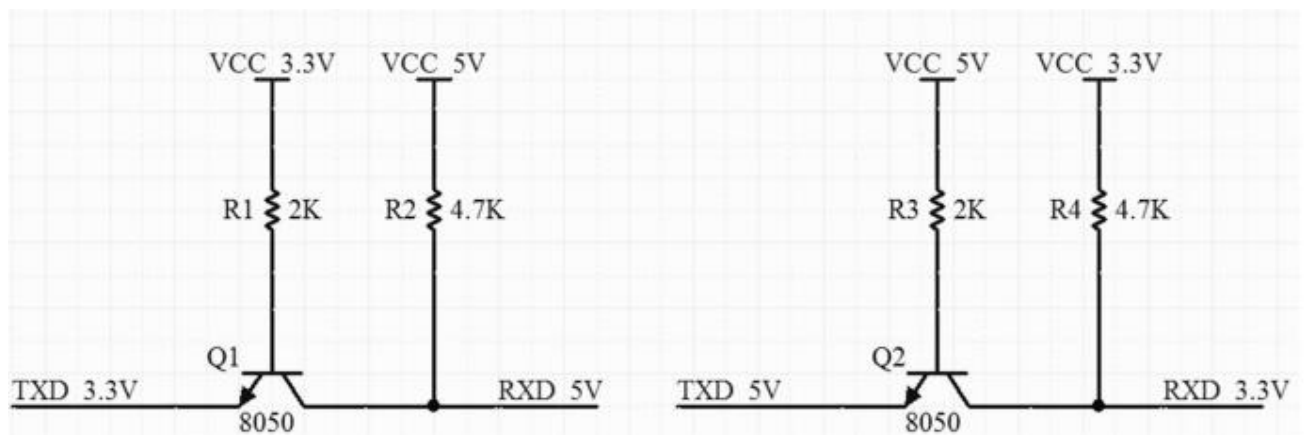


Figure 4.2 GPIO Level Conversion

## 4.3 Power Supply Reference Design

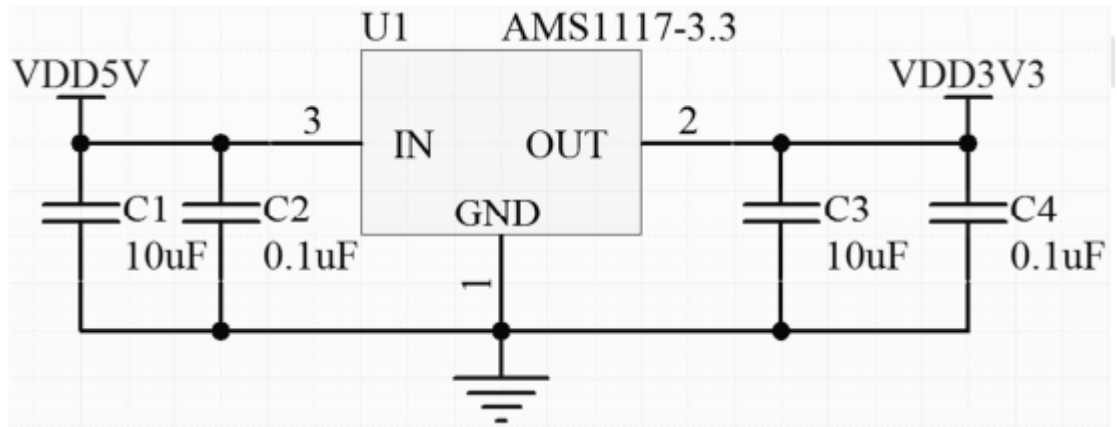


Figure 4.3 Power Supply Reference Design

#### 4.4 Automatically Download Reference Design

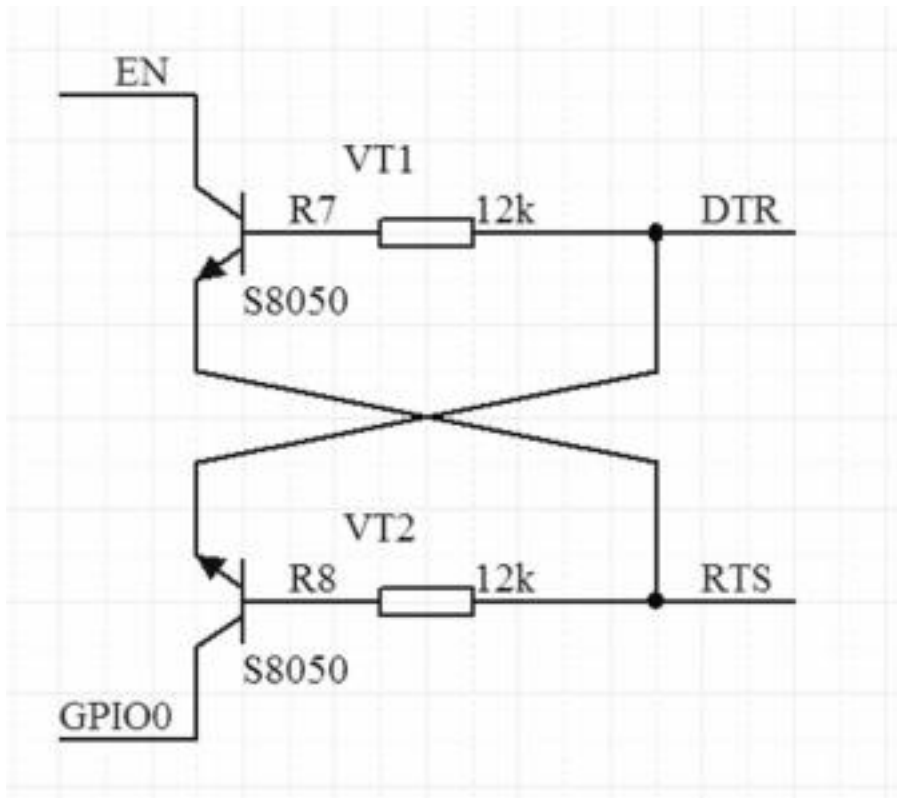
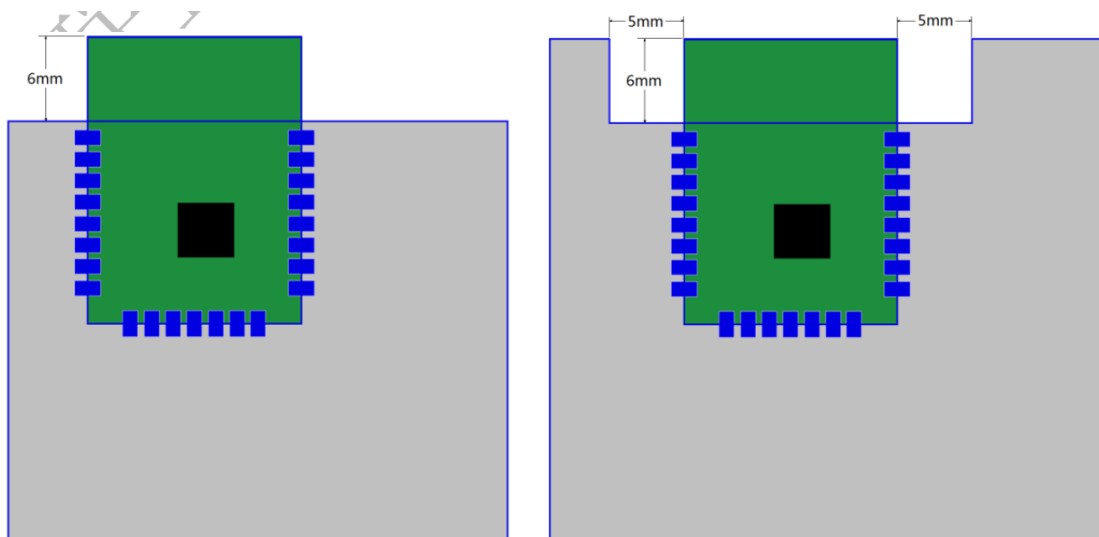


Figure 4.4 Automatically Download Reference Design

#### 4.5 Antenna placement reference

The AW-01 module uses an onboard antenna or an external antenna in the 2.4G wi-fi frequency band. If the onboard antenna is used, the following figure shows two commonly used antenna placement methods that have less impact on the antenna performance. It is recommended to choose as much as possible. One of the ways to place the module; Note: The second way of placement requires that the two sides of the PCB antenna are at least 5.0mm away from the two sides of the base plate



#### 4.6 WIFI product structure design considerations

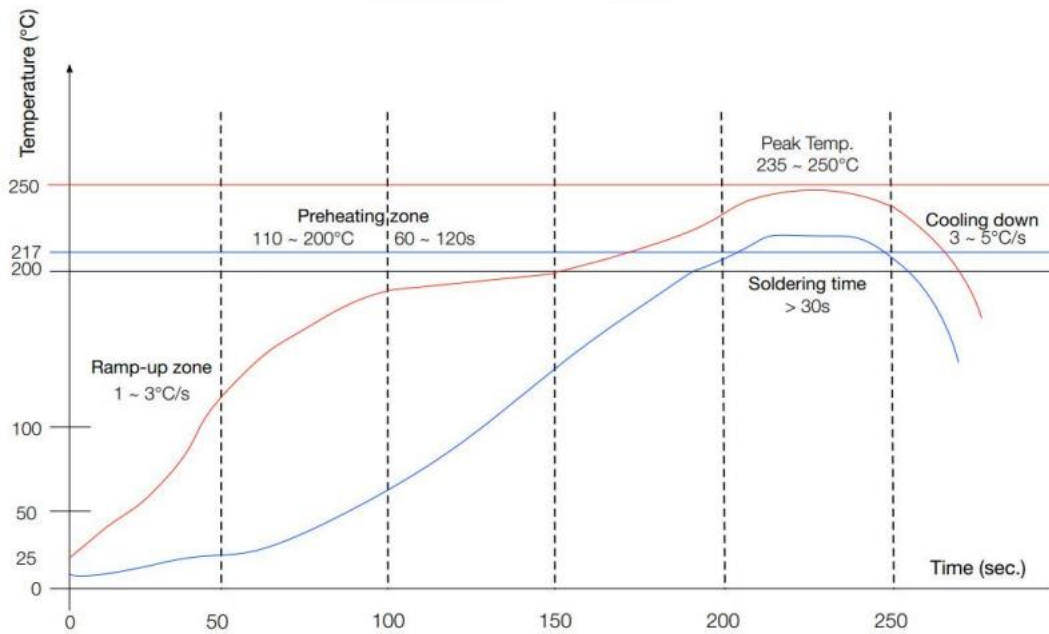
The following points should be paid attention to when placing the product board of the WIFI module in the product structure:

- Since the metal plate and metal surface have a strong

shielding effect on wireless signals, the side of the WIFI module PCB antenna must face the outside of the product in the product structure. It is forbidden to face the PCB antenna side of the WIFI module to the direction that has the shielding effect on the wireless signal, such as the PCB board and the battery;

- When installing the actual product board, the position of the WIFI module PCB antenna needs to be vertically upward;
- The WIFI module should be as far away from metal as possible in the actual product structure, such as external equipment such as transformers and motors;
- In the structural design, pay special attention to avoiding screw posts around the position of the WIFI module PCB antenna. When the screws are screwed in, it is actually equivalent to placing a metal post next to the WIFI module PCB antenna; After the actual product structure is determined, in order to achieve For the best antenna performance, it is recommended to do the antenna matching test of the whole machine.

#### 4.7 Furnace temperature curve



Ramp-up zone (升温区): Temp. <150°C, Time 60 ~ 90s, Ramp-up rate 1 ~ 3°C/s.  
 Preheating zone (预热恒温区): Temp. 150 ~ 200°C, Time 60 ~ 120s, Ramp-up rate 0.3 ~ 0.8°C/s.  
 Reflow soldering zone (回流焊接区): Peak Temp. 235 ~ 250°C (<245°C recommended), Time 30 ~ 70s.  
 Cooling down zone (冷却区): Temp. 217 ~ 170°C, Ramp-down rate 3 ~ 5°C/s.  
 Sn&Ag&Cu Lead-free solder (SAC305)/焊料为锡银铜合金无铅焊料

## 5. User guides

### 5.1 Burning download guide

Reference link: <https://docs.w600.fun/?p=app/download.md>

### 5.2 AT command instructions

The W600 series module has built-in AT firmware by default, and the default baud rate is 115200. You can refer to 3.1 typical application diagram to build the minimum system circuit, and then perform AT command operations.

This chapter only describes the commands, please refer to the link to the basic tutorial:

<https://docs.w600.fun/?p=at/esp-start.md>

#### 5.2.1 AT

<b>Parameters</b>	<b>No</b>
<b>Description</b>	<b>Test</b>
<b>Example</b>	<b>AT</b> <b>OK</b>

### 5.2.2 AT+GMR

<b>Parameters</b>	<b>No</b>
<b>Description</b>	<b>View firmware version information</b>
<b>Example</b>	<b>AT+GMR</b>  <b>AT version:1.1.5( Dec 20, 2018 00:27:26)</b> <b>SDK version:3.0.0</b> <b>ThingsTurn Technology Co., Ltd.</b> <b>Dec 20, 2018 00:27:26</b>  <b>OK</b>

### 5.2.3 AT+RST

<b>Parameters</b>	<b>No</b>
<b>Description</b>	<b>Restart Module</b>
<b>Example</b>	<b>AT+RST</b>

	<b>OK</b>
--	-----------

#### 5.2.4 AT+RESTORE

<b>Parameters</b>	<b>No</b>
<b>Description</b>	<b>Reset the module to factory settings</b>
<b>Example</b>	<b>AT+RESTORE</b> <b>OK</b>

### 5.3 Secondary development

The AW-01 module supports secondary development. Our company provides basic SDK packages and development documents to facilitate developers' development.

At the same time, we also provide development kits such as Aliso Things, RT Thread, Arduino, and Python.

Please refer to the link: <https://docs.w600.fun/?p=product/w600.md>

## 6、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, 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.

RF warning:

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 & your body.

## **Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01**

### **2.2 List of applicable FCC rules**

FCC Part 15 Subpart C 15.247 & 15.209

### **2.3 Specific operational use conditions**

The module is a WiFi module with WiFi function.

Operation Frequency: 2412-2462MHz

Number of Channel: 11

Modulation: 802.11b/g/n(HT20)/n(HT40)

Type: PCB Antenna

Gain: 2.0 dBi Max.

The module can be used for mobile or portable applications with a maximum 2.0dBi antenna. The host manufacturer installing this module into their product must ensure that the final composite product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation. The host manufacturer 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.

### **2.4 Limited module procedures**

Not applicable. The module is a Single module and complies with the requirement of FCC Part 15.212.

### **2.5 Trace antenna designs**

Not applicable. The module has its own antenna, and doesn't need a host's printed board microstrip trace antenna etc.

### **2.6 RF exposure considerations**

The module must be installed in the host equipment such that at least 20cm is maintained between the antenna and users' body; and if RF exposure statement or module layout is changed, then the host product manufacturer required to take responsibility of the module through a change in FCC ID or new application. The FCC ID of the module cannot be used on the final product. In these circumstances, the host manufacturer will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

### **2.7 Antennas**

Antenna Specification are as follows:

Type: PCB Antenna

Gain: 2.0 dBi

This device is intended only for host manufacturers under the following conditions:

The transmitter module may not be co-located with any other transmitter or antenna;

The module shall be only used with the internal antenna(s) that has been originally tested and certified with this module. The antenna must be either permanently attached or employa 'unique' antenna coupler.

As long as the conditions above are met, further transmitter test will not be required. However, the host manufacturer is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

## **2.8 Label and compliance information**

Host product manufacturers need to provide a physical or e-label stating "Contains FCC ID: ATI-AW01" with their finished product.

## **2.9 Information on test modes and additional testing requirements**

Operation Frequency: 2412-2462MHz

Number of Channel: 11

Modulation: 802.11b/g/n(HT20)/n(HT40)

Host manufacturer must perform test of radiated & conducted emission and spurious emission, etc according to the actual test modes for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

Only when all the test results of test modes comply with FCC requirements, then the end product can be sold legally.

## **2.10 Additional testing, Part 15 Subpart B disclaimer**

The modular transmitter is **only** FCC authorized for FCC Part 15 Subpart C 15.247 & 15.209 and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

## **Federal Communication Commission Statement (FCC, U.S.)**

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 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.

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.

### **FCC Caution:**

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

## **IMPORTANT NOTES**

### **Co-location warning:**

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

### **OEM integration instructions:**

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

The transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the external antenna(s) that has been originally tested and certified with this module.

As long as the conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

### **Validity of using the module certification:**

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module 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 authorization.

### **End product labeling:**

The final end product must be labeled in a visible area with the following: "Contains Transmitter Module [FCC ID: ATI-AW01](#)".

**Information that must be placed in the end user manual:**

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.