

WT5105-M1-SMD

Bluetooth 5.0 module

Liability Disclaimer

Wireless-Tag Technology Co., Limited reserves the right to make changes without further notice to the product to improve reliability, function, or design. Wireless-Tag Technology Co., Limited does not assume any liability arising out of the application or use of any product or circuits described herein.

All trade names, trademarks and registered trademarks mentioned in this document are property of their respective owners and are hereby acknowledged.

Copyright © 2019 Wireless-Tag Co., Ltd. All rights Reserved

Life Support Applications

Wireless-Tag Technology Co., Limited's products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Wireless-Tag Technology Co., Limited customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Wireless-Tag Technology Co., Limited for any damages resulting from such improper use or sale.

Contact Details

For your nearest distributor, please see <http://www.wireless-tag.com>

Information about product updates, downloads, and technical support can be accessed through our homepage.

Main Office

Shenzhen

115-118, building A, City Shanghai Center, 11 Zhongxing road, Bantian street, Longgang district, Shenzhen, Guangdong, China

Phone: +86 0755-22677752

Email: enquiry@wireless-tag.com

Release Notes

Version	Author	Date	Description
V1.0.0	Brussin, Liyan	25 March, 2020	First release
V1.0.1	Brussin	25 March, 2020	Add GPIO14,15,20 functional descriptions

Contents

1. Overview of WT5105	5
2. Module Features	6
3. Hardware Specifications	7
3.1 SoC Block Diagram	7
3.2 Module Pin Description	8
4. Electrical Characteristics.....	10
4.1.1 Absolute Maximum Ratings.....	10
4.1.2 Recommended Operating Conditions	10
4.2 Power Consumption	10
5. Application Notes.....	11
5.1 Module dimensions.....	11
5.2 Reflow Soldering Profile	12
5.3 Schematic Diagram	13
6. Serial AT Command Description	13
6.1 Testing Command	13
6.2 Software Version Query Command	13
6.3 MAC Address Query Command	14
6.4 Serial Port Baud Rate Operation Command.....	14
6.5 Device Naming Operation Command	14
6.6 Bluetooth Advertising Interval Setting Command	14

6.7	Bluetooth Connection Interval Setting Command.....	15
6.8	Bluetooth Advertising Operation Command	15
6.9	Restore Factory Default Settings Command	15
6.10	Customize Product Serial Number	15
6.11	Customize Advertising Data	16
6.12	RF Power Setting Command.....	16
6.13	Sleep Mode Setting Command	17
7.	Error Codes Description.....	17
8.	BLE Protocol Description	18

1. Overview of WT5105

WT5505-M1-SMD is a fully integrated module, based on the WT5501, a series of high-performance Bluetooth 5.0 System-on-Chip (SoC) manufactured by Wireless-Tag Technology, designed for mobile, wearable and Internet of Things (IoT) applications. This series of chips can help users develop low power Bluetooth products with central and/or peripheral roles.

- ARM Cortex-M0 32-bit processor
- Memory
512KB/2MB flash, 128KB ROM, 138KB SRAM with programmable sleep mode retention,
8-channel DMA
- 33/19 GPIOs
3 QDEC decoders, 6-channel PWM, 4-channel I2S, 2-channel PDM, 2-channel I2C,
2-channel SPI, 1-channel UART
JTAG
- Support DMIC/AMIC microphone
- 8-channel 12-bit ADC with low-noise PGA
- 4-channel 24-bit clock, 1 watchdog timer, real-time counter (RTC)
- Power management
Embedded LDOs, embedded Buck DC-DC converter, supply voltage range 1.8V-3.6V
Power monitor: low power detection feature
- Power consumption
0.8 μ A current in sleep mode, wake through IO
7 μ A current in sleep mode, wake on RTC
6.7mA peak current in RX
6.7mA peak current in TX (0dBm)
- RC oscillator with hardware calibration
32KHz RC RTC oscillator, automatic calibration with accuracy of ± 500 ppm
32MHz RC HCLK oscillator, automatic calibration with accuracy of 3%
- High rate throughput Support BLE 2Mbps protocol
Support data length extension (DLE)
- Support Bluetooth-Mesh
- Support BLE 5.0
RFPHY1Mbps/2Mbps/500Kbps/125Kbps
Receiving sensitivity:
BLE 1Mbps data rates: -97dBm

BLE125Kbps data rates: -103dBm

Transmit power : -20dBm to 10dBm, by 3dBm steps

Single-pin antenna: no RF matching or RX/TX switching needed

RSSI: 1dB resolution

- AES-128 hardware encryption
- Operating temperature: -40°C~125°C
- RoHS package: QFN48/QFN32

2. **Module Features**

- Integrated PCB antenna
- Operating voltage: 3.3V
- Operating temperature: -20°C - +85°C
- System

Bluetooth 5.0

Compact size 16.0mm x 13.0mm x 3mm(±0.2mm)

Low-power sleep mode: 3μA, wake-up by IO (P14)

- By default, the module supports UART serial AT command and two-way data transparent transmission with the Bluetooth host.

3. Hardware Specifications

3.1 SoC Block Diagram

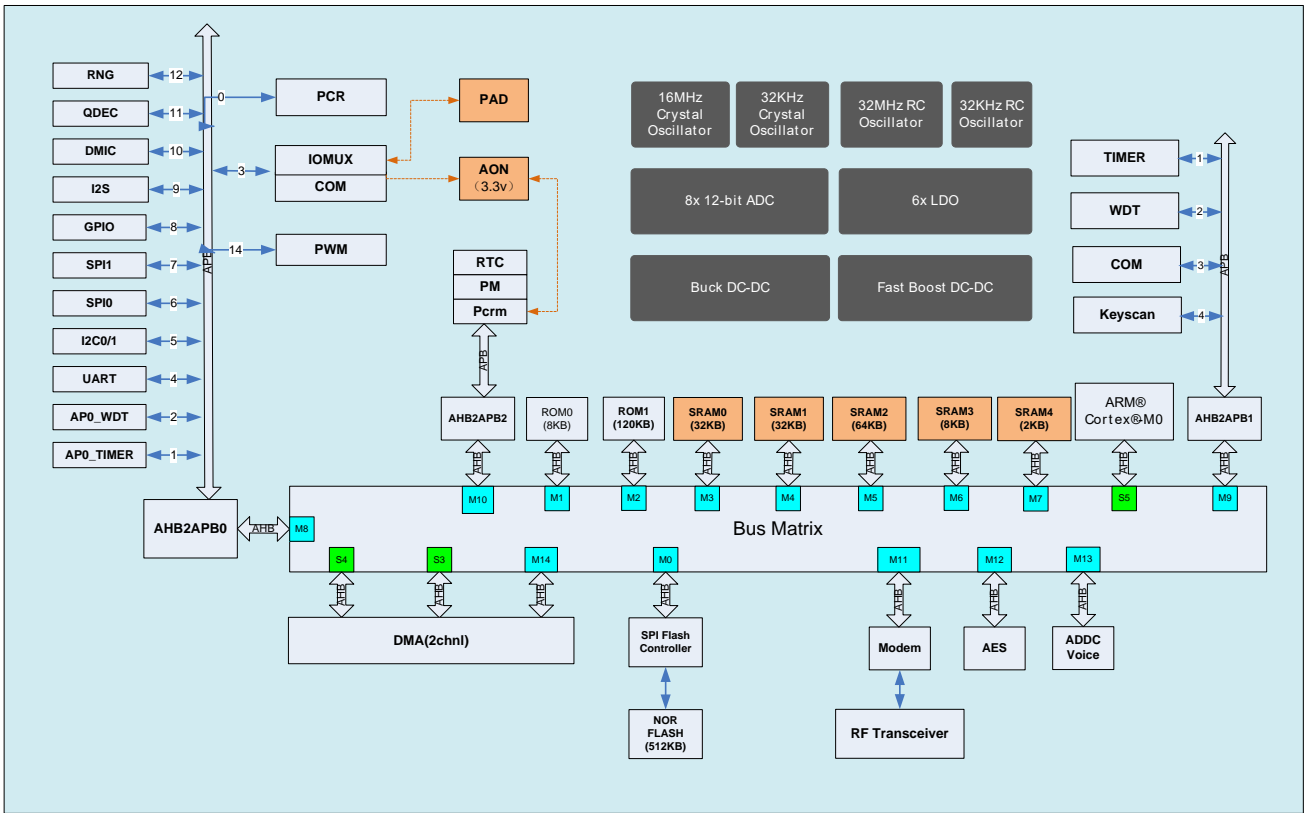


Figure 3-1 SoC Block Diagram

3.2 Module Pinout and Description

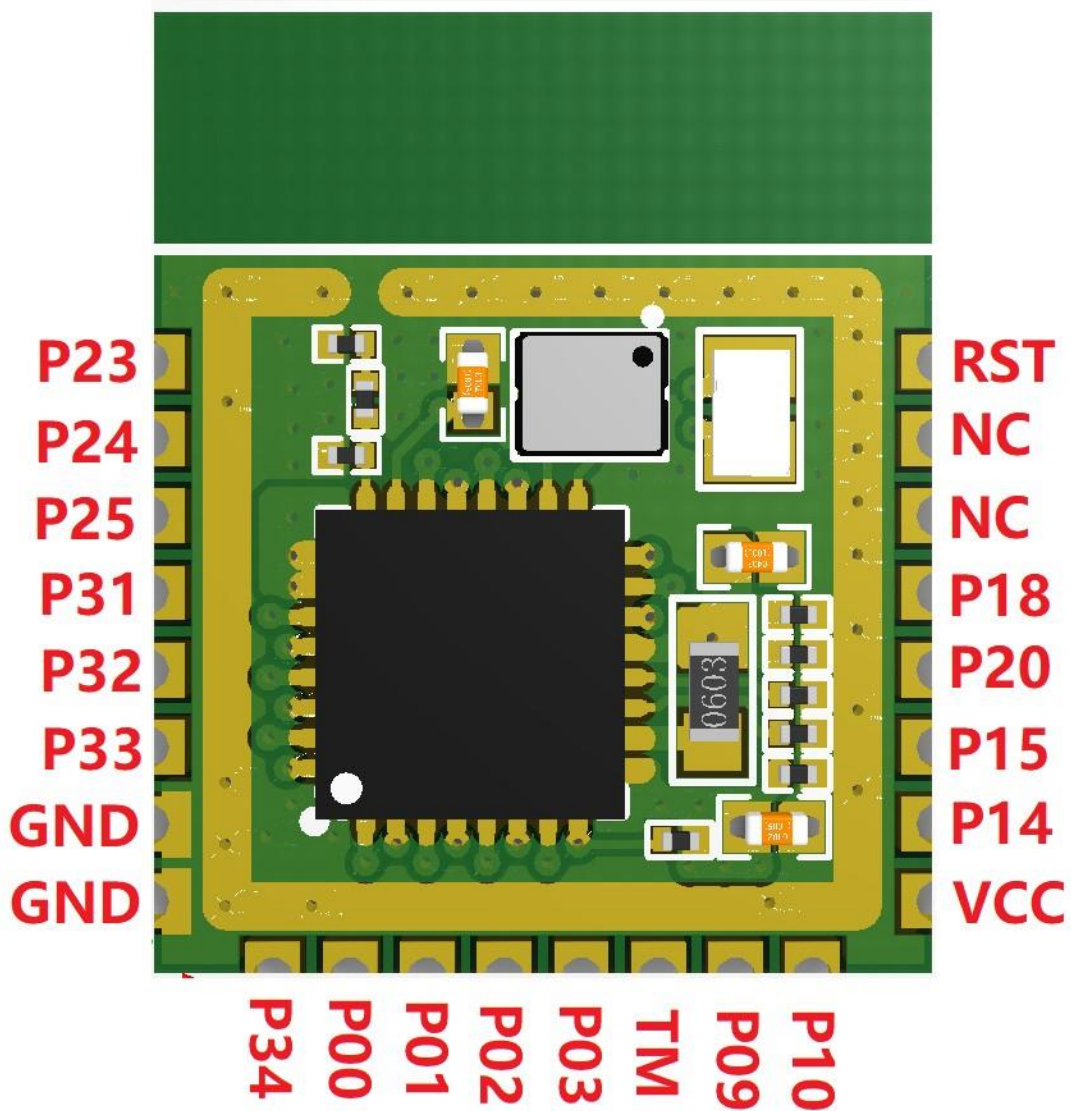


Figure 3-2 Pin Layout

Pin	Name	Description
1	P23	GPIO23
2	P24	GPIO24
3	P25	GPIO25
4	P31	GPIO31
5	P32	GPIO32
6	P33	GPIO33
7	GND	GND
8	GND	GND
9	P34	GPIO34
10	P00	GPIO00
11	P01	GPIO01
12	P02	GPIO02
13	P03	GPIO03
14	TM	Test Mode/ISP download mode/Flash operation mode control pin
15	P09	GPIO09, TX
16	P10	GPIO10, RX
17	VCC	Power input 1.8V-3.6V
18	P14	GPIO14, wake-up from sleep-mode, high-level: wake up
19	P15	GPIO15, mode indicator pin, high-level: active mode, low-level: sleep mode
2	P20	GPIO20, Bluetooth connection status indication, high-level: connection; low-level: disconnection
21	P18	GPIO18

22	NC	NC, reserved idle pin
23	NC	NC, reserved idle pin
24	RST	Chip reset pin

Table 3-1 Pins Description

4. Electrical Characteristics

4.1 Absolute Maximum Ratings

Rating	Condition	Value	Unit
Storage temperature	/	-40 to 85	°C
Maximum welding temperature	/	260	°C
Supply voltage	IPC/JEDEC J-STD-020	+1.8 to +3.6	V

Table 3-2 Absolute Maximum Ratings

4.2 Recommended Operating Conditions

Recommended Operating Conditions	Name	Minimum	Typical	Maximum	Unit
Operating temperature	/	-20	20	85	°C
Supply voltage	VDD	2.7	3.3	3.6	V

Table 3-3 Recommended Operating Conditions

4.3 Power Consumption

Mode	Transmit Power	Rate	Typical	Unit
Sleep			3	μA
Tx	0dB	1 Mbps	3.05	mA
Rx	All rates		3.9	mA

Table 3-4 Power Consumption

5. Application Notes

5.1 Module dimensions

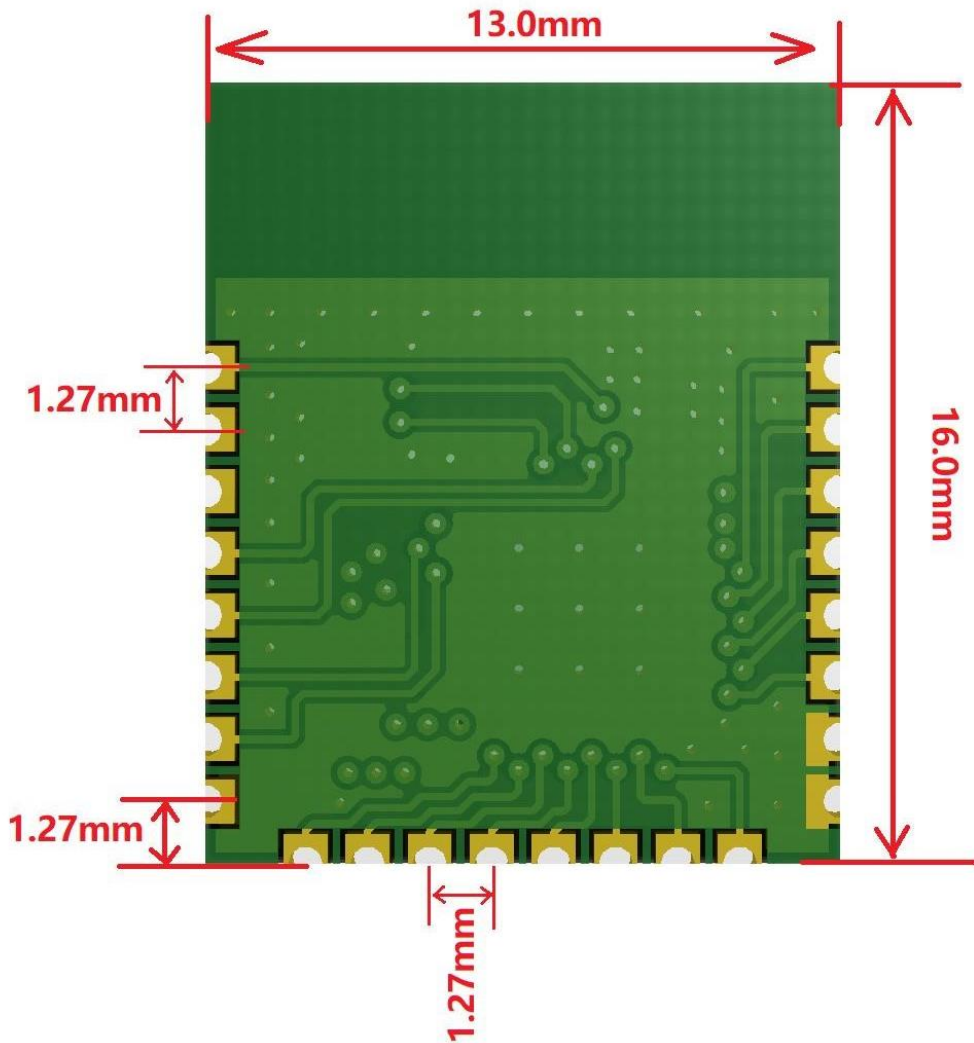


Figure 4-1 Module dimensions (Bottom view)

5.2 Reflow Soldering Profile

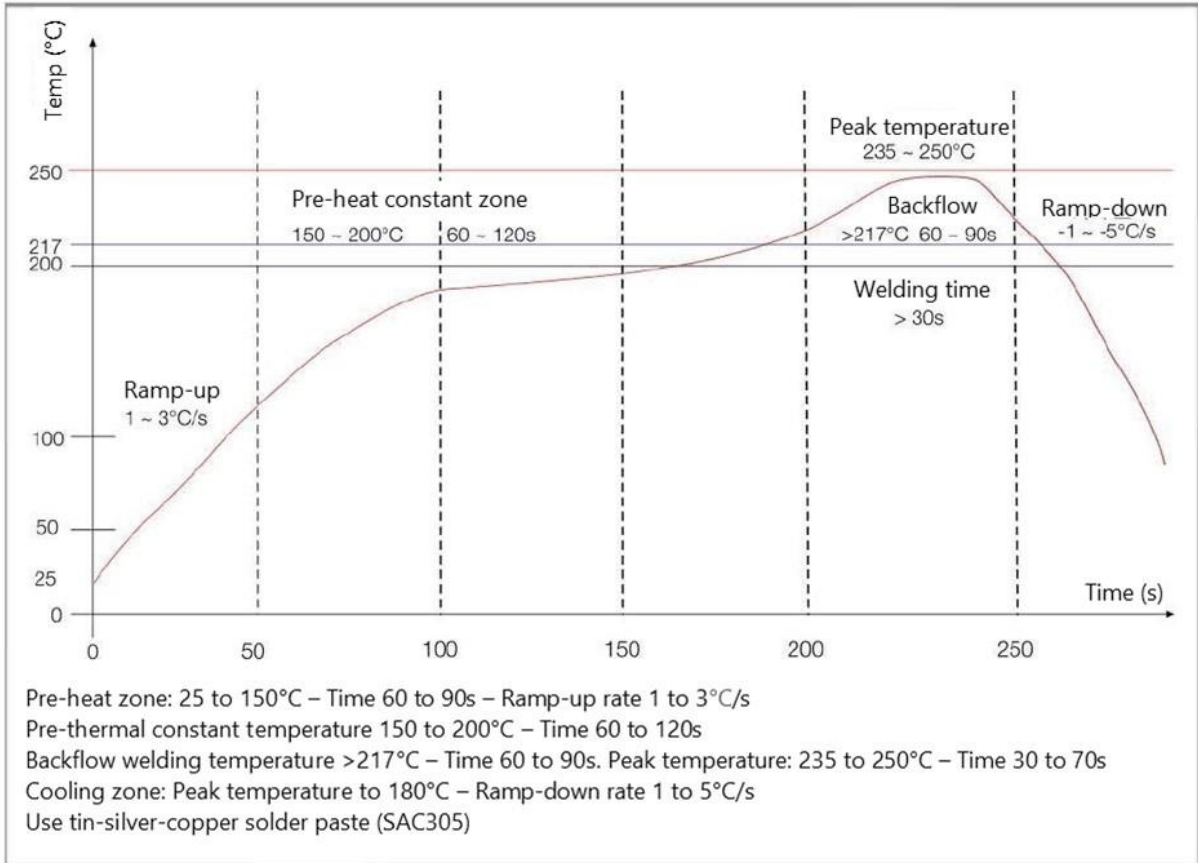


Figure 4-2 Reflow Soldering Profile

5.3 Schematic Diagram

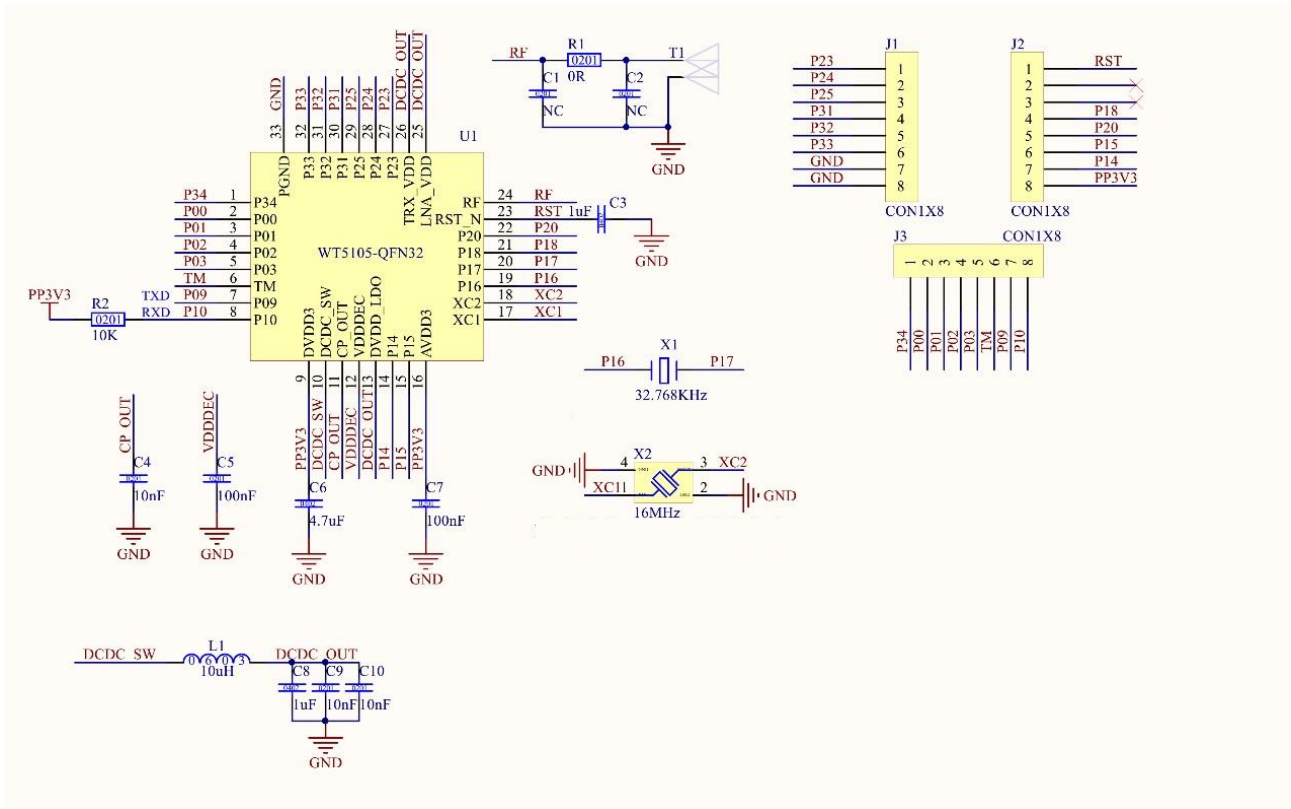


Figure 4-3 WT5105-M1-SMD Schematic Diagram

6. Serial AT Command Description

The module will automatically identify and decode serial port data. Packets with "AT+" at the beginning will be defaulted to AT commands and parsed to return the processing results. Therefore, data in the transparent transmission mode cannot start with the "AT+" characters. Non-AT command data will be forwarded by the module to the connected Bluetooth terminal.

6.1 Testing Command

Command format: AT+TEST\r\n

Return value: OK\r\n

Description: Sends AT test command. If return value is OK, AT test command is successful.

6.2 Software Version Query Command

Command format: AT+VERSION?\r\n

Return value: x.x.x\r\n

Description: Returns the current software version of the module.

6.3 MAC Address Query Command

Command format: AT+ADDR?\r\n

Return value: xx:xx:xx:xx:xx:xx\r\n

Description: Returns the current MAC address of the module.

6.4 Serial Port Baud Rate Operation Command

Command format: AT+BAUD=115200\r\n

Return value: OK\r\n

ERR: CODE\r\n

Description: Modify the serial port baud rate of the module communication to 115200bps. If it returns OK, the modification is successful, and if it returns ERR, the modification failed. The default baud rate of the serial port is 115200bps.

6.5 Device Naming Operation Command

Command format: AT+NAME=WT5105-M1\r\n

Return value: OK\r\n

ERR:CODE\r\n

Description: Rename the module as WT5105-M1; the length of the name shall not exceed 20 bytes.

Command format: AT+NAME?\r\n

Return value: WT5105-M1\r\n

Description: Query the current name of the module, the serial port returns the current name WT5105-M1.

6.6 Bluetooth Advertising Interval Setting Command

Command format: AT+ADV_INT=100\r\n

Return value: OK\r\n

ERR:CODE\r\n

Description: Set the advertising interval of Bluetooth to 100ms. The effective time interval is 20ms-4000ms. If it returns OK, setting is successful, and if it returns ERR, the setting failed.

6.7 Bluetooth Connection Interval Setting Command

Command format: AT+CIT=30,45\r\n

Return value: OK\r\n

ERR:CODE\r\n

Description: Set the minimum Bluetooth connection interval to 30ms, the maximum connection interval to 45ms; the effective Bluetooth connection interval is 10ms-4000ms.

6.8 Bluetooth Advertising Operation Command

Command format: AT+ADV_STOP\r\n

Return value: OK\r\n

ERR:CODE\r\n

Description: Stop Bluetooth advertising.

Command format: AT+ADV_START\r\n

Return value: OK\r\n

ERR:CODE\r\n

Description: Start Bluetooth advertising.

6.9 Restore Factory Default Settings Command

Command format: AT+DEFAULT\r\n

Return value: OK\r\n

ERR:CODE\r\n

Description: Restore the module to the default factory settings. If it returns OK, the module starts to restore the default factory settings. This command is not allowed in Bluetooth connection status.

6.10 Customize Product Serial Number

Command format: AT+SN=1234\r\n

Return value: OK\r\n

ERR:CODE\r\n

Description: Customize product serial number in the broadcast data. If it returns OK, the custom adding is successful; if it returns ERR, the adding fails, the possible reason of which

is that the custom data exceeds the range of serial number requirements. The module serial number supports 0000-FFFF, and the default is FFFF.

This command is not allowed in Bluetooth connection status.

6.11 Customize Advertising Data

Command format: `AT+MANU_DATA=1234\r\n`

Return value: `OK\r\n`

`ERR:CODE\r\n`

Description: Users can add custom data to the Bluetooth advertising data. The maximum data length that can be added is 6 bytes. This command is not allowed in Bluetooth connection status.

6.12 RF Power Setting Command

Command format: `AT+RFPM=3\r\n`

Return value: `OK\r\n`

`ERR:CODE\r\n`

Description: Reset the Bluetooth RF power. This command is not allowed in Bluetooth connection status.

Command format: `AT+RFPM?\r\n`

Return value: `3dBm\r\n`

Description: Query the current Bluetooth RF power.

Power Level	Power Value
0	5dBm
1	4dBm
2	3dBm
3	0dBm
4	-3dBm
5	-5dBm
6	-6dBm
7	-10dBm

8	-15dBm
9	-20dBm

6.13 Sleep Mode Setting Command

Command format: AT+SLEEP\r\n

Return value: OK\r\n

ERR: CODE\r\n

Description: In order to reduce the power consumption, the module can be put into deep sleep mode by this command. At this time, Bluetooth and serial port functions are turned off; and the standby current in this mode is about 3 μ A. The module can be awakened by the external wake-up pin (P14).

7. Error Codes Description

Error Code	Description	Cause for Error
1	Invalid input	
2	Unsupported command	
3	Parsing command is not allowed in the current state.	
4	The command is not allowed in the current state.	
5	The command has no action to perform.	
6	Invalid command parameter	
7	Hardware error	
8	Command processing timeout	
9	Other errors	

8. BLE Protocol Description

[SERVICE UUID:0x0201]

Eigenvalue	Attribute	
0x0202	NOTIFY	
0x0203	WRITE,WRITE NO RESPONSE	