E105-WBS36 Series User Manual

SoC WiFi/BLE/SLE Combo Wireless Serial Module



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1 Overview

1.1 Introduction

The E105-WBS36 series module is a highly integrated 2.4GHz SoC WiFi6, BLE5.4, and SLE1.0 combo serial port transparent transmission module , featuring small size, abundant resources , high transmission power, fast transmission speed, and strong anti-interference capabilities. It uses a universal AT command set , making mode switching and parameter configuration simple and quick. The module can be widely used in smart wearables, home automation, home security, personal healthcare, smart appliances, accessories and remote controls, automobiles, lighting, industrial internet, intelligent data acquisition, and intelligent control, etc.



E105-WBS36S



E105-WBS36SP

1.2 Features and Functions

Starlight (SLE)

- Supports Sparklink Low Energy 1.0 (SLE 1.0).
- Supports SLE 1MHz/2MHz/4MHz, with a maximum air interface rate of 4Mbps;
- Supports Polar channel coding;
- Be adjusted within the range of -5 to 20dBm via AT commands ;
- Supports transparent transmission of serial port data;

WiFi

- 1 × 1 2.4GHz band;
- The PHY supports IEEE 802.11b/g/n/ax;
- The MAC supports IEEE 802.11d/e/i/k/v/r/w;
- Supports 802.11n 20MHz/40MHz bandwidth and 802.11ax 20MHz bandwidth;
- Supported maximum speeds: 150 Mbit/s @ HT40 MCS7, 114.7 Mbit/s @ HE20 MCS9;
- Supports SoftAP mode, allowing up to 6 STATION connections;
- Supports STATION mode, with a maximum of 8 socket connections;
- Supports multiple security authentication modes such as WEP/WAPI/WPA+WPA2 MIX/WPA2+WPA3 MIX/WPA3;
- Supports transparent transmission of serial port data;

BLE

- Supports Bluetooth Low Energy 5.4 (BLE 5.4);
- Supports BLE speeds of 125Kbps/500Kbps/1Mbps/2Mbps;
- Supports a maximum BLE MTU of 517;
- Be adjusted within the range of -5 to 20dBm via AT commands ;
- Supports transparent transmission of serial port data;

peripheral interfaces

- 19 GPIO interfaces, 1 SPI interface, 1 QSPI interface, 2 I2C interfaces, 1 I2S interface, 3 UART interfaces, 6 ADC inputs, and 8 PWM outputs (the above interfaces are implemented through multiplexing).
- The I2C interface supports both Master and Slave modes;

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- The SPI interface supports both Master and Slave modes;
- The UART interface supports flow control (two channels).

1.3 Application scenarios

- Smart home and industrial sensors, etc.
- Smart Wearables
- Home security
- Smart home appliances
- Accessories and remote controls
- Wireless sensing
- Intelligent control
- Petroleum, chemical, metallurgy, etc.

2 Specifications

2.1 RF performance

RF items	Minimum value	Typical value	Maximum value	Unit	Test conditions
Operating frequency band	2400	-	2500	MHz	Frequency points below 2401MHz and above 2483.5MHz cannot meet the radiation requirements of the Radio Regulatory Commission, and the selection of channel frequencies must comply with protocol and regulatory requirements.
WiFi RX Sensitivity	-	-71	-70	dBm	@11ax HE20 MCS9, LDPC 4 × 3.2us PER 10%, 4096 octet PSDU
WiFi RX Adjacent channel rejection ratio	-	10	-	dB	@11n HT40 MCS7, useful signal -58dBm, PER 10%, 4096 octets PPDU
WiFi TX Maximum transmit power	15	-	20	dBm	@11ax HE20, LDPC 4x3.2us
WiFi Reference communication distance	-	260	-	m	@E105-WBS36SP, in a clear, open, unobstructed environment, with an onboard PCB antenna gain of 0.5dBi, antenna height of 1.2m, and transmit power of 20dBm.
	-	315	-	m	@E105-WBS36S, in a clear, open, unobstructed environment, with an antenna gain of 5.0 dBi, an antenna height of 1.2 m, and a transmit power of 20 dBm.
BLE RX Sensitivity	-	-96	-95	dBm	@BLE 2M, PER<30%
BLE TX Maximum transmit power	-	20	-	dBm	@Meets EVM and ACP requirements
BLE Reference communication distance	-	650	-	m	@E105-WBS36SP, in a clear, open, unobstructed environment, with an onboard PCB antenna gain of 0.5dBi, antenna height of 1.2m, and transmit power of 20dBm.
	-	1000	-	m	@E105-WBS36S, in a clear, open, unobstructed environment, with an antenna gain of 5.0 dBi, an antenna height of 1.2 m, and a transmit power of 20 dBm.
SLE RX Sensitivity	-	-93	-91	dBm	@SLE 4M GFSK, PER<10%
SLE TX Maximum transmit power	-	20	-	dBm	@SLE 4M GFSK, meets EVM and ACP requirements.

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SLE Reference communication distance	-	650	-	m	@E105-WBS36SP, in a clear, open, unobstructed environment, with an onboard PCB antenna gain of 0.5dBi, antenna height of 1.2m, and transmit power of 20dBm.
	-	1000	-	m	@E105-WBS36S, in a clear, open, unobstructed environment, with an antenna gain of 5.0 dBi, an antenna height of 1.2 m, and a transmit power of 20 dBm.

2.2 Electrical performance

Electrical items	Minimum value	Typical value	Maximum value	unit	Remark
Operating voltage	3.0	3.3	3.6	V	Output power can be guaranteed with a voltage of ≥3.3V; exceeding 3.6V carries a risk of burnout.
Communication level	-	3.3	-	V	Using 5V TTL levels carries a risk of damage; please use level conversion circuits appropriately.
WiFi TX current	300	-	320	mA	@3.3V instantaneous power consumption, maximum transmit power in WiFi mode, and is related to the matched antenna.
BLE TX current	350	-	450	mA	@3.3V Instantaneous power consumption, maximum transmit power in BLE mode, and dependent on the matched antenna.
SLE TX current	350	-	450	mA	@3.3V Instantaneous power consumption, maximum transmit power in SLE mode, and dependent on the matched antenna.
Operating temperature	-40	-	+85	℃	Industrial-grade design
Operating humidity	10	-	90	%rh	-
Storage temperature	-50	-	+150	℃	-

2.3 Hardware parameters

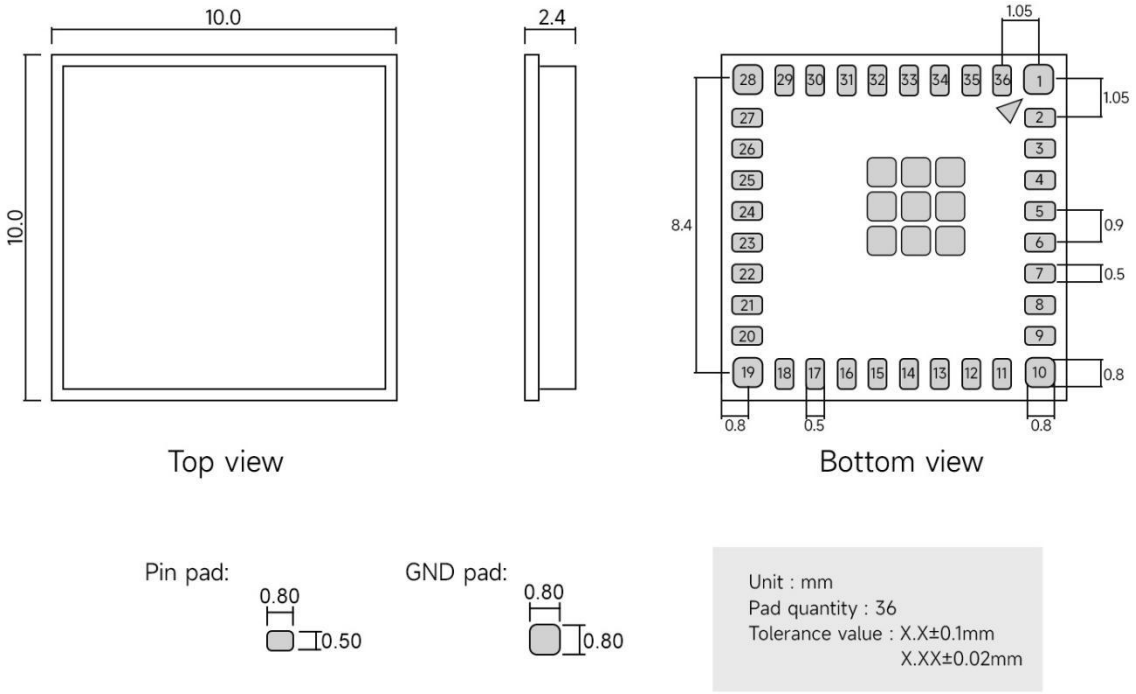
Hardware items	Parameter value	Unit	Remark
processor	32	Bit	high performance
Maximum operating frequency	240	MHz	-
SRAM	606	KB	Chip Embedded
ROM	300	KB	Chip Embedded
FLASH	4	MB	Chip Embedded
Communication interface	UART	-	The communication voltage level is 3.0-3.6V, but 3.3V is recommended to ensure data reliability.
Crystal oscillator frequency	40	MHz	The module is already built in.
Module size	10.0*10.0*2.4	mm	@E105-WBS36S, Length*Width*Height
	16.0 * 11.5 * 2.4	mm	@E105-WBS36SP, Length*Width*Height
Antenna type	SMD PIN	-	@E105-WBS36S, bottom pad lead-out
	Onboard PCB	-	@E105-WBS36SP
Packaging method	patch	-	@E105-WBS36S
	Perforated/stamp hole	-	@E105-WBS36SP
Weight	0.50	g	@E105-WBS36S
	0.65	g	@E105-WBS36SP

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3 Mechanical dimensions and pin definitions

3.1 E105-WBS 36S Dimensions and Pin Definitions



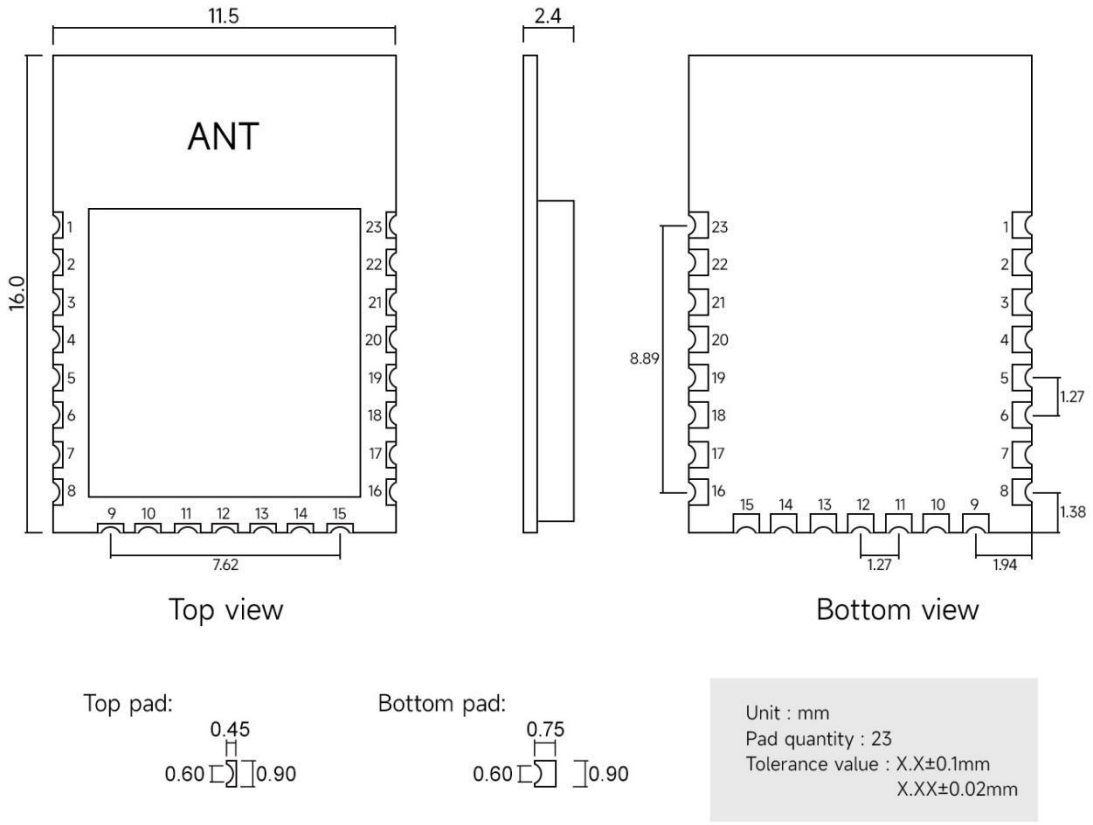
Pin number	Name	Function	Remark
1	GND	-	Module GND
2	GPIO7	I/0	General purpose I/O ports
3	GPIO8	I/0	General purpose I/O ports
4	GPIO9	I/0	For general-purpose I/O ports, pull-up resistors are disabled on the pins.
5	GPIO10	I/0	General purpose I/O ports
6	GPIO11	I/0	For general-purpose I/O ports, pull-up resistors are disabled on the pins.
7	GPIO12	I/0	General purpose I/O ports
8	VDD	-	Module power supply, 3.0-3.6V
9	GND	-	Module GND
10	GND	-	Module GND
11	GND	-	Module GND
12	GPIO13	I/0	General purpose I/O ports
13	GPIO14	I/0	General purpose I/O ports
14	UART1_TXD	OD	The transmit data pin of the UART1_TXD interface is used to transmit serial data through the UART1 channel.
15	UART1_RXD	I	The receive data pin of the UART1_RXD interface is used to receive external serial data through the UART1 channel.
16	UART0_TXD	OD	Programming pins
17	UART0_RXD	I	Programming pins
18	GND	I/0	Module GND
19	GND	I/0	Module GND
20	GND	I/0	Module GND
21	GND	I/0	Module GND
22	GND		Module GND
23	GND		Module GND
24	GND	I/0	Module GND
25	GPIO0	I/0	General purpose I/O ports SLE/BLE Link indicator: High level for disconnection, Low level for connection.

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26	PWR_ON	I/0	PMU power-on enable pin
27	GND	-	Module GND
28	GND	-	Module GND
29	ANT	-	RF Input / Output
30	GND	-	Module GND
31	GND	-	Module GND
32	GPIO1	I/0	General purpose I/O port, pins must not have pull-up resistors. WiFi Link indicator: Disconnected: Low level; Connected: High level
33	GPIO2	I/0	General purpose I/O ports Socket Link indicator: High level for disconnection, Low level for connection.
34	GPIO3	I/0	General purpose I/O ports
35	GPIO4	I/0	General purpose I/O ports
36	GPIO5	I/0	General purpose I/O ports

3.2 E105-WBS36SP Dimensions and Pin Definitions



Pin number	Name	Function	Remark
1	GPIO7	I/0	General purpose I/O ports
2	GPIO8	I/0	General purpose I/O ports
3	GPIO9	I/0	For general-purpose I/O ports, pull-up resistors are disabled on the pins.
4	GPIO10	I/0	General purpose I/O ports
5	GPIO11	I/0	For general-purpose I/O ports, pull-up resistors are disabled on the pins.
6	GPIO12	I/0	General purpose I/O ports
7	VDD	-	Module power supply, 3.0-3.6V
8	GND	-	Module GND
9	GND	-	Module GND
10	GPIO13	I/0	General purpose I/O ports
11	GPIO14	I/0	General purpose I/O ports
12	UART1_TXD	OD	The transmit data pin of the UART1_TXD interface is used to transmit serial data through the UART1 channel.
13	UART1_RXD	I	The receive data pin of the UART1_RXD interface is used to receive external serial data through the UART1 channel.
14	UART0_TXD	OD	Programming pins

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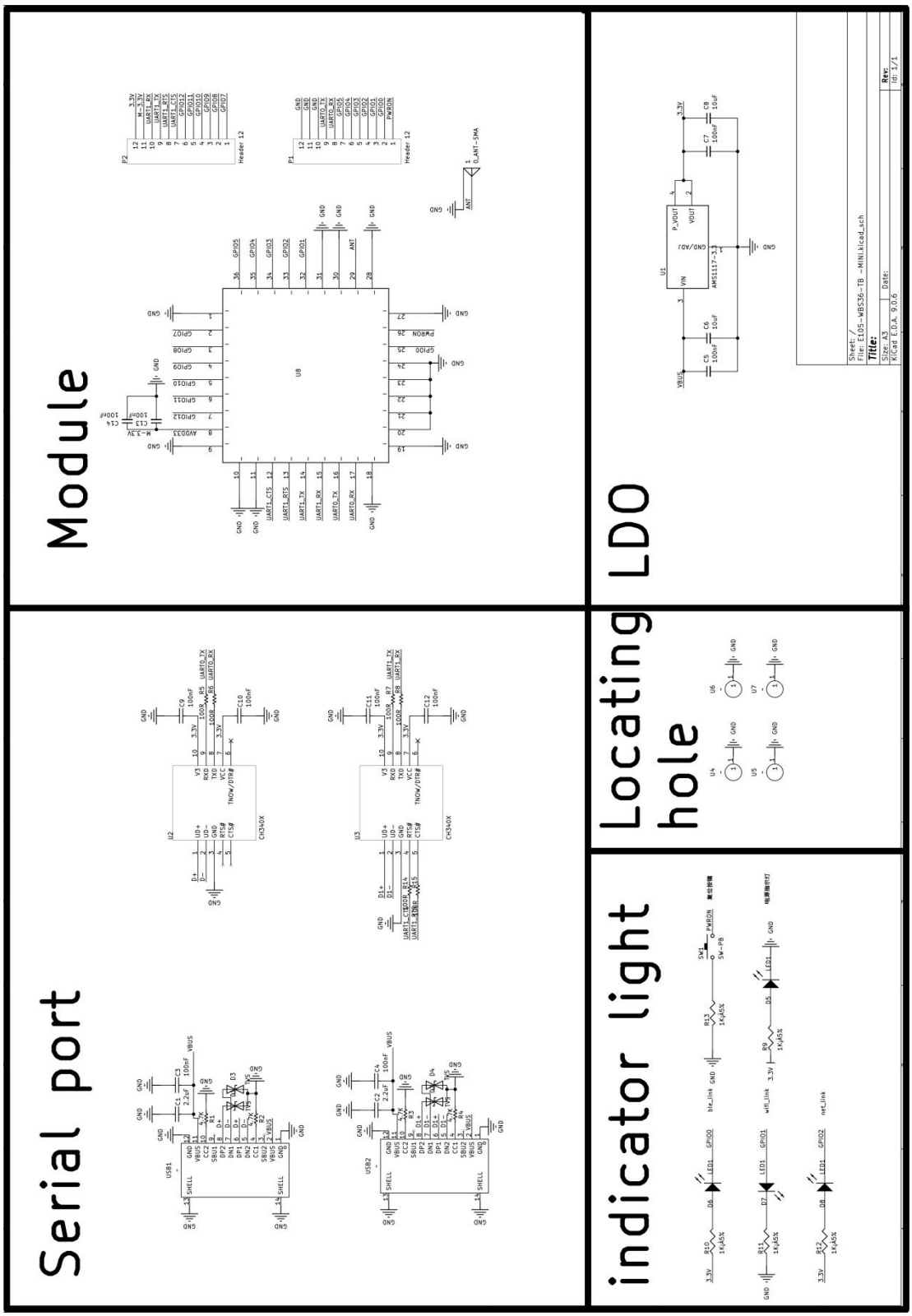
15	UART0_RXD	I	Programming pins
16	GPIO5	I/0	General purpose I/O ports
17	GPIO4	I/0	General purpose I/O ports
18	GPIO3	I/0	General purpose I/O ports
19	GPIO2	I/0	General purpose I/O ports Socket Link indicator: High level for disconnection, Low level for connection.
20	GPIO1	I/0	General purpose I/O port, pins must not have pull-up resistors. WiFi Link indicator: Disconnected: Low voltage; Connected: High voltage.
21	GPIO0	I/0	General purpose I/O ports SLE/BLE Link indicator: Disconnected: High level; Connected: Active level.
22	PWR_ON	I/0	PMU power-on enable pin
23	GND		Module GND

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4 Basic Applications

4.1 Reference circuit



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5 Usage Examples

5.1 WiFi Startup

Start the SoftAP example
AT+ROLE=4 AT+RST AT+WIFIMAC=0C:22:2D:38:44:4E AT+WIFISTARTAP=" BWS36 ",13,2,"123456789" AT+IFCFG=ap0,192.168.3.1,netmask,255.255.255.0,gateway,192.168.3.1 AT+DHCPS=ap0,1 AT+IFCFG
Note: The AT+DHCPS command above cannot be omitted.

Start SoftSTA example
AT+ROLE=4 AT+RST AT+WIFIMAC=0C:22:2D:38:44:44 AT+WIFISTARTSTA AT+WIFISCAN AT+WIFISCANRESULT AT+WIFICONN="BWS36",,"123456789" AT+DHCP=wlan0,1
Note: The above commands can be used not only to connect to the module's AP , but also to connect to the router's AP.

5.2 TCP Communication Test

Starting a TCP Server Example
AT+IPLISTEN=1,5001 AT+IPSEND=0,9,datatest
Notice: -

Starting the TCP CLIENT example
AT+IPSTART=0,tcp,192.168.3.1,5001 AT+IPSEND=0,9,datatest
Note: This command must be executed after a successful Wi-Fi connection.

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5.3 UDP Communication Test

Starting the UDP CLENIT1 example
AT+IPSTART=0,udp,5001 AT+IPSEND=0,9,192.168.3.2,5002,data test
Notice: -

Starting the UDP CLENIT2 example
AT+IPSTART=0,udp,500 2 AT+IPSEND=0,9,192.168.3. 1,500 1 , data test
Note: The IP addresses and ports listed above are subject to change.

5.4 StarSpark SLE Communication Test

Start SLE host
AT+ROLE=2 // Set as SLE Client AT+RST // The changes will take effect after a reboot. The default configuration will automatically connect to the SLE Server with MAC address 01:02:03:04:05:06. AT+SLECONNECTMAC=01:02:03:04:05:06 // Connect to slave device AT+TRANSMODE // Enter transparent transmission mode AAAAAAAAAAAAAAAAA // Send data to SLE Server
Notice: -

Start SLE slave
AT+ROLE=3 // Configure as SLE Server AT+RST // A reboot is required for the changes to take effect, as the default MAC address is 01:02:03:04:05:06. AT+TRANSMODE // Enter transparent transmission mode BBBBBBBBBBBBBBBBBB // Send data to SLE Client
Notice: -

5.5 Communication test with E105-BS21S/X module

E105-WBS36 Startup SLE Host
AT+ROLE=2 // Set as SLE Client AT+RST // Reboot for the changes to take effect. The default configuration will automatically connect to the SLE Server with MAC address 01:02:03:04:05:06. AT+SLECONNECTMAC=01:02:03:04:05:06 // Connect to slave device AT+TRANSMODE // Enter transparent transmission mode AAAAAAAAAAAAAAAAA // Send data to the SLE Server

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Notice: -

E105-BS21 Startup SLE Slave
AT+SLEMODE=1 // Configure as SLE Server AT+SLESTART // Restarting is required for the changes to take effect. AT+SLEMAC=010203040506,1 // Set the recognized MAC address to: 01:02:03:04:05:06 AT+SLESEND=5,12345 // Send data to the SLE Client AT+SLETRANS // E105- BS21 enter transparent transmission mode
Notice: -

E105-WBS36 Start SLE Slave
AT+ROLE=3 // Configure as SLE Server AT+RST // A reboot will take effect. The default configuration will automatically connect to the SLE Server with MAC address 01:02:03:04:05:06. AT+TRANSMODE // Enter transparent transmission mode AAAAAAAAAAAAAAAAA // Send data to SLE Server
Notice: -

E105-BS21 Startup SLE Host
AT+SLEMODE=2 // Set as SLE Client AT+SLESTART //Restart for the changes to take effect. AT+SLECONNECT=010203040506 // Connect to the specified slave device AT+SLESEND=5,12345 // Send data to SLE Server AT+SLETRANS // E105- BS21 enters transparent transmission
Notice: -

5.6 Bluetooth BLE Communication Test

Start BLE host
AT+ROLE=0 AT+RST AT+BLECONNECTMAC=01:02:03:04:05:06 AT+TRANSMODE
Note: The command to set the MAC address is optional.

Start BLE slave
AT+ROLE=1 AT+RST

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AT+TRANSMODE
Notice: -

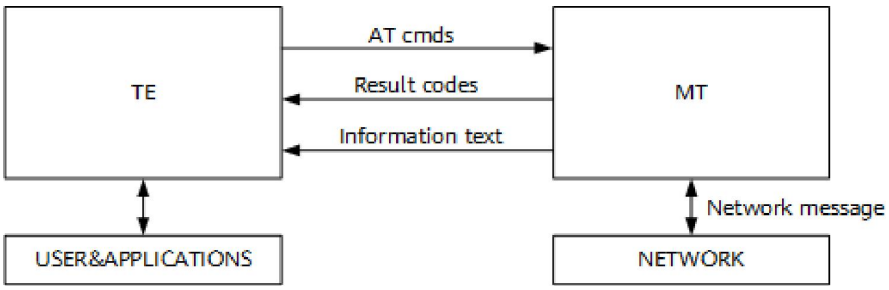
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6 AT Commands

6.1 Command Introduction

AT commands are used for the exchange of control information between TE (e.g., user terminals such as PCs) and MT (e.g., mobile terminals such as mobile stations), as shown in the figure below.



6.2 Instruction Type Description

Instruction type	Instruction format	Application Description
Test command	AT+<cmd>=?	This command is used to query the parameters and value range of setting instructions.
Query command	AT+<cmd>?	This command is used to return the current value of the parameter.
Setting instructions	AT+<cmd>=<parameter>	Set parameter values or execute
Execute instructions	AT+<cmd>	Functions used to execute this instruction

Notice:

- Not every instruction has all four types of commands listed in the table.
- If an AT command is present that is not supported by the current software version, an ERROR will be returned.
- Double quotes represent string data, for example: AT+SCANSSID="XXX".
- < > indicates a required parameter; [ ] indicates an optional value. Parameters are optional.
- The parameters in the command are separated by " , ". Except for string parameters enclosed in double quotes, parameters themselves do not support " , ".
- AT commands cannot contain extra spaces in their parameters.
- AT commands must be uppercase and must end with a carriage return and line feed character (CR LF). Some serial port tools only display the carriage return character (CR) and not the line feed character (LF) when the user presses the Enter key, causing the AT commands to be unrecognizable. If you need to manually input AT commands using a serial port tool, you need to set the Enter key to a carriage return character in the serial port tool .

6.3 Factory default parameter values

Parameter type	Default parameter value	Describe
Serial port	115200, 8N1	Editable, saves data even after power failure

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Starlight SLE Broadcast Name	E105-WBS36-SLE	Editable, saves data even after power failure
Bluetooth BLE broadcast name	E105-WBS36-BLE	Editable, saves data even after power failure
SLE/BLE MAC address	01:02:03:04:05:06	Editable, saves data even after power failure
WiFi MAC address	random	Editable, but not saved if power is lost.
Transmit power	20dBm	Editable, saves changes even after power failure; cannot be edited in WiFi mode.
Role	BLE slave	Editable, saves data even after power failure

6.4 Role Description

The module supports the following three working modes:

Serial Number	Work mode	Mode Details
1	Mode 0	Bluetooth BLE Client : This is used by users to establish Bluetooth BLE connections .
2	Mode 1	Bluetooth BLE server, used to send Bluetooth BLE broadcasts.
3	Mode 2	The StarShine SLE client is used by users to connect to StarShine SLE .
4	Mode 3	The StarShine SLE server is used to send StarShine SLE broadcasts.
5	Mode 4	WiFi mode
Note: The operating mode can be queried using the AT command " AT +ROLE ? " . For details, please see Chapter 6, AT Commands .		

6.5 General AT Commands

Instruction	Describe
AT+HELP	View currently available AT commands
AT+MAC	MAC address management
AT+IPERF	Performance testing
AT+SYSINFO	View system information
AT+PING	Testing IPv4 network connectivity
AT+PING6	Testing IPv6 network connectivity
AT+DNS	Configure the single-board DNS server address
AT+NETSTAT	Check network status
AT+DHCP	DHCP client commands
AT+DHCPS	DHCP server commands
AT+IFCFG	Interface configuration.
AT+PS	WiFi Low Power Settings
AT+RST	Reset board

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6.5.1 Entering AT Command Mode

Format	+++
Response	ENTER AT MODE!
Parameter Description	-
Example	-
Notice	This command can only be used after entering transparent transmission mode via AT+TRANSMODE.

6.5.2 Firmware version number

Format	AT+VER?
Response	● Success: OK ● Failure: ERROR
Parameter Description	-
Example	AT+VER? +VER=FW-7537-0-10 Oct 10 2025 11:27:09 OK
Notice	-

6.5.3 AT+MAC BLE/SLE Address Setting and Query

Format	Command to set: AT+MAC=<MAC>	Query command: AT+MAC?
Response	● Success: OK ● Failure: ERROR	+MAC:<MAC> ● Success: OK ● Failure: ERROR
Parameter Description	<MAC>: MAC address	<MAC>: MAC address
Example	AT+MAC=90:2B:D2:E4:CE:28	AT+MAC?
Notice	-	

6.5.4 AT+ROLE Role Settings and Queries

Format	Setting command: AT+ROLE=<ROLE>	Query command: AT+ROLE?
Response	● Success: OK ● Failure: ERROR	+ROLE:<ROLE> ● Success: OK ● Failure: ERROR
Parameter Description	The default value for <ROLE> is 1. 0: BLE Client; 1: BLE Server;	-

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	2: SLE Client; 3: SLE Server; 4: WiFi ;	
Example	AT+ROLE=1	AT+ROLE?
Notice	-	

6.5.5 AT+ATE0 Turn off echo

Format	AT+ATE0
Response	● Success: OK ● Failure: ERROR
Parameter Description	-
Example	AT+ATE0
Notice	-

6.5.6 AT+ATE1 Enable echo

Format	AT+ATE 1
Response	● Success: OK ● Failure: ERROR
Parameter Description	-
Example	AT+ATE 1
Notice	-

6.5.7 AT+UARTDSP Serial Port Parameter Settings and Queries

Format	Configuration command: AT+UARTDSP=<data_bits>,<stop_bits>,<parity>	Query command: AT+UARTDSP?
Response	● Success: OK ● Failure: ERROR	+UARTDSP:<data_bits>,<stop_bits>,<parity> ● Success: OK ● Failure: ERROR
Parameter Description	<data_bits>: Defaults to 3 0: Reserved ; 1: Retain ; 2: UART_DATA_BIT_7 ; 3: UART_DATA_BIT_8 ; <stop_bits>: Defaults to 1 0: UART_STOP_BIT_1 ; 1: UART_STOP_BIT_2 ; <parity>: Defaults to 0 0: UART_PARITY_NONE ;	-

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	1: UART_PARITY_ODD ; 2: UART_PARITY_EVEN ;	
Example	AT+UARTDSP =3,1,0	AT+UARTDSP?
Notice	-	

6.5.8 AT+UARTBAUD Serial Port Baud Rate Setting and Query

Format	Configuration command: AT+UARTDSP=<baud_rate>	Query command: AT+UARTBAUD?
Response	● Success: OK ● Failure: ERROR	+UARTBAUD:<baud_rate> ● Success: OK ● Failure: ERROR
Parameter Description	<baud_rate>: Default is 115200 0~1000000	-
Example	AT+UARTBAUD=115200	AT+UARTBAUD?
Notice	-	

6.5.9 SLE/BLE Transmit Power Settings and Inquiry

Format	Setting command: AT+TXPWR=<txpwer>	Query command: AT+TXPWR?
Response	● Success: OK ● Failure: ERROR	+TXPWR:<txpwer> ● Success: OK ● Failure: ERROR
Parameter Description	<txpwer>: Default 20dBm -5~20	-
Example	AT+TXPWR= 20	AT+TXPWR?
Notice	Only the SLE/BLE transmit power can be adjusted; in WiFi mode, it outputs at maximum transmit power.	

6.5.10 AT+HELP View all AT commands

Format	AT+HELP ?
Response	● Success: OK ● Failure: ERROR
Parameter Description	-
Example	AT+HELP?
Notice	Includes Wi-Fi, BLE, and SLE commands.

6.5.11 AT+RST Reset and Reboot

Format	AT+RST

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Response	● Success: OK ● Failure: ERROR
Parameter Description	-
Example	AT+RST
Notice	Software reset and restart

6.5.12 AT+RESTORE restores factory settings

Format	AT+RESTORE
Response	● Success: OK ● Failure: ERROR
Parameter Description	-
Example	AT+RESTORE
Notice	-

6.5.13 AT+TRANSMODE Enter transparent transmission mode

Format	AT+TRANSMODE
Response	● Success: OK ● Failure: ERROR
Parameter Description	-
Example	AT+TRANSMODE
Notice	Before TCP/UDP can enter transparent transmission mode, a data packet must first be sent using the "AT+IPSEND" command to determine the peer information.

6.5.14 AT+PING Test IPv4 Network Connectivity

Format	AT+PING=[<-x>,] , <IP>
Response	[<index>]Reply from <IP>:time=<time> TTL=<TTL><tx_count> packets transmitted,<rx_count> received,<loss_count> loss ● Success: OK ● Failure: ERROR
Parameter Description	<-x>: Parameter type -n,count: Send the number of data packets specified by count. The default value is 4 . -t: Ping the specified host until AT+PING=-k stops ; -w,interval: The time interval between two consecutive Ping packets, ranging from 1 to INT_MAX, in milliseconds ; -W,timeout: Ping timeout setting, parameter range 1000~10000, unit is milliseconds ; -l,size: The length of data sent in a single transmission, ranging from 0 to 65344 bytes, with a

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	default of 48 bytes ; -k: Stop the Ping packet; -k is used without parameters . <IP>: Destination host IP address <index>: Ping packet sequence number <time>: Time taken for the Ping packet <TTL>: Time to Live (TTL) <tx_count>: Number of packets sent <rx_count>: Number of packets received <loss_count>: Number of packet losses
Example	● AT+PING=192.168.3.1: Executes ping 192.168.3.1, the default ping. 4 bags ● AT+PING=-n,6,192.168.3.1: Executes ping 192.168.3.1, pinging 6 packets. ● AT+PING=-w,1,192.168.3.1: Execute ping The time interval between two consecutive ping packets is 1ms. (192.168.3.1) ● AT+PING=-l,100,192.168.3.1: Execute ping 192.168.3.1, set the maximum packet length for a single transmission to 100 bytes. ● AT+PING=-t,192.168.3.1: Executes ping 192.168.3.1 until the -k command is entered to stop. ● AT+PING=-k: Stop ping packets
Notice	-

6.5.15 AT+PING6 Test IPv6 Network Connectivity

Format	AT+PING 6 = [<-x>,] , <IP>
Response	[<index>]Reply from <IP>:time=<time> <tx_count> packets transmitted,<rx_count> received,<loss_count> loss ● Success: OK ● Failure: ERROR
Parameter Description	<-x>: Parameter type -c,count: Executes the command the number of times specified by the value of count, which defaults to 4 times . -t: Ping the specified host until AT+PING6=-k stops ; -k: Stop the Ping packet; -k is used without parameters . <IP> : Destination host IPv6 address <index>: Packet serial number Duration of a single Ping packet <tx_count>: Total number of packets sent <rx_count>: Total number of packets received <loss_count>: Number of packet losses
Example	● AT+PING6=2001:a:b:c:d:e:f:b ● AT+PING6=-c,100,2001:a:b:c:d:e:f:b ● AT+PING6=-k
Notice	-

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6.5.16 AT+DNS DNS Server Address Setting and Query

Format	Configuration command: AT+DNS=<dns_num>,<IP>	Query command: AT+DNS?
Response	● Success: OK ● Failure: ERROR	+DNS: <D NS 1_IP> <D NS 2_IP> ● Success: OK ● Failure: ERROR
Parameter Description	<dns_num>: Serial number 1: The first DNS server ; 2: The second DNS server ; <IP>: DNS server IP address	<DNS1_IP>: The IP address of DNS1 <DNS2_IP>: The IP address of DNS2
Example	AT+DNS=1,192.168.3.1 AT+DNS= 2 , 192.168.3.2	AT+DNS?
Notice	-	

6.5.17 AT+NETSTAT Query Network Status

Format	AT+NETSTAT
Response	< Proto > <Recv-Q> <Send-Q> <Local Address> <Foreign Address> <State> ● Success: OK ● Failure: ERROR
Parameter Description	<Proto>: Protocol type TCP protocol; UDP protocol; <Recv-Q> : The amount of data not read by the user <Send-Q> : For TCP connections, the amount of data sent but not yet acknowledged; for UDP connections, the amount of data buffered due to incomplete IP address resolution . < Local Address >: Local address and port < Foreign Address >: Remote address and port <State> : TCP connection state; this item is not included for UDP . CLOSED : This means there is no connection at all; LISTEN: This means listening for connection requests from remote TCP ports. SYN_SENT: This means waiting for a matching connection request after sending a connection request; SYN_RCVD: This means waiting for the other party's confirmation of the connection request after receiving and sending a connection request; ESTABLISHED: This indicates an open connection. FIN_WAIT_1: This means waiting for a remote TCP connection termination request, or confirmation of a previous connection termination request; FIN_WAIT_2: This means waiting for a connection termination request from a remote TCP connection.

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	CLOSE_WAIT: This means waiting for a connection termination request from the local user; CLOSING: This means waiting for the remote TCP to acknowledge the termination of the connection. LAST_ACK: This means waiting for acknowledgment of the original request to terminate the connection to the remote TCP. TIME_WAIT: This means waiting a sufficient amount of time to ensure that the remote TCP receives an acknowledgment of the connection termination request;
Example	AT+NETSTAT
Notice	-

6.5.18 Enabling and Disabling AT+DHCP DHCP Client Service

Format	AT+DHCP=<ifname>,<stat>
Response	● Success: OK ● Failure: ERROR
Parameter Description	<ifname>: Network interface name <stat> : DHCP Client service switch, off by default . 0 : Off; 1 : Enable;
Example	AT+DHCP=wlan0,1
Notice	The network card name should match the STA network card name displayed using AT+IFCFG.

6.5.19 AT+DHCP DHCP Server Service Enabling and Disabling

Format	AT+DHCPS=<ifname>,<stat>
Response	● Success: OK ● Failure: ERROR
Parameter Description	<ifname>: Network interface name <stat> : DHCP Server service switch, off by default . 0 : Off; 1 : Enable;
Example	AT+DHCP= ap 0,1
Notice	The network interface card (NIC) name should match the AP NIC name displayed using AT+IFCFG.

6.5.20 AT+IFCFG Network Interface Settings and Queries

Format	Configuration command: AT+IFCFG=<ifname>,<IP>,netmask,<netmask>,gateway,<gateway> AT+IFCFG=<ifname>[,<switch>]	Query command: AT+IFCFG
Response	● Success: OK ● Failure: ERROR	+IFCFG:<ifname>,ip =<IP>,netmask

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		=<netmask>,gateway =<gateway>,ip6=<IP6>,HWaddr =<HWaddr>,MTU=<MTU value>,RunStatus =<RunStatus> ● Success: OK ● Failure: ERROR
Parameter Description	<ifname>: Network interface name <IP>: IP address <netmask>: Subnet mask <gateway>: Gateway address <switch>: Network adapter switch up: Enable network card; down: Disable network card ; <IP6>: IPv6 address <HWaddr>: Hardware address <MTU value>: Maximum length of data frame <RunStatus>: Whether the network interface card is running. 0: The network card is not running; 1: The network card is running ;	
Example	● AT+IFCFG=ap0,192.168.3.1,netmask,255.255.255.0,gateway,192.168.3.1: Configures the IP address , subnet mask, and gateway for network interface card ap0. ● AT+IFCFG=ap0,up: Enables network card ap0. ● AT+IFCFG=ap0,down: Disable network card ap0 ● AT+IFCFG: Query various configuration information of the network card	
Notice	● Only after starting STA/SOFTAP can a valid <HWaddr> be found. ● When configuring an IP address, <IP> must immediately follow <ifname>. ● When enabling/disabling the network adapter, <switch> must immediately follow <ifname>. ● Enabling/disabling the network interface card (NIC) and configuring its IP address, netmask, and gateway cannot be done in the same command.	

6.5.21 AT+WIFIPS Wi-Fi Low Power Settings

Format	AT+WIFIPS=<switch>
Response	● Success: OK ● Failure: ERROR
Parameter Description	<switch>: Low-power mode enable switch 0: Low power consumption is off; 1: Enable FAST-PS low-power mode; 2: Enable PS-POLL low-power mode; 3: Disable PS-POLL mode and enable FAST-PS low-power mode; 255: Permanently disable low-power settings (for authentication only; will be restored upon reboot) ;
Example	AT+WIFIPS=0

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Notice	Low-power commands need to be sent after Wi-Fi connection and IP address acquisition; otherwise, they may not take effect.

6.5.22 AT+WIFIMAC: Setting and querying WIFI MAC address

Format	Command to set: AT+WIFIMAC=<MAC>	Query command: AT+WFIMAC?
Response	● Success: OK ● Failure: ERROR	+MAC:<MAC> ● Success: OK ● Failure: ERROR
Parameter Description	<MAC>: WiFi MAC address	-
Example	AT+WIFIMAC=2A:2B:D2:E4:CE:28	AT+WFIMAC?
Notice	The configuration command is valid only if issued before AT+STARTSTA/AT+STARTAP. This MAC address is lost after a reboot. The configured address is the STA MAC address; the SOFT AP MAC address will be derived by adding 2 to the second-to-last byte of this address.	

6.6 STATION Related AT Commands

Instruction	Describe
AT+STARTSTA	Start STA
AT+STOPSTA	Turn off STA
AT+RECONN	Configure reconnection policy
AT+SCAN	Initiate STATION scan
AT+SCANCHN	Specified channel scanning
AT+SCANSSID	SSID Scan
AT+SCANRESULT	View STA TION scan results
AT+CONN	Initiate connection with AP
AT+FCONN	Initiate a fast connection with the AP.
AT+DISCONN	Disconnect from AP
AT+STASTAT	Check STATION status
AT+PBC	Wps PBC connection
AT+PIN	Wps pin connection
AT+PINSHOW	Display the generated PIN code

6.6.1 AT+WIFISTARTSTA Enable STATION service

Format	Configuration command: AT+WIFISTARTSTA=[<protocol_mode>],[<pmf>]	Query command: AT+WIFISTARTSTA
Response	● Success: OK ● Failure: ERROR	● Success: OK ● Failure: ERROR

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Parameter Description	<protocol_mode>: Protocol type, defaults to 4. 0: Not configured; 1:802.11b; 2: 802.11b + 802.11g; 3: 802.11b+802.11g + 802.11n; 4: 802.11b+802.11g+802.11n+802.11ax; <pmf>: Manages frame protection policy, defaults to 1. 0: No protection; 1: Adaptive; 2: Mandatory protection;	-
Example	AT+WIFISTARTSTA= 1,1	AT+WIFISTARTSTA
Notice	● When an instruction is executed without parameters, the above parameters use the system default values. ● Repeated startup of STATE is not supported .	

6.6.2 AT+WIFISTOPSTA Disable STATION service

Format	AT+WIFISTOPSTA
Response	● Success: OK ● Failure: ERROR
Parameter Description	-
Example	AT+WIFISTOPSTA
Notice	After executing AT+STOPSTA, there is no need to first execute "AT+DHCP=wlan0,0" to disable the DHCP service; the DHCP service will be automatically disabled.

6.6.3 Setting the reconnection policy for AT+WIFIRECONN

Format	AT+WIFIRECONN=<enable>[,<period>,<count>[,<timeout>]]
Response	● Success: OK ● Failure: ERROR
Parameter Description	<enable>: Enables reconnection. 0: Do not reconnect; 1: Perform a reconnection; <period>: Reconnection interval period, in seconds, range: 1~65535 <count>: Maximum number of reconnections, value range: 1~65535 <timeout>: Timeout for a single reconnection, with a value range of 2 to 65535, the default being 2. A value of 65535 indicates an infinite loop of reconnections.
Example	AT+WIFIRECONN=1,10,3600,50 AT+WIFIRECONN=0
Notice	When the reconnect enable bit is 0 (disabled), you do not need to enter the following parameters;

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	otherwise, an ERROR response will be given.

6.6.4 Enable Station Scan Service with AT+WIFISCAN

Format	AT+WIFISCAN
Response	● Success: OK ● Failure: ERROR
Parameter Description	-
Example	AT+WIFISCAN
Notice	● This command is a non-blocking command. ● The command returning "OK" indicates that the scan was started successfully. Execute " AT+WIFISCANRESULT " to view the scan results.

6.6.5 AT+WIFISCANCHN Specified Channel Scan

Format	AT+WIFISCANCHN=<chn>
Response	● Success: OK ● Failure: ERROR
Parameter Description	<chn>: Channel number, ranging from 1 to 14, only single-channel scanning is supported.
Example	AT+WIFISCANCHN= 3
Notice	● This command is a non-blocking command. ● The command returning "OK" indicates that the scan was started successfully. ● The value range for <chn> varies by region; in China, it ranges from 1 to 13.

6.6.6 AT+WIFISCANSSID (Specify SSID for scanning)

Format	AT+WIFISCANSSID=<ssid>
Response	● Success: OK ● Failure: ERROR
Parameter Description	<ssid>: Service set identifier, i.e., router name. This parameter must be enclosed in double quotes.
Example	AT+WIFISCANSSID="XXX" AT+WIFISCANSSID=P"\\xe4\\xb8\\xad\\xe5\\x9b\\xbd": Specifies the SSID as " China " and starts the scan.
Notice	● This command is a non-blocking command. ● The command returning "OK" indicates that the scan was started successfully. ● an SSID named "China"), enter the encoding of "China" in the following format: P"\\xe4\\xb8\\xad\\xe5\\x9b\\xbd" ● The `<ssid>` directive must contain special characters or be escaped using backslashes (`\`). For example, if the SSID name is "ab,c", the command parameter should be "ab\,c".

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6.6.7 AT+WIFISCANRESULT View Station Scan Results

Format	AT+WIFISCANRESULT
Response	+SCANRESULT:<ssid>,<bssid>,<chn>,<rssi>,<auth_type> ● Success: OK ● Failure: ERROR
Parameter Description	<ssid>: Service set identifier, i.e., router name <bssid>: Basic Service Set Identifier, usually the router's MAC address. <chn>: Channel number, value range 1~14 <rssi>: Signal strength <auth_type>: Authentication method -1: Invalid security type; 0: OPEN; 1: WEP; 2: WPA2_PSK; 3: WPA_WPA2_PSK; 4: WPA_PSK; 5: WPA; 6: WPA2; 7: SAE; 8: WPA3_WPA2_PSK_MIX; 9: WPA3 - Enterprise; 10: OWE; 11: WAPI-PSK; 12: WAPI-CERT; 13: WPA3/WPA2-Enterprise MIX; 14: Unknown type;
Example	AT+WIFISCANRESULT
Notice	● <chn>: The value range varies in different regions; in China, it is 1 to 13. ● The scan results can only be viewed after the scan command is executed successfully. ● <ssid> : If the characters are not ASCII encoded, they will be displayed according to their original encoding. For example, an SSID named "China" will be displayed as: P"\xe4\xb8\xad\xe5\x9b\xbd" ● <bssid> : Will comply with privacy requirements, for example: 2c:00:73:7e:**:**

6.6.8 Initiating a connection with the AP using AT+WIFICONN

Format	AT+WIFICONN=<ssid>[,<bssid>,<passwd>][,<psk_type>]
Response	● Success: OK ● Failure: ERROR
Parameter Description	<ssid>: Service set identifier, i.e., router name. This parameter must be enclosed in double quotes. <bssid>: Basic Service Set Identifier, usually the router's MAC address. <passwd>: Password, must be enclosed in double quotes.

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	<psk_type>: Password type, 0 indicates ASCII format, 1 indicates HEX format, default value is 0.
Example	AT+WIFICONN="XXX": Router with connection name XXX and encryption method set to open. AT+CONN="XXX",,"123456789": Router with connection name XXX and encryption method not open. AT+CONN=,90:2B:D2:E4:CE:28,"123456789": Connects to the router with BSSID 90:2B:D2:E4:CE:28 AT+WIFICONN=P"\\xe4\\xb8\\xad\\xe5\\x9b\\xbd",,"123456789": Connects to the router named "China". AT+WIFICONN="XXX",,"3132333435",1: The router is configured with WEP authentication and a HEX password. Therefore, psk_type needs to be set to 1.
Notice	● <ssid> and <bssid> cannot both be empty. ● If neither <ssid> nor <bssid> is empty, the connection will fail if <ssid> and <bssid> do not match. ● If the SSID is a non-ASCII character (e.g., an SSID named " China "), enter the encoding of " China " in the following format : P"\\xe4\\xb8\\xad\\xe5\\x9b\\xbd" ● If the contents of `<ssid>` and `<passwd>` contain special characters, they must be escaped using a backslash (\). For example, if the SSID name is "ab,c", the command parameter should be "ab\,c". ● If the password is of type HEX, you need to set psk_type to 1. ● This command is a non-blocking command. ● When using STAUT with WPA, WPA2, or WPA-WPA2 hybrid encryption, set psk_type=0 and passwd cannot be greater than or equal to 64 bits. ● When using STAUT with WEP encryption, set psk_type=0 and passwd cannot be 10/26 bits, or set psk_type=1 and passwd cannot be 5/13 bits. ● When using STAUT with WAPI encryption, if psk_type=1, passwd should be greater than or equal to 8 bits and less than or equal to 32 bits; if psk_type=0, passwd should be greater than or equal to 8 bits and less than or equal to 64 bits. ● The command returning "OK" indicates that the connection command was successfully issued. The connection result is reported via +NOTICE, and the +NOTICE information is as follows: +NOTICE:CONNECTED indicates a successful connection. +NOTICE:DISCONNECTED indicates that the connection failed .

6.6.9 Initiating a fast connection with the AP using AT+WIFIFCONN

Format	AT+WIFIFCONN=<ssid>,<bssid>,<chn>,<auth_type>[,<pas swd>]
Response	● Success: OK ● Failure: ERROR
Parameter Description	<ssid>: Service set identifier, i.e., router name. This parameter must be enclosed in double quotes. <bssid>: Basic Service Set Identifier, usually the router's MAC address. <chn>: Channel number, value range 1~14 <auth_type>: Authentication method 0: OPEN; 1: WEP;

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	2: WPA2_PSK; 3: WPA_WPA2_PSK; 7: WPA3-SAE; 8: WPA2_PSK_WPA3-SAE; 11: WAPI-PSK; <passwd>: Password. This must be enclosed in double quotes. If the peer network authentication method is WEP and the password is in ASCII format, double quotes are required here.
Example	AT+WIFIFCONN="XXX",,6,3,"123456789": Connects to the router named XXX, specifying channel 6. AT+WIFIFCONN=P"\\xe4\\xb8\\xad\\xe5\\x9b\\xbd",,6,3,"123456789": Connects to a router named "China", specifying channel 6. AT+FCONN=,90:2B:D2:E4:CE:28,6,3,"123456789": Connects to the router with BSSID 90:2B:D2:E4:CE:28, specifying channel 6. AT+WIFIFCONN="XXX",,6,1,""1234567890123"": Connects to a router named XXX. The remote router is configured with WEP authentication and an ASCII password. Double quotes are used here.
Notice	● <ssid> and <bssid> cannot both be empty. ● If neither <ssid> nor <bssid> is empty, the connection will fail if <ssid> and <bssid> do not match. ● If the SSID is a non-ASCII character (e.g., an SSID named " China "), enter the encoding of " China " in the following format : P"\\xe4\\xb8\\xad\\xe5\\x9b\\xbd" ● ` contain special characters , they must be escaped using a backslash (\). For example, if the SSID name is "ab,c", the command parameter should be "ab\,c". ● When <auth_type> is set to OPEN, the <passwd> parameter and the comma before the parameter are not needed. ● The value range for <chn> varies by region; in China, it ranges from 1 to 13. ● This command is a blocking command; it first returns the connection result, then returns OK or ERROR. ● The connection result is reported via +NOTICE. The +NOTICE information is as follows: +NOTICE:CONNECTED indicates a successful connection. +NOTICE:DISCONNECTED indicates that the connection failed .

6.6.10 AT+WIFIDISCONN Disconnect from AP

Format	AT+WIFIDISCONN
Response	● Success: OK ● Failure: ERROR
Parameter Description	-
Example	AT+WIFIDISCONN
Notice	● This command is a non-blocking command. ● The command returning "OK" indicates that the disconnect command was successfully issued.

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6.6.11 Use AT+WIFISTASTAT to check the STA connection status

Format	AT+WIFISTASTAT
Response	+STASTAT:<status>,<ssid>,<bssid>,<chn>,<rssi> ● Success: OK ● Failure: ERROR
Parameter Description	<status>: Current connection status. 0: Not connected; 1: Connected; <ssid>: Service set identifier, i.e., router name <bssid>: Basic Service Set Identifier, usually the router's MAC address. <chn>: Channel number, value range 1~14 <rssi>: Router signal strength, value range -100 to 0.
Example	AT+WIFISTASTAT
Notice	● The value range for <chn> varies by region; in China, it ranges from 1 to 13. ● If the SSID is not ASCII encoded, it will be displayed according to its original encoding . For example, an SSID named "China" will be displayed as: P"\xe4\xb8\xad\xe5\x9b\xbd"

6.7 SoftAP Related AT Commands

instruction	describe
AT+ WIFI STARTAP	Start SoftAP in normal mode
AT+ WIFI SETAPADV	Configure SoftAP startup parameters
AT+ WIFI STOPAP	Disable SoftAP service
AT+ WIFI SHOWSTA	Query the STATION information of the current connection.
AT+ WIFI DEAUTHSTA	AP disconnects STA TION connection
AT+WIFIAPSCAN	Open SOFTAP scanning service

6.7.1 AT+WIFISTARTAP: Start SoftAP in Normal Mode

Format	AT+WIFISTARTAP=<ssid>,<chn>,<auth_type>[,<passwd>]
Response	● Success: OK ● Failure: ERROR
Parameter Description	<ssid>: Service set identifier, i.e., router name. This parameter must be enclosed in double quotes. <chn>: Channel number, ranging from 1 to 14. A value of 0 indicates that no channel is specified, and the Automatic Channel Selection (ACS) algorithm is used, which will trigger an automatic channel scan. <auth_type>: Authentication method. 0: OPEN; 1: WEP-SHARED;

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	2: WPA2_PSK; 3: WPA_WPA2_PSK; 7: WPA3-SAE; 8: WPA2_PSK_WPA3-SAE; 14: WEP-OPEN; <passwd>: Password. Parameters must be enclosed in double quotes. Authentication methods are 2/3/7/8. Password length must be 8 characters or more. 1/14 passwords are fixed lengths of 5/10/13/26 characters.
Example	AT+WIFISTARTAP="XXX",6,2,"123456789" AT+WIFISTARTAP="XXX",6,0
Notice	● The value range for <chn> varies by region; in China, it ranges from 1 to 13. ● When <auth_type> is set to OPEN, there is no <passwd> parameter or comma before the parameter. ● When <auth_type> is set to WEP-SHARED or WEP-OPEN, the length of the <passwd> parameter can only be 5/10/13/26. ● If the contents of `<ssid>` and `<passwd>` contain special characters, they must be escaped using a backslash (\). For example, if the SSID name is "ab,c", the command parameter should be "ab\\,c". ● For advanced parameter configuration, please execute AT+SETAPADV first, and then start AP.

6.7.2 AT+WIFISETAPADV: Setting SoftAP Startup Parameters

Format	AT+WIFISETAPADV=[<protocol_mode>],[<bcn_period>],[<dtim_period>],[<group_rekey>],[<ssid_hide>],[<sgi>]
Response	● Success: OK ● Failure: ERROR
Parameter Description	<protocol_mode>: Protocol type, defaults to 4. 1:802.11b; 2: 802.11b + 802.11g; 3: 802.11b+802.11g+802.11n; 4: 802.11b+802.11g+802.11n+802.11ax; <bcn_period>: Beacon period, parameter value range 25~1000, unit is ms, default is 100; pass 0 to use the default value. <dtim_period>: DTIM period, parameter value range 1~30, default is 2; passing 0 indicates using the default value. `<group_rekey>`: Configures the multicast key update time. The parameter value ranges from 30 to 86400 seconds, with a default of 86400. Passing 0 indicates using the default value. <ssid_hide>: Whether SoftAP hides the SSID 1: Not hidden; 2: Hide; <sgi>: Short GI switch, defaults to 0. 0: Disable short GI; 1: Enable short GI;

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Example	AT+WIFISETAPADV=3,100,2,3600,1,1 AT+WIFISETAPADV=,100,2,3600,
Notice	● This command must be issued before AT+STARTAP. ● If you do not need to change the default values of the above parameters, you do not need to issue this command. ● AT+STOPAP will not change the above parameter settings. ● Parameters can be omitted; omitted parameters will use the system default value. ● The use of the `<group_rekey>` parameter depends on the `<auth_type>` parameter in the AT+STARTAP command. The manually configured value of `<group_rekey>` only takes effect when `<auth_type>` is configured as WPA_WPA2_PSK. If `<auth_type>` is configured as WPA2_PSK, `<group_rekey>` defaults to 86400.

6.7.3 AT+WIFISTOPAP Disable SoftAP service

Format	AT+WIFISTOPAP
Response	● Success: OK ● Failure: ERROR
Parameter Description	-
Example	AT+WIFISTOPAP
Notice	After executing AT+STOPAP, there is no need to first execute "AT+DHCPS=AP0,0" to disable the DHCP service.

6.7.4 AT+WIFISHOWSTA Query the currently connected station information

Format	AT+WIFISHOWSTA
Response	+SHOWSTA:<STA_MAC>, mcs: <MCS>, protocol: <PROTOCOL>, rssi: <RSSI> ● Success: OK ● Failure: ERROR
Parameter Description	<STA_MAC>: The MAC address of the currently connected STATION. <MCS>: Real-time packet reception physical rate PROTOCOL: Real-time packet receiving protocol <RSSI>: Received Signal Strength <nss_mode>: Spatial flow status of the device.
Example	AT+WIFISHOWSTA
Notice	-

6.7.5 AT+WIFIDEAUTHSTA Disconnect Station Connection

Format	AT+WIFIDEAUTHSTA=<MAC>

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Response	● Success: OK ● Failure: ERROR
Parameter Description	<MAC>: The MAC address of the station to be disconnected.
Example	AT+WIFIDEAUTHSTA=90:2B:D2:E4:CE:28
Notice	-

6.7.6 AT+WIFIAPSCAN enables SOFTAP scanning service

Format	AT+WIFIAPSCAN
Response	● Success: OK ● Failure: ERROR
Parameter Description	-
Example	AT+WIFIAPSCAN
Notice	● This command is a non-blocking command. ● The command returning "OK" indicates that SOFTAP scanning was successfully initiated.

6.8 TCP/IP Related AT Commands

Instruction	Describe
AT+IPSTART	Create SOCKET service
AT+IPSEND	Send TCP/UDP data
AT+IPLISTEN	Open TCP listener
AT+IPCLOSE	Closing/ deleting the socket disconnects the TCP connection.
+IPD	Active reporting of receiving TCP/UDP data

6.8.1 AT+IPSTART Create SOCKET Service

Format	TCP: AT+IPSTART=<link_ID>,<IP_protocol>,<remote_IP>,<remote_port>	UDP: AT+IPSTART=<link_ID>,<IP_protocol>,<local_port>
Response	● Success: OK ● Failure: ERROR	
Parameter Description	`<link_ID>`: Network connection ID, bound to the local socket . The value range needs to be determined based on the business scenario. Configure network protocol stack socket resources. In AT scenarios, this is only for functional verification. It supports 6 TCP connections and 4 UDP transmissions, but the total number cannot exceed 8. The value range is 0~7. <IP_protocol>: IP protocol type TCP: TCP connection	

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	UDP: UDP listening <remote_IP>: Remote IP address <remote_port>: Remote port number <local_port>: Local port number
Example	AT+IPSTART=0,tcp,192.168.3.1,5001 AT+IPSTART=0,udp,5001
Notice	-

6.8.2 Sending TCP/UDP data using AT+IPSEND

Format	Send TCP data: AT+IPSEND=<link_ID>,<len>,<string>	Send UDP data: AT+IPSEND=<link_ID>,<len>,<remote_IP> , <remote_port> , <string>
Response	● Success: OK ● Failure: ERROR	
Parameter Description	<link_ID> : Network connection ID, bound to the local socket , value range: 0 ~ 7 <len>: The length of the data to be sent, with a maximum length of 1024. <remote_IP>: Remote IP address <remote_port>: Remote port number <string>: The data to be sent	
Example	AT+IPSEND=0,9,data test OK AT+IPSEND=0,9,192.168.3.1,5001,data test OK	
Notice	● \0 is used as the end-of-transmission character. If you want to send \0, you need to escape it as \\0. ● For TCP and UDP data transmission scenarios, a server-side data receiving function needs to be enabled within the network.	

6.8.3 AT+IPLISTEN enables TCP listening.

Format	AT+IPLISTEN=<control>[,<local_port>]
Response	● Success: OK ● Failure: ERROR
Parameter Description	<control>： 0: Disable TCP listening; 1: Start TCP listening; <local_port>: Local port number
Example	AT+IPLISTEN=1,5001 AT+IPLISTEN=0
Notice	The `<local_port>` parameter is not needed when the value of `<control>` is 0.

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6.8.4 AT+IPCLOSE closes the socket connection

Format	AT+IPCLOSE=<link_ID>
Response	● Success: OK ● Failure: ERROR
Parameter Description	<link_ID>: Network connection ID, bound to the local socket , value range: 0 ~ 7
Example	AT+IPCLOSE=0
Notice	-

6.8.5 +IPD Receives Network Data

Format	+IPD,<link_ID>,<len>,<remote_IP>,<remote_port>:<data>
Response	When the system is in TCP connection state or UDP listening state, if it receives remote TCP/UDP data, it will proactively report: +IPD,<link_ID>,<len>,<remote_IP>,<remote_port>:<data>
Parameter Description	<link_ID>: Network connection ID, bound to the local socket , value range: 0 ~ 7 <len>: The length of the data received this time. <remote_IP>: Remote IP address <remote_port>: Remote port number <data>: Received data
Example	+IPD,0,4,192.168.3.1,5001:abcd
Notice	-

6.9 Bluetooth BLE Commands

Instruction	Describe
AT+BLENAME	Set/Query Name
AT+BLEDEVMANUF	Set/Query Manufacturer
AT+BLEADVDATA	Settings/Broadcast Data
AT+BLEADVINTV	Set/broadcast interval
AT+BLESCANIW	Set/scan interval and window
AT+BLECONINTV	Set/Connection Interval
AT+BLESCAN	Enable/disable scanning
AT+BLECONNECTMAC	Specify MAC connection
AT+BLEDISCONNECT	Disconnect all connections
AT+BLEAUTOCONNECTMAC	Set/Query Automatic Connection
AT+BLEUUIDSVR	Query/Set Service UUID
AT+BLEUUIDSLAVE	Query/Set UUID
AT+BLEUUIDMAST	Query/Set UUID
AT+BLEMTU	Query/Set MTU

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6.9.1 Setting and querying BLE broadcast names using AT+BLENAME

Format	Setting command: AT+BLENAME=<ble_name>	Query command: AT+BLENAME?
Response	● Success: OK ● Failure: ERROR	+BLENAME:<ble_name> ● Success: OK ● Failure: ERROR
Parameter Description	<ble_name>: Length not greater than 30	-
Example	AT+BLENAME="E105-WBS36-BLE"	AT+BLENAME?
Notice	-	

6.9.2 Setting and querying BLE manufacturer names

Format	Setting command: AT+BLEDEVMANUF=<ble_manuf>	Query command: AT+BLEDEVMANUF?
Response	● Success: OK ● Failure: ERROR	+BLEDEVMANUF:<ble_manuf> ● Success: OK ● Failure: ERROR
Parameter Description	<ble_manuf>: Can only be greater than 7, in the 0xff field of broadcast data; broadcast data automatically has a value greater than 7 in the broadcast portion.	-
Example	AT+BLEDEVMANUF="cdebyte"	AT+BLEDEVMANUF?
Notice	-	

6.9.3 AT+BLEADVDATA BLE Broadcast Data Settings and Queries

Format	Setting command: AT+BLEADVDATA=<ble_advdata>	Query command: AT+BLEADVDATA?
Response	● Success: OK ● Failure: ERROR	+BLEADVDATA:<ble_name> ● Success: OK ● Failure: ERROR
Parameter Description	<ble_advdata>: Hexadecimal data, which needs to be set according to the BLE broadcast protocol.	-
Example	AT+BLEADVDATA="03196161" Change the broadcast name to aa	AT+BLEADVDATA?
Notice	-	

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6.9.4 AT+BLEADVINTV BLE Broadcast Interval Settings and Queries

Format	Set command: AT+BLEADVINTV=<ble_intv>	Query command: AT+BLEADVINTV?
Response	● Success: OK ● Failure: ERROR	+BLEADVINTV:<ble_intv> ● Success: OK ● Failure: ERROR
Parameter Description	<ble_intv>: BLE broadcast interval, default 72, unit 0.625ms, value range 10 ~10000	-
Example	AT+BLEADVINTV= 100	AT+BLEADVINTV?
Notice	-	

6.9.5 AT+BLESCANIW BLE Scan Interval/Scan Window Settings and Query

Format	Configuration command: AT+BLESCANIW=<ble_scan_interval>,<ble_scan_window>	Query command: AT+BLESCANIW?
Response	● Success: OK ● Failure: ERROR	+BLESCANIW:<ble_scan_interval>,<ble_scan_window> ● Success: OK ● Failure: ERROR
Parameter Description	<ble_scan_interval>: Scan interval, default 72, unit 0.625ms, value range 10~10000 <ble_scan_window>: Scan serial port, default 72, unit 0.625ms, value range 10~10000	-
Example	AT+BLESCANIW=100,100	AT+BLESCANIW?
Notice	-	

6.9.6 AT+BLECONINTV BLE Connection Gap Setting and Query

Format	Setting command: AT+BLECONINTV=<ble_con_intv>	Query command: AT+BLECONINTV?
Response	● Success: OK ● Failure: ERROR	+BLECONINTV:<ble_con_intv> ● Success: OK ● Failure: ERROR
Parameter Description	<ble_con_intv>: BLE connection gap, default 30, unit 0.625ms,	-

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	value range 10~10000.	
Example	AT+BLECONINTV=100	AT+BLECONINTV?
Notice	-	

6.9.7 AT+BLESCAN BLE Start/Stop Scan

Format	AT+BLESCAN=<adv_enable>
Response	● Success: OK ● Failure: ERROR
Parameter Description	<adv_enable>: Defaults to 0 0: Turn off scanning; 1: Open the scan;
Example	AT+BLESCAN=1 //Start scanning
Notice	● This command must be used in the BLE Client. ● The scan needs to be manually ended: AT+BLESCAN=0; ● Only BLE slave devices with broadcast names can be detected; ● To print the scanned data, you need to disable automatic connection using the command AT+BLEAUTOCONNECTMAC=0, 01:02:03:04:05:06. ● Response format: 1. <Serial Number> <rssi><mac address type><mac address><BLE broadcast name><ADV/RSP> 2. <Serial Number> <rssi> <MAC Address Type> <MAC Address> should be printed using the following format: "%4d %4d %d %02X:%02X:%02X:%02X:%02X:%02X" 3. The maximum printable length of <BLE broadcast name> is 20 bytes; any extra bytes will not be printed. If the length is less than 20 bytes, spaces will be added. 4. <ADV/RSP>: Print in HEX format, ending with "\r\n"

6.9.8 AT+BLECONNECTMAC BLE specifies the MAC address for the connection.

Format	AT+BLECONNECTMAC=<MAC>
Response	● Success: OK ● Failure: ERROR
Parameter Description	<MAC>: Target MAC address
Example	AT+BLECONNECTMAC=01 : 02:03:04:05:06
Notice	A blocking operation requires waiting for a result before performing other operations.

6.9.9 AT+BLEDISCONNECT BLE Disconnect

Format	AT+BLEDISCONNECT

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Response	● Success: OK ● Failure: ERROR
Parameter Description	-
Example	AT+BLEDISCONNECT
Notice	-

6.9.10 AT+BLEAUTOCONNECTMAC BLE Automatic Connection Setup and Query

Format	Configuration command: AT+BLEAUTOCONNECTMAC=<auto_contion_falg>,<MAC>	Query command: AT+BLEAUTOCONNECTMAC?
Response	● Success: OK ● Failure: ERROR	+ B LEAUTOCONNECTMAC:<ble_name> ● Success: OK ● Failure: ERROR
Parameter Description	<auto_contion_falg>: Defaults to 1 0: Off; 1: Open; <MAC>: Target MAC address, default target address is 01:02:03:04:05:06	-
Example	AT+SLEAUTOCONNECTMAC= 1,01:02:03:04:05:06	AT+ B LEAUTOCONNECTMAC?
Notice	-	

6.9.11 AT+BLEUUIDSVR transparent transmission Service UUID Settings and Query

Format	Setting command: AT+BLEUUIDSVR=<server_uuid>	Query command: AT+BLEUUIDSVR?
Response	● Success: OK ● Failure: ERROR	+BLEUUIDSLAVE:<sever_uuid> ● Success: OK ● Failure: ERROR
Parameter Description	<server_uuid>: 0x0000-0xffff	-
Example	AT+BLEUUIDSVR=0xfff0	AT+BLEUUIDSVR?
Notice	-	

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6.9.12 AT+BLEUUIDSLAVE Data Receiver UUID Setting and Query

Format	Setting command: AT+BLEUUIDSLAVE=<slave_uuid>	Query command: AT+BLEUUIDSLAVE?
Response	● Success: OK ● Failure: ERROR	+BLEUUIDSLAVE:<slave_uuid> ● Success: OK ● Failure: ERROR
Parameter Description	<slave_uuid> : 0x0000-0xffff	-
Example	AT+BLEUUIDSLAVE=0xfff1	AT+BLEUUIDSLAVE?
Notice	Serial input is forwarded to Bluetooth output; data input from the serial port RX will generate a notification on this channel and be sent to the mobile device.	

6.9.13 AT+BLEUUIDMAST Data Transmission UUID Setting and Query

Format	Setting command: AT+BLEUUIDMAST=<mast_uuid>	Query command: AT+BLEUUIDMAST?
Response	● Success: OK ● Failure: ERROR	BLEUUIDMAST : <mast_uuid> ● Success: OK ● Failure: ERROR
Parameter Description	<mast_uuid> : 0x0000-0xffff	-
Example	AT+BLEUUIDMAST=0xfff2	AT+BLEUUIDMAST?
Notice	Bluetooth input is forwarded to serial port output. After the app writes data to this channel via the BLEAPI interface, the data will be output from the serial port TX.	

6.9.14 AT+BLEMTU BLE Maximum MTU Setting

Format	AT+BLEMTU=<ble_mtu>
Response	● Success: OK ● Failure: ERROR
Parameter Description	<ble_mtu>: Value range 23~517
Example	AT+BLEMTU=517
Notice	-

6.10 Star Flash SLE Command

Instruction	Describe
AT+SLENAME	Set/Query Broadcast Name

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AT+SLESCAN	Set /Query Scan Switch
AT+ SLEADVINTV	Set /Query Broadcast Interval
SLESCANIW	Set/query scan interval and window
AT+ SLECONINTV	Set/Query Connection Interval
AT+SLECONNECTMAC	Specify MAC address for connection
AT+ S LEDISCONNECT	Disconnect the current connection
AT+ S LEAUTOCONNECTMAC	Set /Query Automatic Connection

6.10.1 AT+SLENAME SLE Broadcast Name Setting and Query

Format	Command to set: AT+SLENAME = <sle_name>	Query command: AT+SLENAME?
Response	● Success: OK ● Failure: ERROR	+SLENAME:<ble_name> ● Success: OK ● Failure: ERROR
Parameter Description	<sle_name>: Length not greater than 30	-
Example	AT+SLENAME="E105-WBS36-SLE"	AT+SLENAME?
Notice	-	

6.10.2 AT+SLESCAN SLE Start/Stop Scan

Format	AT+SLESCAN=<sle_enable>
Response	● Success: OK ● Failure: ERROR
Parameter Description	<sle_enable>: Defaults to 0 0: Stop; 1: Turn on;
Example	AT+SLESCAN=1
Notice	● This command must be used in the SLE Client. ● The scan needs to be manually ended: AT+SLESCAN=0 ● To print the scanned data, you need to disable automatic connection using the command AT+SLEAUTOCONNECTMAC=0, 01:02:03:04:05:06. ● The scan format is: <MAC address><MAC address type><rssi><data status><data length><hex broadcast data>

6.10.3 AT+SLEADVINTV SLE Broadcast Interval Settings and Queries

Format	Set command: AT+SLEADVINTV=<sle_intv>	Query command: AT+SLEADVINTV?
Response	● Success: OK ● Failure: ERROR	+SLEADVINTV:<sle_intv> ● Success: OK

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		● Failure: ERROR
Parameter Description	<sle_intv>: SLE broadcast interval, default 200, unit 125us, value range 30 ~10000	-
Example	AT+SLEADVINTV= 3 0	AT+SLEADVINTV?
Notice	-	

6.10.4 AT+SLESCANIW SLE Scan Interval/Scan Window Settings and Query

Format	Configuration command: <sle_scan_interval> , <sle_scan_window>	Query command: AT+SLESCANIW?
Response	● Success: OK ● Failure: ERROR	+SLESCANIW:< s le_name> ● Success: OK ● Failure: ERROR
Parameter Description	<sle_scan_interval> : SLE scan interval, default 100, unit 125us, value range 30~10000 < s le_scan_window> : SLE scan window, default value 100, unit 125us, value range 30~10000	-
Example	AT+SLESCANIW=100,100	AT+SLESCANIW?
Notice	-	

6.10.5 AT+SLECONINTV SLE Connection Gap Setting and Query

Format	Set command: AT+SLECONINTV=<sle_con_intv>	Query command: AT+SLECONINTV?
Response	● Success: OK ● Failure: ERROR	+SLECONINTV : <sle_con_intv> ● Success: OK ● Failure: ERROR
Parameter Description	<sle_con_intv>: SLE connection gap, default 30 Unit: 125μs, value range: 30 ~ 10000	-
Example	AT+SLESCANIW=100,100	AT+SLESCANIW?
Notice	-	

6.10.6 AT+SLECONNECTMAC SLE specifies the MAC address for the connection.

Format	AT+SLECONNECTMAC=<MAC>

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Response	● Success: OK ● Failure: ERROR
Parameter Description	<MAC>: Target MAC address, default value is 01:02:03:04:05:06
Example	AT+SLECONNECTMAC=01:02:03:04:05:06
Notice	This command is only valid in SLE client mode.

6.10.7 AT+SLEDISCONNECT SLE Disconnect

Format	AT+SLEDISCONNECT
Response	● Success: OK ● Failure: ERROR
Parameter Description	-
Example	AT+SLEDISCONNECT
Notice	This command must be sent while in SLE connection mode; automatic connection must be manually disabled.

6.10.8 AT+SLEAUTOCONNECTMAC SLE Automatic Connection Setup and Query

Format	Configuration command: AT+SLEAUTOCONNECTMAC=<auto_falg>,<MAC>	Query command: AT+SLEAUTOCONNECTMAC?
Response	● Success: OK ● Failure: ERROR	+SLEAUTOCONNECTMAC:<auto_falg> ● Success: OK ● Failure: ERROR
Parameter Description	<auto_falg> : Defaults to 0 0: Off; 1: Open; <MAC> : Target MAC address	-
Example	AT+SLEAUTOCONNECTMAC=1,01:02:03:04:05:06	AT+SLEAUTOCONNECTMAC?
Notice	-	

6.11 Equipment Appearance Values Summary Table

Equipment appearance	Value	Remarks
BLE_APPEARANCE_UNKNOWN	0	None
BLE_APPEARANCE_GENERIC_PHONE	64	Generic category

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BLE_APPEARANCE_GENERIC_COMPUTER	128	Generic category
BLE_APPEARANCE_GENERIC_WATCH	192	Generic category
BLE_APPEARANCE_WATCH_SPORTS_WATCH	193	Watch subtype
BLE_APPEARANCE_GENERIC_CLOCK	256	Generic category
BLE_APPEARANCE_GENERIC_DISPLAY	320	Generic category
BLE_APPEARANCE_GENERIC_REMOTE_CONTROL	384	Generic category
BLE_APPEARANCE_GENERIC_EYE_GLASSES	448	Generic category
BLE_APPEARANCE_GENERIC_TAG	512	Generic category
BLE_APPEARANCE_GENERIC_KEYRING	576	Generic category
BLE_APPEARANCE_GENERIC_MEDIA_PLAYER	640	Generic category
BLE_APPEARANCE_GENERIC_BARCODE_SCANNER	704	Generic category
BLE_APPEARANCE_GENERIC_THERMOMETER	768	Generic category
BLE_APPEARANCE_THERMOMETER_EAR	769	Thermometer subtype
BLE_APPEARANCE_GENERIC_HEART_RATE_SENSOR	832	Generic category
BLE_APPEARANCE_HEART_RATE_SENSOR_HEART_RATE_BELT	833	Heart Rate Sensor subtype
BLE_APPEARANCE_GENERIC_BLOOD_PRESSURE	896	Generic category
BLE_APPEARANCE_BLOOD_PRESSURE_ARM	897	Blood Pressure subtype
BLE_APPEARANCE_BLOOD_PRESSURE_WRIST	898	Blood Pressure subtype
BLE_APPEARANCE_HUMAN_INTERFACE_DEVICE_HID	960	HID Generic
BLE_APPEARANCE_KEYBOARD	961	HID subtype
BLE_APPEARANCE_MOUSE	962	HID subtype
BLE_APPEARANCE_JOYSTICK	963	HID subtype
BLE_APPEARANCE_GAMEPAD	964	HID subtype
BLE_APPEARANCE_DIGITIZER_TABLET	965	HID subtype
BLE_APPEARANCE_CARD_READER	966	HID subtype
BLE_APPEARANCE_DIGITAL_PEN	967	HID subtype
BLE_APPEARANCE_BARCODE_SCANNER	968	HID subtype
BLE_APPEARANCE_GENERIC_GLUCOSE_METER	1024	Generic category
BLE_APPEARANCE_GENERIC_RUNNING_WALKING_SENSOR	1088	Generic category
BLE_APPEARANCE_RUNNING_WALKING_SENSOR_IN_SHOE	1089	Running Walking Sensor subtype
BLE_APPEARANCE_RUNNING_WALKING_SENSOR_ON_SHOE	1090	Running Walking Sensor subtype
BLE_APPEARANCE_RUNNING_WALKING_SENSOR_ON_HIP	1091	Running Walking Sensor subtype
BLE_APPEARANCE_GENERIC_CYCLING	1152	Generic category

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BLE_APPEARANCE_CYCLING_CYCLING_COMPUTER	1153	Cycling subtype
BLE_APPEARANCE_CYCLING_SPEED_SENSOR	1154	Cycling subtype
BLE_APPEARANCE_CYCLING_CADENCE_SENSOR	1155	Cycling subtype
BLE_APPEARANCE_CYCLING_POWER_SENSOR	1156	Cycling subtype
BLE_APPEARANCE_CYCLING_SPEED_AND_CADENCE_SENSOR	1157	Cycling subtype
BLE_APPEARANCE_INVALID	65536	out of uint16_t

6.12 Platform Commands

instruction	describe
AT+NVREAD	Read NV item
AT+NVWRITE	Modify NV item
AT+EFUSEMAC	Write / Read efuse Mac
AT+CUSTOMEFUSE	Write/ Query User Reserved Space
AT+ VER?	Print version number
AT+DUMP	Printing crash message
AT+LOGL	Set print levels
AT+SETIOMODE	Set/Query IO Working Mode
AT+ GPIODIR	Configure GPIO to work as input or output.
AT+WTGPIO	Set the GPIO level state
AT+RDGPIO	Read the level state of GPIO
AT+CUSTOMEFUSEREUSEFAPC	Write/Read the second user reserved bit

6.12.1 AT+NVREAD to read NV items

Format	AT+NVREAD=<key_id>
Response	● Success: OK ● Failure: ERROR
Parameter Description	<key_id>: The ID of the NV item to be read.
Example	AT+NVREAD=0x3 // Read the NV item with ID 0x3
Notice	-

6.12.2 AT+NVWRITE Write NV Item

Format	AT+NVWRITE=<key_id>,<attr>,<length>,<value>
Response	● Success: OK ● Failure: ERROR
Parameter Description	<key_id>: The ID of the NV item to be modified. <attr>: The attribute value to be modified. 0: Standard NV;

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	1: Permanent NV, cannot be modified/upgraded; 4: Cannot be upgraded via NV, can be modified, but cannot be upgraded via OTA; <length>: The length of the value to be modified. <value>: The value to be modified. Each two characters are recognized as one byte.
Example	AT+NVWRITE=0x6,0,1,01 modifies the value of the NV item with ID 0x6 to 1. The command `AT+NVWRITE=0x5,0,6,010203040506` modifies the value of the NV item with ID 0x5 to [1,2,3,4,5,6].
Notice	" 0x " as a prefix when inputting the value , otherwise it will affect the length calculation.

6.12.3 AT+DUMP Printing System Crash Message

Format	AT+DUMP
Response	● Success: OK ● Failure: No system crash information printed.
Parameter Description	-
Example	AT+dump No crash dump found! OK or Printing crash message APP|----------Last Crash info dump---------- APP|task:at thrdPid:0xb type:0x7 nestCnt:1 phase:Task ccause:0x1 mcause:0x7 mtval:0x0 .....
Notice	Only the last crash information is saved and printed only once. It can be exported and then parsed by a script.

6.12.4 Setting Print Levels in AT+LOGL

Format	AT+LOGL=<level>
Response	● Success: OK ● Failure: ERROR
Parameter Description	<level>: Level 0: Debug level; 1: Warn level; 2: Error level;
Example	AT+LOGL=1 // Set print level +LOGL:1 OK

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	AT+LOGL //Query print level +LOGL:1 OK
Notice	No parameters are used to query the print level.

6.12.5 AT+SETIOMODE sets the I/O working mode

Format	AT+SETIOMODE=<GPIO ID>,<MODE>,<PULL>,<DS>
Response	● Success: OK ● Failure: ERROR
Parameter Description	<GPIO ID>: 0~18 <MODE>: 0~7, I/O pin multiplexing mode PIN_MODE_0=0; PIN_MODE_1=1; PIN_MODE_2=2; PIN_MODE_3=3; PIN_MODE_4=4; PIN_MODE_5=5; PIN_MODE_6=6; PIN_MODE_7=7; PIN_MODE_MAX=8; <PULL>: 0~3, pin pull-up/pull-down state PIN_PULL_TYPE_DISABLE=0; /**< No pull-up/pull-down (high impedance), pin is floating, suitable for externally connected pull-up/pull-down or special analog applications*/ PIN_PULL_TYPE_DOWN=1; /**< Pull-down, internally connected with a weak pull-down resistor, making the pin default to low level */ PIN_PULL_TYPE_STRONG_UP=2; /**< Strong pull-up, internally connected with a strong pull-up resistor, suitable for applications requiring larger pull-up current */ PIN_PULL_TYPE_UP=3; /**< Pull-up, internally connected with a weak pull-up resistor, making the pin high level by default */ <DS>: 0~7, pin drive capability PIN_DS_0=0; PIN_DS_1=1; PIN_DS_2=2; PIN_DS_3=3; PIN_DS_4=4; PIN_DS_5=5; PIN_DS_6=6; PIN_DS_7=7; PIN_DS_MAX=8;
Example	AT+SETIOMODE=1,2,3,4 +SETIOMODE:<GPIO ID>,<MODE>,<PULL>,<DS> OK
Notice	-

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6.12.6 AT+GETIOMODE Query I/O Working Mode

Format	AT+GETIOMODE=<GPIO ID>
Response	● Success: OK ● Failure: ERROR
Parameter Description	<GPIO ID>: 0~18
Example	AT+GETIOMODE=1 +GETIOMODE:<GPIO ID>,<MODE>,<PULL>,<DS> OK <MODE>: 0~7, I/O pin multiplexing mode <PULL>: 0~3, pin pull-up/pull-down state <DS>: 0~7, pin drive capability
Notice	-

6.12.7 AT+GPIODIR sets the GPIO to either input or output mode.

Format	AT+GPIODIR=<GPIO ID>,<DIR>
Response	● Success: OK ● Failure: ERROR
Parameter Description	<GPIO ID>: 0~18 <DIR>: GPIO Input/Output Direction 0: Input; 1: Output;
Example	AT+GPIODIR=2,1 +GPIODIR:<GPIO ID>,<DIR> OK
Notice	An error will be returned if the pin corresponding to the queried ID is not in GPIO multiplexing mode.

6.12.8 AT+WTGPIO sets the GPIO level state

Format	AT+WTGPIO=<GPIO ID>,<LEVEL>
Response	● Success: OK ● Failure: ERROR
Parameter Description	<GPIO ID>: 0~18 <LEVEL>: 0: Low level; 1: High level;
Example	AT+WTGPIO=3,1 +WRGPIO:<GPIO ID>,<DIR>,<LEVEL> OK <DIR>: 0: Input, 1: Output
Notice	An error will be returned if the pin corresponding to the queried ID is not in output mode.

6.12.9 AT+RDGPIO Read GPIO Level Status

Format	AT+RDGPIO=<GPIO ID>

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Response	● Success: OK ● Failure: ERROR
Parameter Description	<GPIO ID>: 0~18
Example	AT+RDGPIO=2 +RDGPIO:<GPIO ID>,<DIR>,<LEVEL> OK <DIR>: 0: Input, 1: Output <LEVEL>: 0: low level, 1: high level
Notice	An error will be returned if the pin corresponding to the queried ID is not in output mode.

7 Hardware Design

- It is recommended to use a DC regulated power supply to power this module, with the power supply ripple coefficient as small as possible, and the module must be reliably grounded;
- Please ensure the correct connection of the power supply positive and negative terminals. Reversing the connection may cause permanent damage to the module.
- Please check the power supply and ensure it is within the recommended voltage range. Exceeding the maximum value will cause permanent damage to the module.
- Please check the power supply stability; the voltage should not fluctuate significantly or frequently.
- When designing power supply circuits for modules, it is often recommended to retain a margin of more than 30% to ensure long-term stable operation of the entire unit.
- The module should be kept as far away as possible from power supplies, transformers, high-frequency traces, and other parts with high electromagnetic interference.
- High-frequency digital traces, high-frequency analog traces, and power traces must avoid the area under the module. If it is absolutely necessary to run the traces under the module, assuming the module is soldered on the Top Layer, lay ground copper on the Top Layer of the module contact area (all copper and well grounded), and run the traces close to the digital part of the module on the Bottom Layer .
- Assuming the module is soldered or placed in the Top Layer, it is also wrong to arbitrarily route traces in the Bottom Layer or other layers, as this will affect the module's stray emissions and receiver sensitivity to varying degrees .
- If there are devices around the module that cause significant electromagnetic interference, it will greatly affect the module's performance. Depending on the intensity of the interference, it is recommended to keep them away from the module. If possible, appropriate isolation and shielding can be implemented.
- If there are traces around the module that cause significant electromagnetic interference (high-frequency digital, high-frequency analog, power supply traces), it will greatly affect the module's performance. Depending on the intensity of the interference, it is recommended to keep them away from the module. If possible, appropriate isolation and shielding can be implemented.
- Try to stay away from TTL protocols that also use a physical layer of 2.4GHz, such as USB 3.0;
- The antenna mounting structure has a significant impact on module performance; therefore, it is essential to ensure that the antenna is exposed, ideally vertically upwards. When the module is installed inside the housing, a high-quality antenna extension cable can be used to extend the antenna to the outside of the housing.
- Antennas should never be installed inside a metal casing, as this will greatly reduce the transmission distance.

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8 Frequently Asked Questions

8.1 Transmission distance is not ideal

- When there are obstacles in line-of-sight communication, the communication distance will be reduced accordingly ;
- Temperature, humidity, and co-channel interference can all lead to increased packet loss rates in communications .
- The ground absorbs and reflects radio waves, and the test results are poor when the ground is close to the ground .
- Seawater has a strong ability to absorb radio waves, so testing results are poor at the seaside .
- If there are metal objects near the antenna, or if it is placed inside a metal casing, the signal attenuation will be very severe .
- Power register settings are incorrect; air speed is set too high (the higher the air speed, the shorter the distance) .
- At room temperature, the power supply voltage is lower than the recommended value; the lower the voltage, the lower the power output .
- The antenna may be poorly matched with the module or have quality issues.

8.2 Module is easily damaged .

- Please check the power supply and ensure it is within the recommended voltage range. Exceeding the maximum value will cause permanent damage to the module .
- Please check the power supply stability; the voltage should not fluctuate significantly or frequently .
- Please ensure anti-static operation during installation and use, as high-frequency devices are sensitive to electrostatic discharge .
- Please ensure that the humidity is not too high during installation and use, as some components are humidity-sensitive .
- Unless there are special requirements, it is not recommended to use it at excessively high or low temperatures.

8.3 Too high error rate

- If there is interference from a co-channel signal nearby, move away from the source of interference or change the frequency or channel to avoid the interference.
- An inadequate power supply can also cause garbled characters, so it is essential to ensure the reliability of the power supply.
- Poor quality or excessive length of extension lines or feeders can also lead to a high bit error rate.

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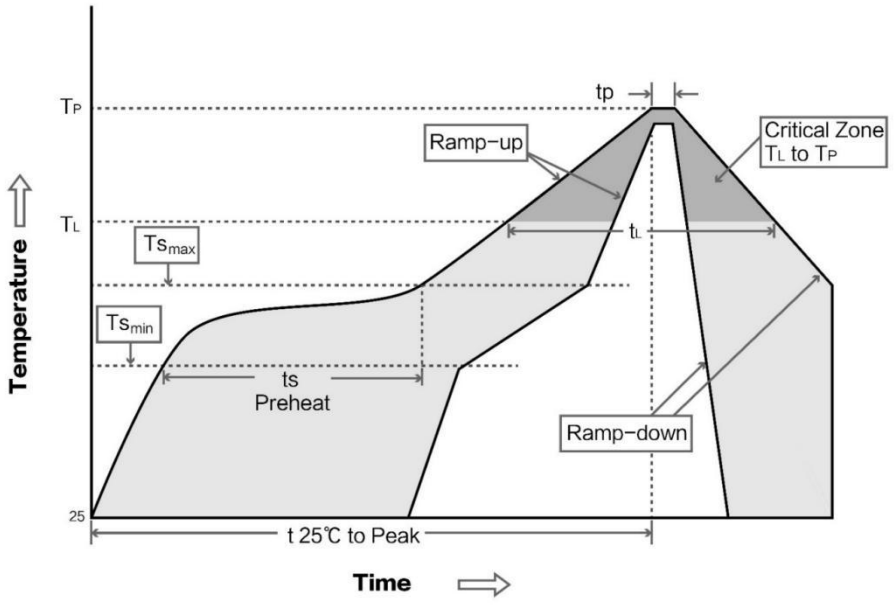
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9 Welding Operation Instructions

9.1 Reflow soldering temperature

Profile Feature	Curve characteristics	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Solder paste	Sn63/Pb37	Sn96.5/Ag3/Cu0.5
Preheat Temperature min (Tsmin)	Minimum preheating temperature	100℃	150℃
Preheat temperature max (Tsmax)	Maximum preheating temperature	150℃	200℃
Preheat Time (Tsmin to Tsmax)(ts)	preheating time	60-120 sec	60-120 sec
Average ramp-up rate(Tsmax to Tp)	Average rate of ascent	3℃/second max	3℃/second max
Liquidous Temperature (TL)	Liquid phase temperature	183℃	217℃
Time(tL)Maintained Above(TL)	Time above the liquidus line	60-90 sec	30-90 sec
Peak temperature (Tp)	Peak temperature	220-235℃	230-250℃
Aveage ramp-down rate（Tp to Tsmax）	Average rate of descent	6℃/second max	6℃/second max
Time 25℃ to peak temperature	Time from 25℃ to peak temperature	6 minutes max	8 minutes max

9.2 Reflow Soldering Profile



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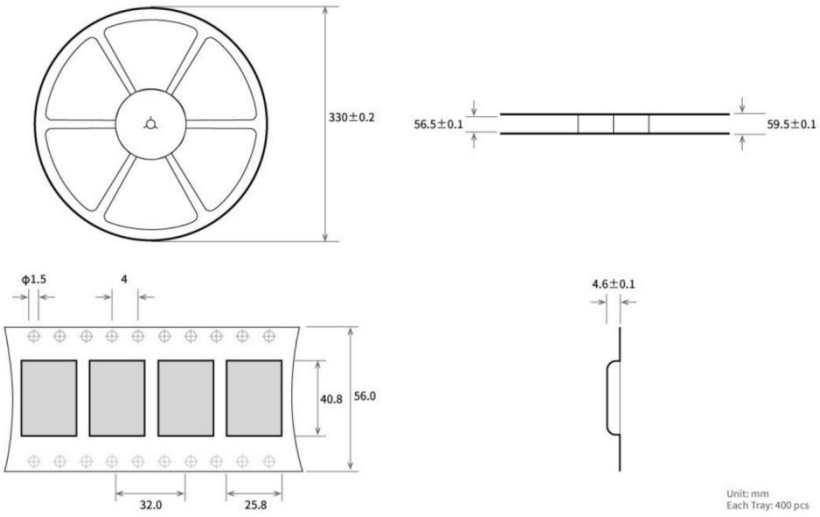
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10 Related Models

Product Model	Chip solutions	Operating frequency Hz	Transmit power dBm	Communication interface	Support Protocol	Product Dimensions mm	Antenna type	Features
E105-BS21	-	2.4G	6	UART	SLE1.0	25.5 * 18.0	PCB	Star Flash Serial port transparent transmission
E105-BS21X	-	2.4G	6	UART	SLE1.0	19.2 * 18.0	PIPX	Star Flash Serial port transparent transmission

11 Packaging Methods

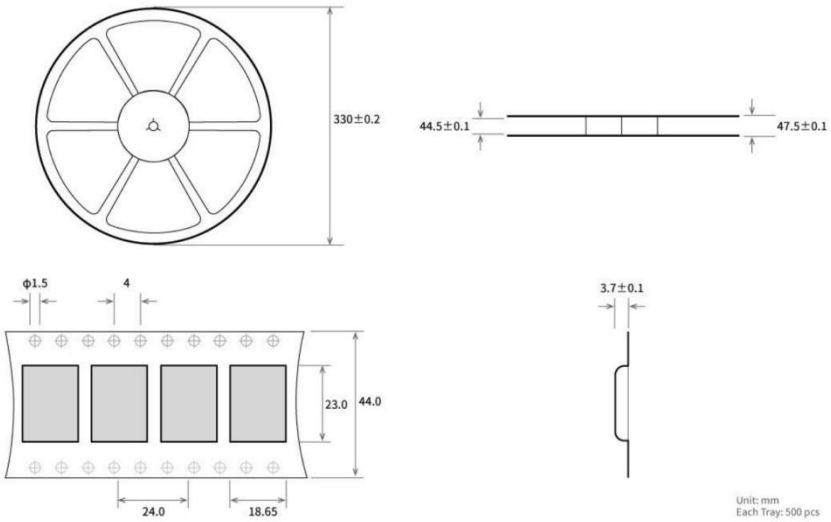
11.1 E105-WBS36S Packaging Method



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11.2 E105-WBS36SP Packaging Method



Revision History

Version	Revision Date	Revision Notes	maintainer
1.0	2025-12-22	Initial version	NING
1.1	2026-07-07	Modify hardware parameters	Lan

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