E105-BS21 Series Product Specifications

SLE SMD Star Flash Wireless Module



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Chapter1 Overview

1.1 Introduction

E105-BS21 series modules are serial-to- SLE (SparkLink Low Energy) modules based on SparkLink protocol version 1.0 . They have the characteristics of small size, low power consumption , long transmission distance, fast transmission speed, strong anti-interference ability, low latency, etc. They work in the 2.4GHz frequency band with a maximum RF transmission power of 6dBm .

E105-BS21 series modules use universal AT commands, which are simple and fast to operate. The modules can be widely used in smart wearables, home automation, home security, personal health care, smart home appliances, accessories and remote controls, automobiles, lighting, industrial Internet, smart data acquisition, smart control and other fields.



Figure 1: E105-BS21



Figure 2: E105-BS21X

1.2 Features

- Support Star Flash 1.0 protocol;
- Easy to use, no experience in Star Flash protocol application is required;
- Low latency: Faster connection speed, the fastest connection speed can reach 4ms;
- Low power consumption: The current consumption of the module is only about 2mA when it is working, and the sleep current is about 6uA;
- Automatic connection: You can set the Star Flash to automatically start and connect automatically after power on through AT commands;
- Automatic reconnection: You can set the disconnection to automatically reconnect through AT commands;
- Transparent transmission mode: You can set the connection to automatically enter the transparent transmission mode through AT commands;
- Parameter setting: The various parameters of the module can be modified through AT commands;
- Automatic saving: When the module parameters are configured using instructions, they are automatically saved to Flash;
- Supports modification of transmit power, broadcast interval, connection interval, serial port baud rate, broadcast name, MAC address, etc.

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1.3 Application Scenario

- Smart home and industrial sensors, etc.
- Smart Wear
- Home Security
- Smart Home Appliances
- Accessories and Remote Controls
- Wireless Sensing
- Intelligent Control
- Petroleum, chemical industry, metallurgy, etc.

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Chapter 2 Specifications

2.1 Basic parameters

Main parameters		Performance Description			Remark
		Minimum	Typical Value	Maximum	
Operating voltage (V)		1. 8	3.3	3. 6	
Supply voltage (V)		-	-	3.9	
Communication level (V)		-	3.3	-	Using 5V level may cause burnout
Operating temperature (℃)		- 4 0	-	85	Industrial-grade design
Operating frequency band (MHz)		240 2	-	2480	Support ISM band
Transmit power (dBm)		-28	0	6	-
Power consumption	Emission current (mA)	-	1 2 .5	-	Peak transient current @ 6dBm
		-	5.3	-	Peak transient current @ 0dBm
	Receive current (mA)	-	2.5	-	-
	Sleep current (uA)	-	6	-	-
Receiving sensitivity (dBm)		-	-9 0 . 6	-	4 Mbit/s frame type 1
Communication distance (m)		-	270	-	Clear and open environment, height 1 meter, @ 6dBm, airspeed 4 Mbps

2.2 Hardware Parameters

Main parameters	describe	Remark
IC Solution	BS21	-
Crystal frequency	32MHz	-
Star Flash Protocol	SLE 1.0	-
Communication interface	UART	-
Packaging	SMD	-
FLASH	512KB	-
RAM	160KB	-
Kernel	RISC-V	-
Dimensions (IPEX)	19.2 *1 8 mm	Corresponding to E105-BS21X module, tolerance range ±0.2mm
Dimensions (PCB)	25.5*18mm	Corresponding to E105-BS21 module, tolerance range ±0.2mm
Antenna interface	IPEX	Equivalent impedance is about 50Ω , corresponding to E105-BS21X module

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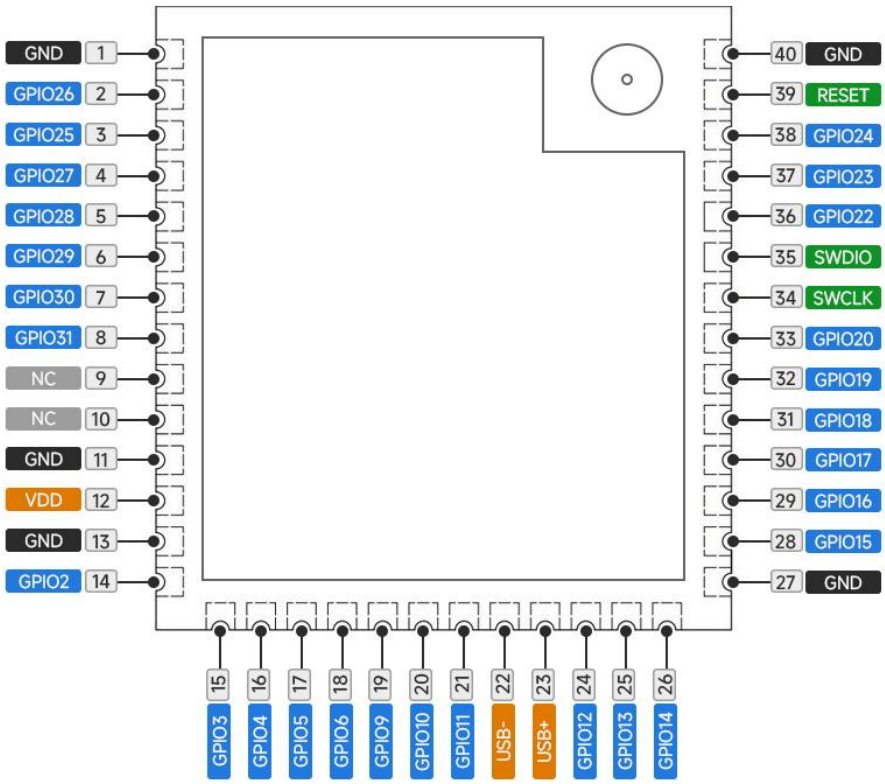
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Antenna interface	PCB	Equivalent impedance is about 50Ω , corresponding to E105-BS21 module

Chapter3 Mechanical dimensions and pin definition

3.1 E105-BS21 & E105-BS21X Pin Definition

The pin layout diagram shows the approximate location of the pins on the module. The pin layout of E105-BS21 and E105-BS21X is the same, but the antenna form is different.



Pin number	name	Function	Remark
1	GND		Module GND
2	GPIO26	I/0	General IO port
3	GPIO25	I/0	General IO port
4	GPIO27	I/0	General IO port
5	GPIO28	I/0	General IO port
6	GPIO29	I/0	General IO port

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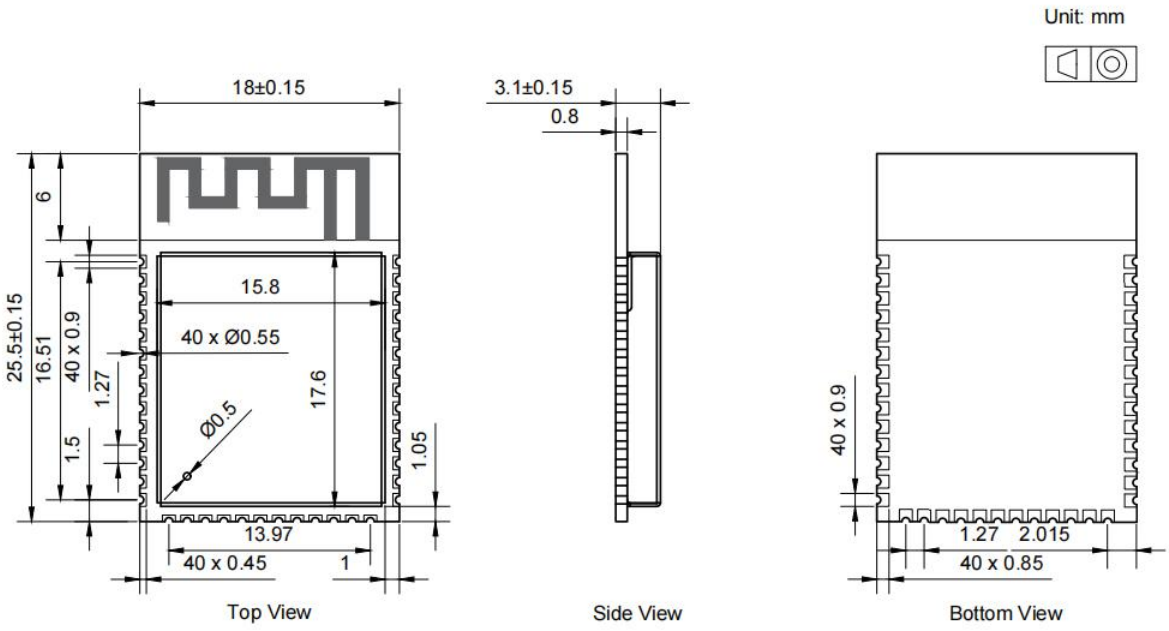
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7	GPIO30	I/0	General IO port
8	GPIO31	I/0	General IO port
9	NC	-	-
10	NC	-	-
11	GND		Module GND
12	VDD		Power input 1.8V~3.6V
13	GND		Module GND
14	GPIO2	I/0	General IO port
15	GPIO3	I/0	General IO port
16	GPIO4	I/0	General IO port
17	GPIO5	I/0	General IO port
18	GPIO6	I/0	General IO port
19	GPIO9	I/0	General IO port
20	GPIO10	I/0	General IO port
twenty one	GPIO11	I/0	General IO port
twenty two	USB-		USB negative terminal(Not developed for use, the pin can be suspended)
twenty three	USB+		USB positivel(Not developed for use, the pin can be suspended)
twenty four	GPIO12	I/0	General IO port
25	GPIO13	I/0	General IO port
26	GPIO14	I/0	General IO port
27	GND		Module GND
28	GPIO15	I/0	General IO port
29	GPIO16	I/0	General IO port
30	GPIO17	I/0	General IO port
31	GPIO18	I/0	General IO port
32	GPIO19	I/0	Communication serial port TXD
33	GPIO20	I/0	Communication serial port RXD
34	SWCLK		Debug pins
35	SWDIO		Debug pins
36	GPIO22	I/0	General IO port
37	GPIO23	I/0	General IO port
38	GPIO24	I/0	General IO port
39	RESET	I	Reset pin, cannot be left floating, pull low for 10ms to reset, can be used to wake up from deep sleep
40	GND		Module GND

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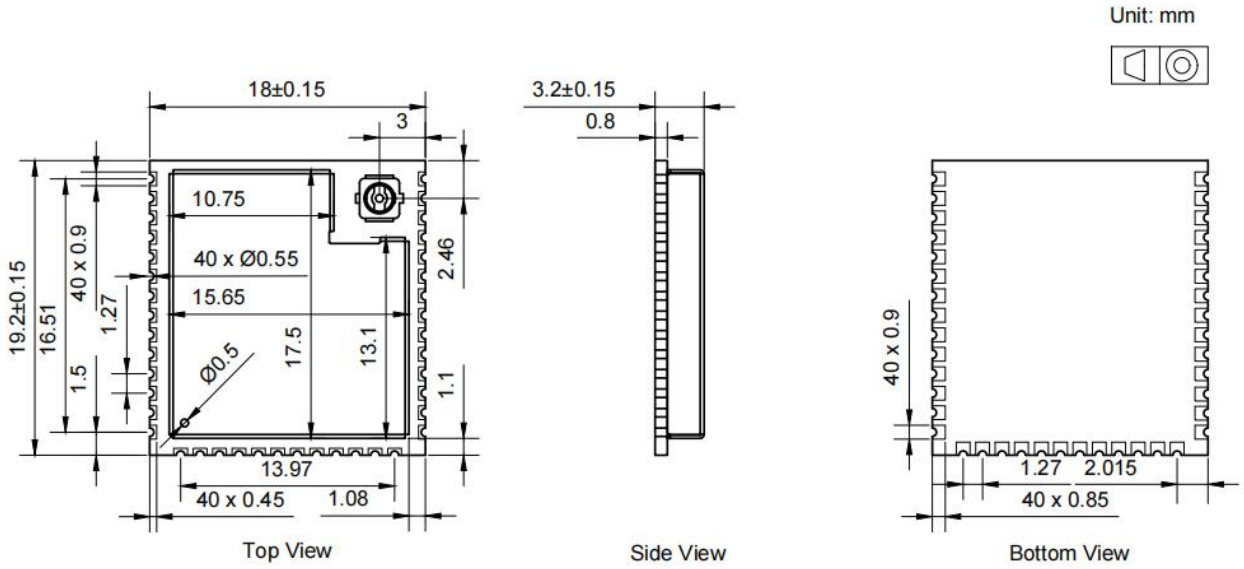
3.2 E105-BS21 Dimensions



3.3 E105-BS21X Dimensions

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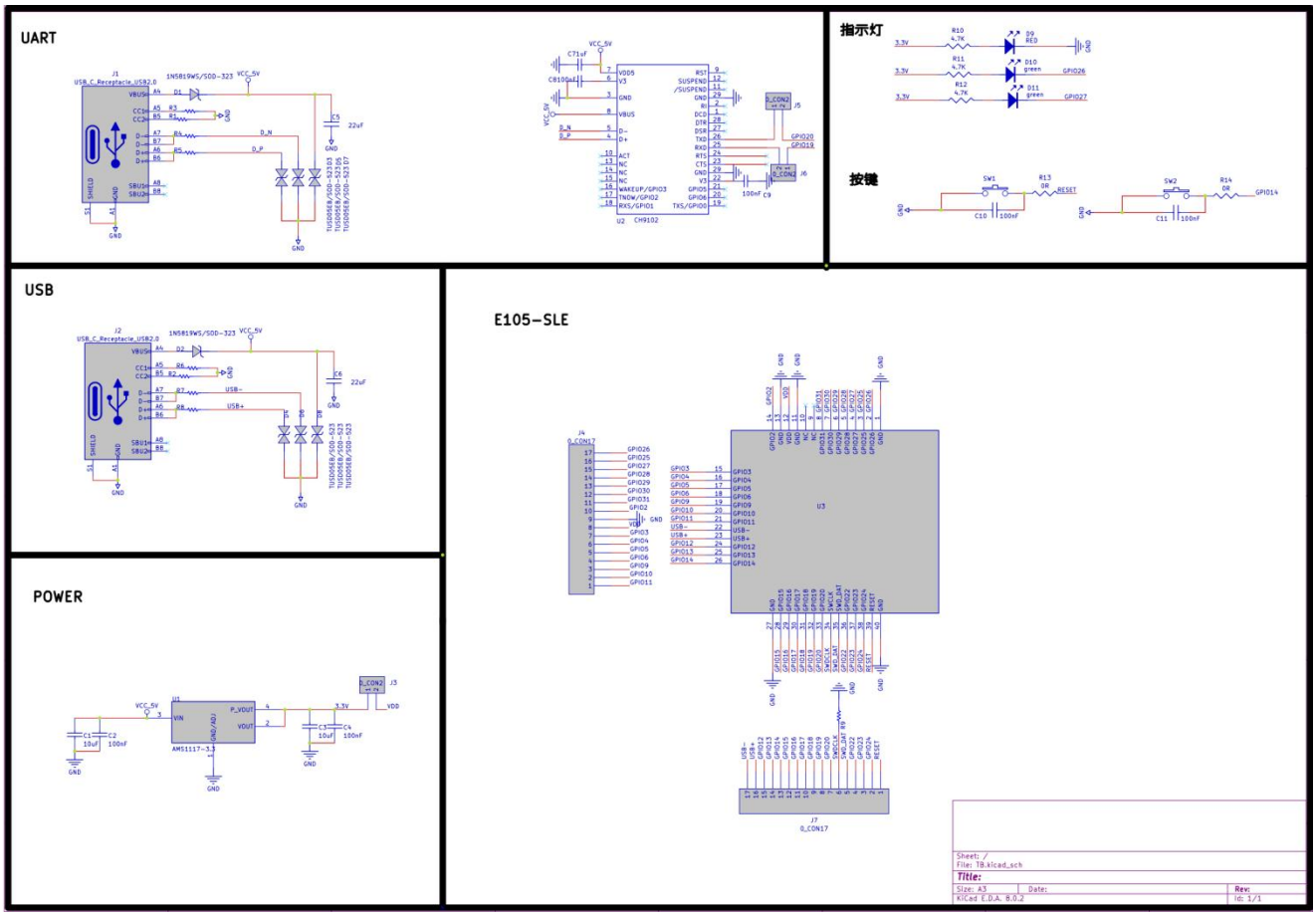


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Chapter 4 Basic Applications

4.1 Recommended Circuit



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Chapter 5 Module Parameter Description

5.1 Role Description

The module supports the following three working modes:

Serial number	Working Mode	Mode Details
1	Mode 0	Star Flash is shut down and Star Flash service is stopped.
2	Mode 1	The Star Flash server (server) is used to send Star Flash broadcasts.
3	Mode 2	Star Flash client (client) , users connect to Star Flash.
Note: The working mode can be queried through the AT command "AT+ SLEMODE? " , please refer to Chapter 6 AT Commands for details .		

5.2 Default Configuration

Module factory default configuration parameters:

Serial number	Parameter Type	Parameter Details
1	Device Name	EBYTE SLE
2	Serial port baud rate	115200 bps, no parity
3	Maximum output power	6 dBm
4	MAC Address	00:00:00:00:00:00
5	Broadcast Interval	4ms, connection interval: 4ms, scanning interval: continuous scanning
6	Automatic reconnection	Open

5.3 Module working information

Serial number	Module work completed	Information Printing Details
1	Module startup	\r\n+EVENT:MODULE INIT\r\n
2	Connection Completed	\r\n+EVENT:SLE CONNECTED\r\n
3	Disconnect	\r\n+EVENT:SLE DISCONNECTED\r\n
4	Connecting	\r\n+EVENT:SLE CONNECTING...\r\n
5	Scanning	\r\n+EVENT:SLE SCANING...\r\n
6	Stop Scanning	\r\n+EVENT:SLE SCAN STOP\r\n
7	Sleep Mode	\r\n+EVENT:SLE SLEEP\r\n
8	Sleep wake-up	\r\n+EVENT:SLE WAKEUP\r\n
9	Return to AT command mode	\r\n+EVENT:AT CMD\r\n

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Chapter 6 Usage Examples

6.1 Star Flash Startup

1. When the module starts, some restart information will be output by default. Users do not need to care about it and can use the software to filter these restart information.
2. When the module is initialized, it will print \r\n+EVENT:MODULE INIT\r\n. If you want to check whether the module is successfully started, you can judge this return. The default AT command baud rate is 115200 bps, without parity check.



6.2 Star Flash Connection

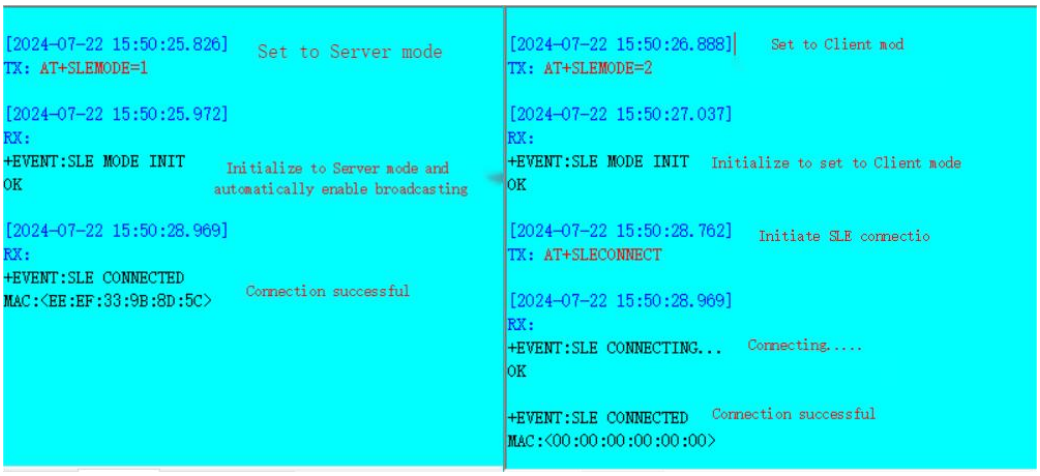
1. Before connecting the module, you need to specify the mode (Server mode or Client mode). After successful execution, it returns:\r\n+EVENT:SLE MODE INIT\r\n.After the mode is determined, send AT+SLESTART to start,firmware version 7491-0-10 does not support this command. Just skip this command when using it. For detailed steps, please refer to the figure below.
2. Server mode is responsible for broadcasting, and Client mode is responsible for connecting. Xingshan does not currently support connecting to mobile devices such as mobile phones.
3. In Server mode, broadcasting will be automatically turned on after initialization is completed. If the connection is accidentally disconnected, AT+SLEADV is required to restart the broadcasting. The broadcasting will be automatically turned off after the broadcast connection is successful.
4. After initialization in Client mode, you need to manually initiate a connection. You can use AT+SLECONNECT or AT+SLECONNECT=<MAC> to connect. AT+SLECONNECT selects the target device based on the module name, while AT+SLECONNECT=<MAC> selects the target by the MAC address. It is recommended to use

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SLECONNECT=<MAC> to connect to ensure that you will not mistakenly connect to other modules.

5. After the connection is successful, the MAC address of the peer module will be returned. The MAC address cannot be 00:00:00:00:00:00, otherwise the MAC address returned in Server mode will be abnormal, as shown in the figure below. The default MAC address is 00:00:00:00:00:00. The user needs to use AT+SLEMAC=<MAC>,0 to set the initial MAC address of the module.



6. After the connection is successful, the module serial port will return \r\n+EVENT:SLE CONNECTED\r\n. When one end of the connection is abnormally disconnected, the other end will automatically disconnect after 5 seconds and return \r\n+EVENT:SLE DISCONNECTED\r\n.

7. After the connection is successful, the user can use AT+SLESEND=<length>,<data> to exchange data between the two parties, or use transparent transmission mode for data exchange, see Section 7.3.

8. After the module is successfully connected for the first time, you can enable AT+SLEAUTOSETUP=1 (power-on automatic initialization of the star flash mode function). After enabling this function, the module will automatically initialize to the last initialized mode (Server/Client mode) after powering on. It can be used in conjunction with AT+SLEAUTOCONNECT=1 (automatic connection function after initialization is completed). This function is not enabled by default .

9. Multiple connections are not supported yet.

6.3 Star Flash Transmission

1. After the connection is completed, use AT+SLESEND=<length>,<data> in AT command mode for data exchange. If the user does not want to use AT commands for control, you can also use AT+SLETRANS to enter transparent transmission mode. After entering transparent transmission mode, it cannot respond to AT commands. You need to use the CMD\r\n command to return to AT command mode. After returning to AT command mode, the module serial port returns \r\n+EVENT:AT CMD\r\n.

2. The above operation is rather troublesome. In order to simplify the operation steps of entering transparent transmission mode, a new command AT+SLEAUTOTRANS=1 (automatically enter transparent transmission mode function) is added. After setting this command, the module will automatically enter transparent transmission mode after connection and automatically exit transparent transmission mode after disconnection. This function is not enabled by default . (The setting before connection is effective)

3. In transparent transmission mode, high-speed data can be sent and received without returning OK. A single packet of data can support up to 1000 bytes. If bytes are lost, please increase the serial port sending interval appropriately.

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6.4 Star Flash disconnection and automatic reconnection

1. When the module is in connected state, you can disconnect all connections through AT+SLEDISCONNECT or disconnect a certain connection through AT+SLEDISCONNECT=<MAC>.
Since the module has the automatic reconnection function enabled by default, it will automatically reconnect after a disconnection, even if it is manually disconnected . Before you need to disconnect, you need to turn off the automatic connection function by using AT+SLEAUTORECONNECT=0.
2. When the module is in a connected state, if one end of the connection is abnormally disconnected, the other end will automatically disconnect after 5 seconds.

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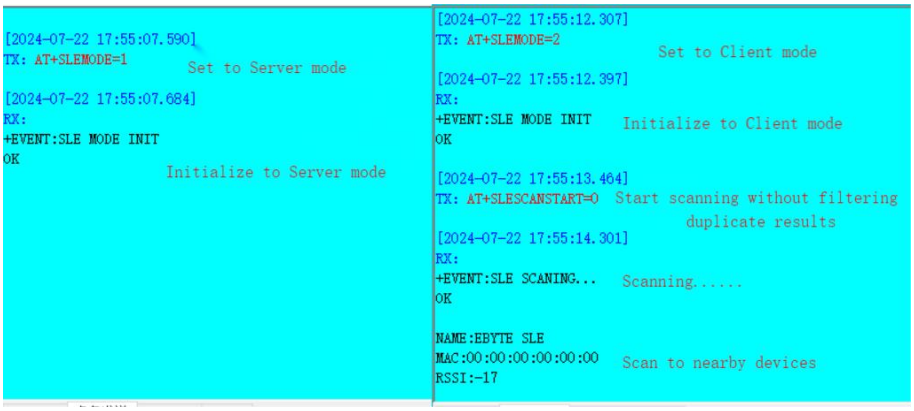
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6.5 Starflash Scanning

1. When the module is set to Client mode and is not connected, you can use AT+SLESCANSTART=0 to scan nearby devices. During the scan, the scanned device information will be output. If you need to filter the scan results, you can use AT+SLESCANSTART=1 to scan nearby devices. The scan results will automatically filter invalid devices with MAC addresses of 00:00:00:00:00:00.

2. To stop scanning, you can use AT+SLESCANSTOP. After stopping scanning, the serial port will return \r\n+EVENT:SLE SCAN STOP\r\n.



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Chapter 7 AT Commands

Note: Before sending operation instructions, first ensure that the module is in wake-up mode, otherwise it will not be able to receive configuration instructions !

7.1 Instruction Description

Instruction Type	Instruction Format	describe
Query command	AT+[X]?	This command is used to query the parameters of the setting command.
Setting Instructions	AT+[X]=<…>	This command is used to set user-defined parameters.
Execute Instructions	AT+[X]	Used for instructions without parameters, such as module reset.

Notice:

- Serial port configurations all end with a carriage return (\r) and a line feed (\n);
- The return results of the two configuration modes both end with (\r) and (\n), which will not be explained later.
- The default serial port baud rate is 115200, 8 data bits, 1 stop bit, no parity;
- The command parameters are all in ASCII format;
- The command execution response format is OK\r\n, and the command error response format is ERROR\r\n ;
- In AT commands, <> indicates parameters, and [] indicates required parameters;
- The instruction part is not case sensitive;
- All AT commands cannot contain invisible characters such as spaces and tabs.

7.2 Instruction List

7.2.1 Test instructions

instruction	AT	response	OK<CR><LF>
describe	Test whether the serial port communication is normal .		
parameter			
Example	AT OK		
instruction	AT +DEVTYPE=?	response	DEVTYPE=<dev><CR><LF> OK<CR><LF>
describe	Read the device model.		
parameter	<dev>: device model		
Example	AT +DEVTYPE=? DEVTYPE=E105-BS21		

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	OK

instruction	AT +FWCODE=?	response	FWCODE=<fwcode><CR><LF> OK<CR><LF>
describe	Read the firmware code.		
parameter	<fwcode>: firmware code		
Example	AT +DEVTYPE=? FWCODE=7491-0-10 OK		

7.2.2 Device Restart

instruction	AT +REBOOT	response	+REBBOT<CR><LF>
describe	The module restarts.		
Example	AT+REBOOT +REBOOT ... +EVENT:MODULE INIT		
instruction	AT +RESTORE	response	+RESTORE<CR><LF>
describe	The module is restored to factory settings and restarted.		
Example	AT+RESTORE +RESTORE ... +EVENT:MODULE INIT		

7.2.3 Serial port settings

instruction	AT +UART?	response	+UART:<baud>,<parity><CR><LF> OK<CR><LF>
describe	Query the serial port configuration.		
parameter	<baud>: serial port baud rate <parity>: serial port parity bit		
Example	AT+UART? +UART:115200,0 OK	Function	The serial port baud rate is 115200, no verification
instruction	AT +UART=<baud>,<parity>	response	OK<CR><LF>
describe	Set the serial port configuration and automatically save the parameters (restart to take effect).		
parameter	<baud>: serial port baud rate, [2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400] bps <parity>: serial port parity bit, [0:8N1 1:8O1 2:8E1]		
Example	AT +UART=115200,0 OK	Function	Set the serial port baud rate to 115200, no checksum

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7.2.4 Star Flash Mode

instruction	AT +SLEMODE?	response	+SLEMODE:<role><CR><LF> OK<CR><LF>
describe	Query the Star Flash working mode.		
parameter	<role>: Star Flash working mode [0: Turn off Star Flash 1: Star Flash SERVER 2: Star Flash CLIENT]		
Example	AT+SLEMODE? +SLEMODE:1 OK	Function	The query shows that the Star Flash working mode is SERVER
instruction	AT +SLEMODE=<role>	response	<CR><LF>+EVENT:SLE MODE SETTING<CR><LF>
describe	Set the Star Flash working mode. Before switching modes, you need to turn off the Star Flash first to automatically save the parameters.		
parameter	<role>: Star Flash working mode [0: Turn off Star Flash 1: Star Flash SERVER 2: Star Flash CLIENT]		
Example	AT +SLEMODE=2 +EVENT:SLE MODE INIT... OK	Function	Set the Star Flash working mode to CLIENT mode
instruction	AT+SLESTART	response	<CR><LF>+EVENT:SLE MODE INIT<CR><LF>
describe	To initiate StarFlash reset, send the command after AT+SLEMODE. This command is not included in firmware version 7491-0-10. Users with this version of the module may skip this step. For details, refer to Section 6.2.		
parameter	-		
Example	AT+SLESTART +EVENT:SLE MODE INIT OK	Function	Enable StarFlash Service

7.2.5 Star Flash Establishes Connection

instruction	AT +SLEADV	response	OK<CR><LF>
describe	When the SERVER mode is started normally, broadcasting will start automatically. Broadcasting needs to be restarted only after disconnection (SERVER mode is valid).The module can be powered on only once and takes effect only in SERVER or CLIENT mode.		
parameter			
Example	AT +SLEADV OK	Function	Manually restart the broadcast
instruction	AT +SLECONNECT	response	<CR><LF>+EVENT:SLE CONNECTING...<CR><LF> OK<CR><LF>
describe	Search for nearby devices with the same name and establish a connection (available in CLIENT mode).		
parameter			
Example	AT +SLECONNECT	Function	Search and connect to nearby devices with

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	+EVENT:SLE CONNECTING... OK		the same name as this device
instruction	AT +SLECONNECT=<mac>	response	<CR><LF>+EVENT:SLE CONNECTING...<CR><LF> OK<CR><LF>
describe	Search for nearby devices with address <mac> and establish a connection (valid in CLIENT mode).		
parameter	<mac>: target address, [XX:XX:XX:XX:XX:XX], where X is a hexadecimal number		
Example	AT +SLECONNECT=1234567890AB +EVENT:SLE CONNECTING... OK	Function	Search for the device with the connection address 12:34:56:78:90:ab

7.2.6 Star Flash Disconnection

instruction	AT +SLEDISCONNECT	response	OK<CR><LF>
describe	Disconnect all Starflash connections.		
parameter			
Example	AT +SLEDISCONNECT OK	Function	Disconnect all Starflash connections
instruction	AT +SLEDISCONNECT=<mac>	response	<CR><LF>+EVENT:SLE CONNECTING...<CR><LF> OK<CR><LF>
describe	Disconnect the connection with address <mac>.		
parameter	<mac>: target address, [XX:XX:XX:XX:XX:XX], where X is a hexadecimal number		
Example	AT +SLEDICONNECT=1234567890AB OK	Function	Disconnect the device with MAC address 12:34:56:78:90:ab

7.2.7 Star Flash Scanning

instruction	AT +SLESCANSTART=<duplicate>	response	OK<CR><LF>
describe	Scan nearby Star Flash devices (valid in CLIENT mode). In filter mode, invalid devices with MAC address 00:00:00:00:00:00 will be filtered out.		
parameter	<duplicate>: Whether to filter the results		
Example	AT +SLESCANSTART=1 +EVENT:SLE SCANING... OK NAME:30,EBYTE SLE MAC:12:34:56:78:90:ab RSSI: -17	Function	Scan nearby devices and filter duplicate results
instruction	AT +SLESCANSTOP	response	OK<CR><LF>
describe	Stop scanning nearby Starflash devices (valid in CLIENT mode).		
parameter			

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Example	AT +SLESCANSTOP +EVENT:SLE SCAN STOP OK	Function	Stop scanning for nearby devices

7.2.8 Star Flash Address

instruction	AT +SLEMAC?	response	+SLEMAC:<mac>,<type><CR><LF> OK<CR><LF>
describe	Check the Star Flash address.		
parameter	<mac>: MAC address, [XX:XX:XX:XX:XX:XX], where X is a hexadecimal number. <type>: address type, [0: static address 6: random address (not supported yet)]		
Example	AT +SLEMAC? +SLEMAC:12:34:56:78:90:AB,0 OK	Function	The static MAC address found is 12:34:56:78:90:AB
instruction	AT +SLEMAC=<mac>,<type>	response	OK<CR><LF>
describe	Set the Star Flash address and automatically save the parameters (settings are valid before establishing a connection).SERVER mode can be read only after being connected to the network. If you need to read before entering the network, you need to write a command).		
parameter	<mac>: MAC address, [XX:XX:XX:XX:XX:XX], where X is a hexadecimal number. <type>: address type, [0: static address 6: random address (not supported yet)]		
Example	AT +SLEMAC=1234567890AB,0 OK	Function	Set the static MAC address to 12:34:56:78:90:ab

7.2.9 Star Flash Output Power

instruction	AT +SLEPWR?	response	+SLEPWR:<pwr><CR><LF> OK<CR><LF>
describe	Query the output power of the Star Flash.		
parameter	<pwr>: Automatically set to the nearest power level, [-127~20] dBm		
Example	AT +SLEPWR? +SLEPWR:20 OK	Function	The maximum output power is 20dbm. (Non-specific transmit power)
instruction	AT +SLEPWR=<pwr>	response	OK<CR><LF>
describe	Set the Star Flash output power and automatically save the parameters (settings are valid before establishing a connection).		
parameter	<pwr>: Automatically set to the nearest power level, [-127~20] dBm		
Example	AT +SLEPWR=6 OK	Function	Set the transmit power to 6dBm and automatically select the closest power level

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7.2.10 Star Flash Parameter Settings

instruction	AT +SLEADVSET?	response	+SLEADVSET:<max>,<min><CR><LF> OK<CR><LF>
describe	Check the interval of Star Flash broadcast.		
parameter	<max>: Maximum broadcast interval, [32~64000], unit: 125us <min>: minimum broadcast interval, [32~64000], unit: 125us		
Example	AT +SLEADVSET? +SLEADVSET:200,200 OK	Function	The broadcast interval is found to be 200*0.125 = 25 ms.
instruction	AT +SLEADVSET=<max>,<min>	response	OK<CR><LF>
describe	Set the interval of Star Flash broadcast and automatically save the parameters (settings are valid before establishing a connection).		
parameter	<max>: Maximum broadcast interval, [32~64000], unit: 125us <min>: minimum broadcast interval, [32~64000], unit: 125us		
Example	AT+SLEADVSET=20,20 OK	Function	Set the broadcast interval to 20*0.125 = 2.5 ms

instruction	AT +SLECNTSET?	response	+SLECNTSET:<max>,<min>,<latency>, <timeout><CR><LF> OK<CR><LF>
describe	Query the Star Flash connection gap.		
parameter	<max>: Maximum connection interval, [32~16000], unit: 125us <min>: minimum connection gap, [32~16000], unit 125us <latency>: latency period, unit slot (this value indicates that there is no need to reply within the set period, and when it is 0, it means that each packet needs to be replied) <timeout>: timeout period, [10~3200], unit 10ms		
Example	AT +SLECNTSET? +SLECNTSET:100,100,499,500 OK	Function	The query shows that the connection interval is 12.5ms, the delay period is 499, and the timeout period is 5 seconds.
instruction	AT +SLECNTSET=<max>,<min>,<latency>,<timeout>	response	OK<CR><LF>
describe	Set the Star Flash connection interval and automatically save the parameters (settings are valid before establishing a connection).		
parameter	<interval_max>: maximum connection interval, [32~16000], unit: 125us <interval_min>: minimum connection interval, [32~16000], unit: 125us <latency>: latency period, [0~499], unit: slot (no reply is required within the set period, 0 means every packet needs to be replied) <timeout>: timeout period, [10~3200], unit 10ms		
Example	AT +SLECNTSET=80,80,499,50	Functio	Set the connection interval to 10ms, the delay

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	OK	n	period to 499, and the timeout period to 500ms
instruction	AT +SLESCANSET?	response	+SLESCANSET:<interval>,<window><CR><LF> OK<CR><LF>
describe	Query star flash scanning parameters.		
parameter	<interval>: scanning interval, [32~64000], unit 125us <window>: scanning window, [32~64000], unit 125us (scanning window needs to be less than or equal to scanning interval)		
Example	AT +SLESCANSET? +SLESCANSET:100,100 OK	Function	The scan interval and scan window are both 12.5ms.
instruction	AT +SLESCANSET=<interval>,<window>	response	OK<CR><LF>
describe	Set the star flash scanning parameters and save them automatically (settings are valid before establishing a connection).		
parameter	<interval>: scanning interval, [32~64000], unit 125us <window>: scanning window, [32~64000], unit 125us (scanning window needs to be less than or equal to scanning interval)		
Example	AT +SLESCANSET=100,50 OK	Function	Set the scan interval to 12.5ms and the scan window to 6.25ms

7.2.11 Star Flash Name

instruction	AT +SLENAME?	response	+SLENAME:<name><CR><LF> OK<CR><LF>
describe	Query the name of the star flash.		
parameter	<name>: Star flash name, no more than 30 bytes		
Example	AT +SLENAME? +SLENAME:EBYTE SLE OK	Function	The name of the star flash is EBYTE SLE
instruction	AT +SLENAME=<name>,<save>	response	OK<CR><LF>
describe	Set the star flash scanning parameters (settings are valid before establishing a connection).		
parameter	<name>: Star flash name, no more than 30 bytes <save>: whether to save to FLASH, [1: save 0: do not save]		
Example	AT +SLENAME=Star Flash BS21,1 OK	Function	Set the name to Star Flash BS21 and save it in FLASH

7.2.12 Sending data using Star Flash AT command

instruction	AT +SLESEND=<len>,<data>	response	OK<CR><LF>
describe	Xingshan sends data and needs to be used after a successful connection is established.		
parameter	<len>: user sent length, [1~240] bytes, the length value must be equal to the actual sent data		

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	<data>: data sent by the user, up to 240 bytes		
Example	AT +SLESEND=5,12345 OK	Function	Xingshan sends data with a length of 5 12345

7.2.13 Star Flash enters transparent transmission mode

instruction	AT +SLETRANS	response	OK<CR><LF>
describe	Xingshan enters transparent transmission mode to send data, which needs to be used when a connection is successfully established. To exit the transparent transmission mode, enter "CMD<CR><LF>" in the transparent transmission mode to exit the transparent transmission mode.		
parameter			
Example	AT +SLESEND OK 12345 CMD +EVENT:AT CMD	Function	Enter transparent mode Send data 12345 Enter the command CMD<CR><LF> to exit the transparent transmission mode Return to AT command mode

7.2.14 Star Flash Auxiliary Function (Does not affect each other)

instruction	AT +SLEAUTOSETUP?	response	+SLEAUTOSETUP:<enable><CR><LF> OK<CR><LF>
describe	Query whether the automatic start-up star flash function is enabled after the module is started.		
parameter	<enable>: function enable, [0: disable 1: enable]		
Example	AT+SLEAUTOSETUP? +SLEAUTOSETUP:0 OK	Function	It is found that the module does not automatically start the star flash after startup
instruction	AT +SLEAUTOSETUP=<enable>	response	OK<CR><LF>
describe	Set whether to enable the star flash function automatically after the module starts, and automatically save the parameters.		
parameter	<enable>: function enable, [0: disable 1: enable]		
Example	AT +SLEAUTOSETUP=1 OK	Function	Set the module to automatically start Star Flash after startup
instruction	AT +SLEAUTOCONNECT?	response	+SLEAUTOCONNECT:<enable><CR><LF> OK<CR><LF>
describe	Check whether the automatic connection of Starflash is enabled.		
parameter	<enable>: function enable, [0: disable 1: enable]		
Example	AT+SLEAUTOCONNECT? +SLEAUTOCONNECT:0 OK	Function	It is found that the automatic connection is not enabled after the Star Flash is started.
instruction	AT +SLEAUTOCONNECT=<enable>	response	OK<CR><LF>
describe	Set whether to enable automatic connection of Starflash and automatically save parameters.		

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parameter	<enable>: function enable, [0: disable 1: enable]		
Example	AT +SLEAUTOCONNECT=1 OK	Function	Set up automatic connection after Star Flash starts
instruction	AT +SLEAUTOTRANS?	response	+SLEAUTOTRANS:<enable><CR><LF> OK<CR><LF>
describe	Check whether the StarFlash automatically enters transparent transmission mode after connection. Note: After the Star Flash is disconnected, it will automatically return to the AT command mode.		
parameter	<enable>: function enable, [0: disable 1: enable]		
Example	AT+SLEAUTOTRANS? +SLEAUTOTRANS:0 OK	Function	After querying the Star Flash connection, it does not automatically enter the transparent transmission mode
instruction	AT +SLEAUTOTRANS=<enable>	response	OK<CR><LF>
describe	Set whether to automatically enter transparent transmission mode after Star Flash is connected and automatically save parameters. Note: After the Star Flash is disconnected, it will automatically return to the AT command mode.		
parameter	<enable>: function enable, [0: disable 1: enable]		
Example	AT +SLEAUTOTRANS=1 OK	Function	Automatically enter transparent transmission mode after setting Star Flash connection
instruction	AT +SLEAUTORECONNECT?	response	+SLEAUTORECONNECT:<enable><CR><LF> OK<CR><LF>
describe	Query whether the StarFlash automatically reconnects after being disconnected and automatically saves parameters. In SERVER mode, it automatically enters broadcast mode, and in CLIENT mode, it automatically enters scan mode.		
parameter	<enable>: function enable, [0: disable 1: enable]		
Example	AT+SLEAUTORECONNECT? +SLEAUTORECONNECT:0 OK	Function	Query: Star Flash does not automatically reconnect after disconnection
instruction	AT +SLEAUTORECONNECT=<enable>	response	OK<CR><LF>
describe	Set whether to automatically reconnect after the Star Flash is disconnected and automatically save the parameters. In SERVER mode, it automatically enters broadcast mode, and in CLIENT mode, it automatically enters scan mode.		
parameter	<enable>: function enable, [0: disable 1: enable]		
Example	AT +SLERECONNECT=1 OK	Function	Set up Star Flash to automatically reconnect after disconnection

7.2.15 Star Flash Hibernation

instruction	AT +SLESLEEP	response	<CR><LF>+EVENT:SLE SLEEP<CR><LF> OK<CR><LF>

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describe	The module enters permanent sleep mode and can only be awakened by RST or power-on again. The awakening time is about 430ms.		
parameter			
Example	AT+SLESLEEP +EVENT:SLE SLEEP	Function	The module enters permanent sleep mode
instruction	AT +SLESLEEP=<time>	response	<CR><LF>+EVENT:SLE SLEEP<CR><LF> OK<CR><LF>
describe	The module enters a timed sleep state and wakes up automatically after a set time (ms). Note: If the Star Flash is in a connected state, it cannot enter sleep mode and needs to be disconnected before entering sleep mode.		
parameter	<time>: sleep time, automatically wake up after [1~600000]ms		
Example	AT +SLESLEEP=2000 +EVENT:SLE SLEEP OK +EVENT:SLE WAKEUP	Function	Automatically enter transparent transmission mode after setting Star Flash connection

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Chapter 8 Hardware Design

- It is recommended to use a DC regulated power supply to power the module. The power supply ripple coefficient should be as small as possible and the module should be reliably grounded.
- Please pay attention to the correct connection of the positive and negative poles of the power supply. Reverse connection may cause permanent damage to the module.
- Please check the power supply to ensure that it is within the recommended power supply voltage. If it exceeds the maximum value, the module will be permanently damaged.
- Please check the stability of the power supply. The voltage should not fluctuate greatly or frequently.
- When designing the power supply circuit for the module, it is often recommended to retain more than 30% margin, so that the whole machine can work stably for a long time;
- The module should be kept as far away as possible from power supplies, transformers, high-frequency wiring and other parts with large electromagnetic interference;
- High-frequency digital routing, high-frequency analog routing, and power routing must avoid the bottom of the module. If it is necessary to pass under the module, assuming that the module is soldered on the Top Layer, ground copper should be laid on the Top Layer of the module contact part (all copper should be laid and well grounded), and it must be close to the digital part of the module and routed on the Bottom Layer ;
- Assuming the module is soldered or placed on the Top Layer, it is also wrong to randomly route the wires on the Bottom Layer or other layers, which will affect the module's spurious signal and receiving sensitivity to varying degrees ;
- If there are devices with large electromagnetic interference around the module, it will also greatly affect the performance of the module. It is recommended to keep away from the module according to the intensity of the interference. If possible, appropriate isolation and shielding can be performed.
- If there are traces with large electromagnetic interference around the module (high-frequency digital, high-frequency analog, power traces), it will also greatly affect the performance of the module. It is recommended to keep them away from the module according to the intensity of the interference. If possible, appropriate isolation and shielding can be performed.
- Try to stay away from some TTL protocols whose physical layer is also 2.4GHz, such as USB3.0;
- The antenna installation structure has a great impact on the performance of the module. Make sure the antenna is exposed and preferably vertically upward. When the module is installed inside the housing, use a high-quality antenna extension cable to extend the antenna to the outside of the housing;
- The antenna must not be installed inside a metal shell, as this will greatly reduce the transmission distance.

9 FAQ

9.1 The transmission distance is not ideal

- When there is a straight-line communication obstacle, the communication distance will be attenuated accordingly ;
- Temperature, humidity, and co-channel interference can increase the communication packet loss rate ;
- The ground absorbs and reflects radio waves, so the test results are poor when close to the ground ;

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- Seawater has a strong ability to absorb radio waves, so the test results at the seaside are poor ;
- If there are metal objects near the antenna, or the antenna is placed in a metal shell, the signal attenuation will be very serious ;
- The power register is set incorrectly, or the air rate is set too high (the higher the air rate, the closer the distance) ;
- The power supply voltage at room temperature is lower than the recommended value. The lower the voltage, the lower the power output .
- The antenna used does not match the module well or the antenna itself has quality issues.

9.2 Modules are vulnerable to damage

- Please check the power supply to ensure that it is within the recommended power supply voltage. If it exceeds the maximum value, the module will be permanently damaged .
- Please check the stability of the power supply. The voltage should not fluctuate greatly or frequently .
- Please ensure anti-static operation during installation and use, as high-frequency components are sensitive to static electricity ;
- Please ensure that the humidity is not too high during installation and use, as some components are humidity sensitive devices ;
- If there is no special requirement, it is not recommended to use it at too high or too low temperature.

9.3 The bit error rate is too high

- There is interference from the same frequency signal nearby. Stay away from the interference source or change the frequency or channel to avoid interference.
- Unsatisfactory power supply may also cause garbled characters, so the reliability of the power supply must be ensured;
- Extension cables or feeder cables that are of poor quality or are too long can also cause a high bit error rate.

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Chapter 10 Welding Operation Instructions

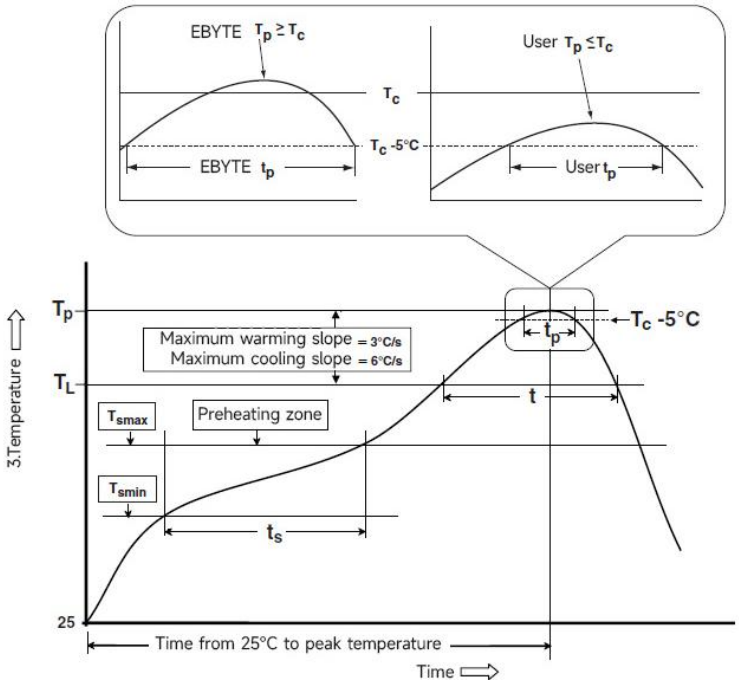
10.1 Reflow Temperature

Reflow profile characteristics		Leaded process assembly	Lead-free assembly
Preheating/keeping	Minimum temperature (Tsmin)	100℃	150℃
	Maximum temperature (Tsmax)	150℃	200℃
	Time (Tsmin~Tsmin)	60-120 seconds	60-120 seconds
Heating slope (TL~Tp)		3℃/sec, max.	3℃/sec, max.
Liquidus temperature (TL)		183℃	217℃
Keep time above TL		60~90 seconds	60~90 seconds
Package peak temperature Tp		Users must not exceed the temperature stated on the product's "Moisture Sensitivity" label.	Users must not exceed the temperature stated on the product's "Moisture Sensitivity" label.
The time (Tp) within 5°C of the specified classification temperature (Tc) is shown in the figure below.		20 seconds	30 seconds
Cooling slope (Tp~TL)		6℃/sec, max.	6℃/sec, max.
Time from room temperature to peak temperature		6 minutes, longest	8 minutes, longest
※The peak temperature (Tp) tolerance of the temperature curve is defined as the upper limit of the user			

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10.2 Reflow Oven Curve



Chapter 11 Related Models

Product Model	Chip Solution	Operating frequency Hz	emission power dBm	Communication interface	Support Agreement B L	Product size mm	antenna form	Features
E 73-2G4M04S 1A	n RF52810	2.4G	4	I/O	4.2/5.0	1 7.5 * 28.7	P CB/IPX	Hardware Resources Secondary Development
E 73-2G4M04S 1B	n RF52832	2.4G	4	I/O	4.2/5.0	1 7.5 * 28.7	P CB/IPX	Hardware Resources Secondary Development
E 73-2G4M08S 1C	n RF52840	2.4G	8	I/O	4.2/5.0	1 3 * 18	P CB/IPX	Hardware Resources Secondary Development
E104-BT01	CC2541	2.4G	0	I/O	4.0	14*22	P CB	Hardware Resources Secondary

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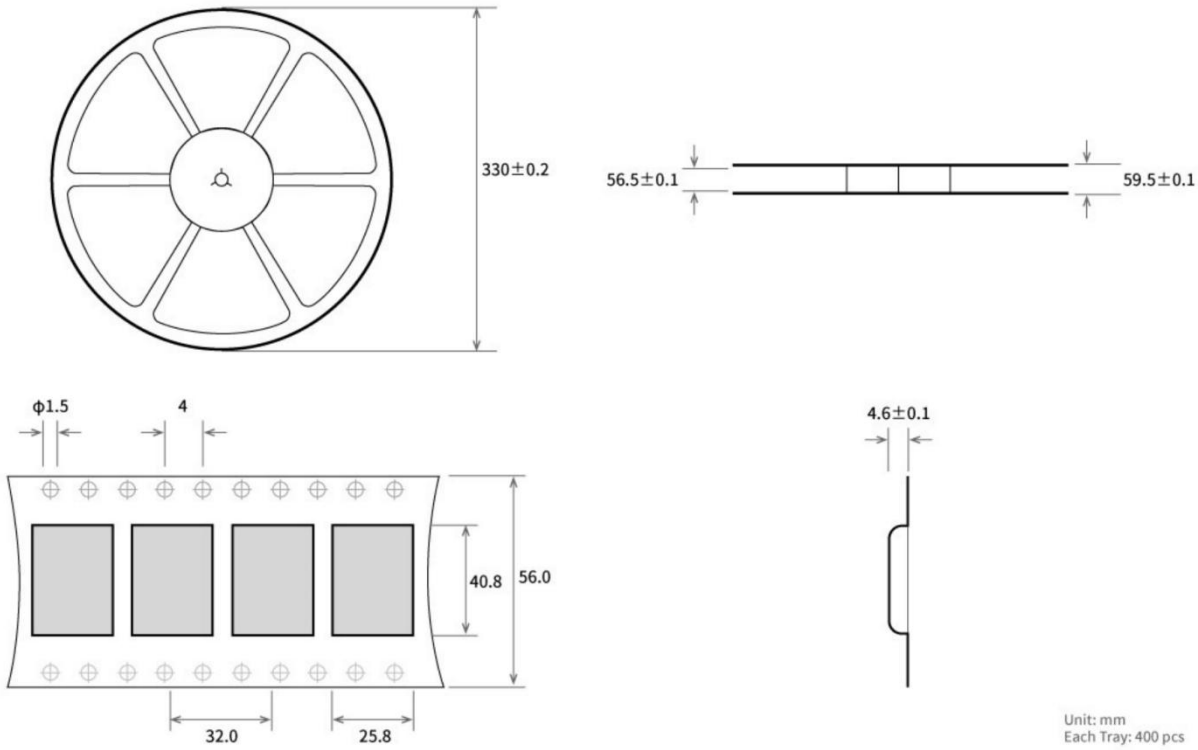
								Development
E104-BT02	DA14580	2.4G	0	TTL	4.2	14*22	P CB	The industry's lowest power consumption High-speed continuous transmission sniffing
E 72-2G4M04S 2B	C C2640	2.4G	2	TTL	4.2	14*2 3	P CB/IPX	Built-in A RM dual core Multi-role mode
E 104-2G4U04 A	C C2540	2.4G	0	USB	4.0	1 8 * 59	P CB	Dongle Protocol Analyzer
E104-BT5010 A	nRF52810	2.4G	0	UART	5.0	1 1.5 * 16	Ceramic Antenna	Low power consumption, transparent transmission

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Chapter 12 Packaging

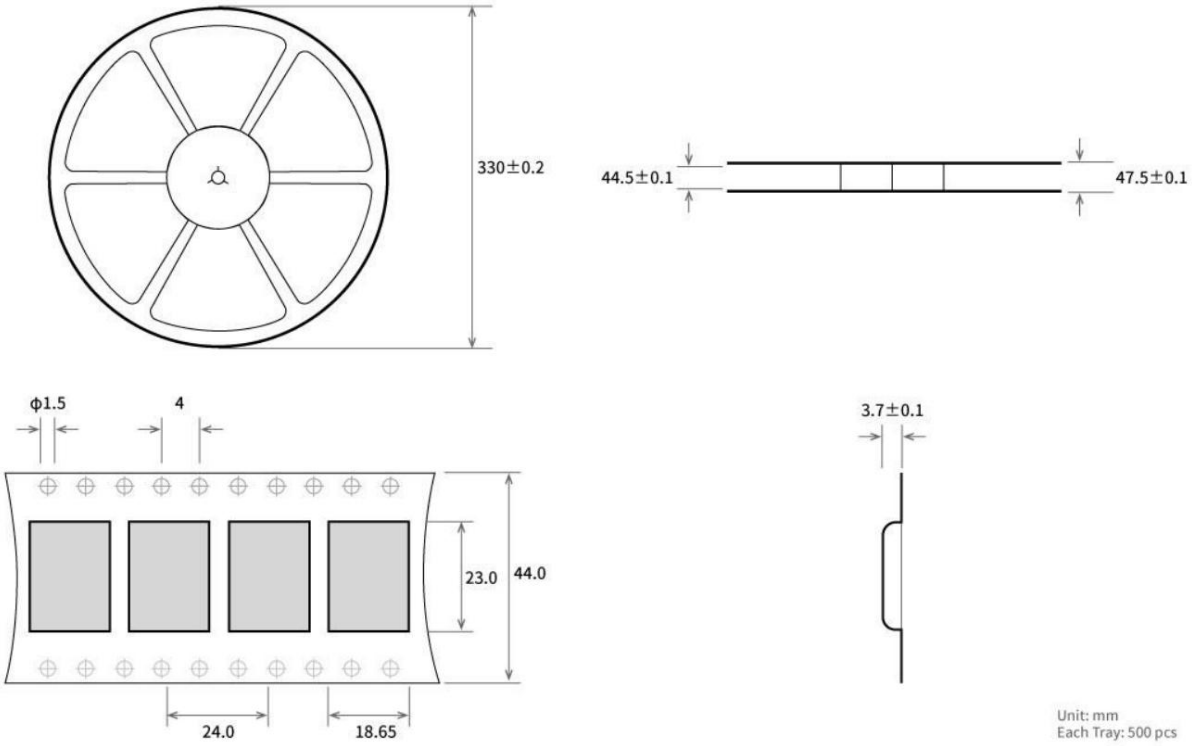
12.1 E105-BS21 Packaging



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12.2 E105-BS21X Packaging



Revision History

Version	Revision Date	Revision Notes	Maintainer
1.0	2024-8-8	Initial release	Hao
1.1	2024-11-18	Some instructions are modified	Hao
1.2	2024-11-28	Change the pin description	Hao
1.3	2026-2-11	Add the AT+SLESTART command	Hao

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