E611-868/915NW33S Product Manual

Star Topology Networking

High-Power Surface Mount

868/915MHz Wireless Module



Chengdu Ebyte Electronic Technology Co.,Ltd.

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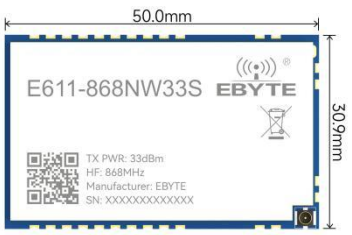
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Chapter 1：Overview

1.1 Introduction

E611-868/915NW33S module is a 2W high-power, long-range video and data transmission module developed by Chengdu EBYTE Electronics Technology Co., Ltd. Featuring a transmission rate of 16Mbps, it supports up to 4 channels of 1080p video transmission and can network with a maximum of 31 sub-nodes. It also enables simultaneous transparent transmission via both Ethernet and serial ports. Operating in the 850MHz to 930MHz frequency band, it delivers a maximum RF transmit power of 33dBm.

E611-868/915NW33 module utilizes universal AT commands for simple and efficient operation. It finds extensive application in smart wearable, home automation, home security, personal wellness, smart appliances, accessories and remote controls, automotive systems, lighting, industrial internet, intelligent data acquisition, and smart control systems.



E611-868NW33S



E611-915NW33S

1.2 Features and Functions

- Maximum transmit power 33 dBm (2 W)；
- Supports star-shaped networking with a maximum of 31 sub-nodes；
- Supports transmission speeds up to 16Mbps, capable of simultaneously transmitting up to four 1080p video streams；
- The module supports simultaneous transparent transmission over both Ethernet and serial ports；
- Supports integrated video and data transmission；
- Switching between master and slave modes is simple, enabling one-touch pairing for easy operation；
- Under ideal conditions, the maximum transmission distance can reach 2 km；
- Supports relay networking functionality；
- Equipped with AT commands for convenient module parameter configuration；

1.3 Application Scenarios

- Video Surveillance
- Home Security
- Smart Home Appliances
- Intelligent Control
- Wireless Flight Controller

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Chapter 2：Specifications and Parameters

2.1 Basic Parameters

Key Parameters		Performance Description			Note
		Min	Typical	Max	
Operating Voltage（V）		5	5/12	24	Supply voltage ≥12V ensures maximum wireless power output
Communication Level（V）		-	3.3	-	Using 5V levels carries the risk of burnout
Operating Temperature（℃）		-40	-	85	Industrial-grade design
Operating frequency band（MHz）		850	-	930	E611-868NW33S：863~873MHz E611-915NW33S：902~928MHz
Transmit Power（dBm）		31.0	33	33.5	-
Power Consumption	Launch current（mA）	550	1100	2000	Peak Transient Current 550mA @ 24V supply, 1100mA @ 12V supply, 2000mA @ 5V supply
	Receive current（mA）	50	85	180	50mA at 24V supply, 85mA at 12V supply, 180mA at 5V supply
Receive sensitivity（dBm）		-	-107	-	@1M MCS10
Communication range（m）		-	1500	2000	Clear open environment, antenna gain 5.0 dBi, antenna height 1 meter, @33 dBm, transmission rate 16 Mbps

2.2 Hardware Specifications

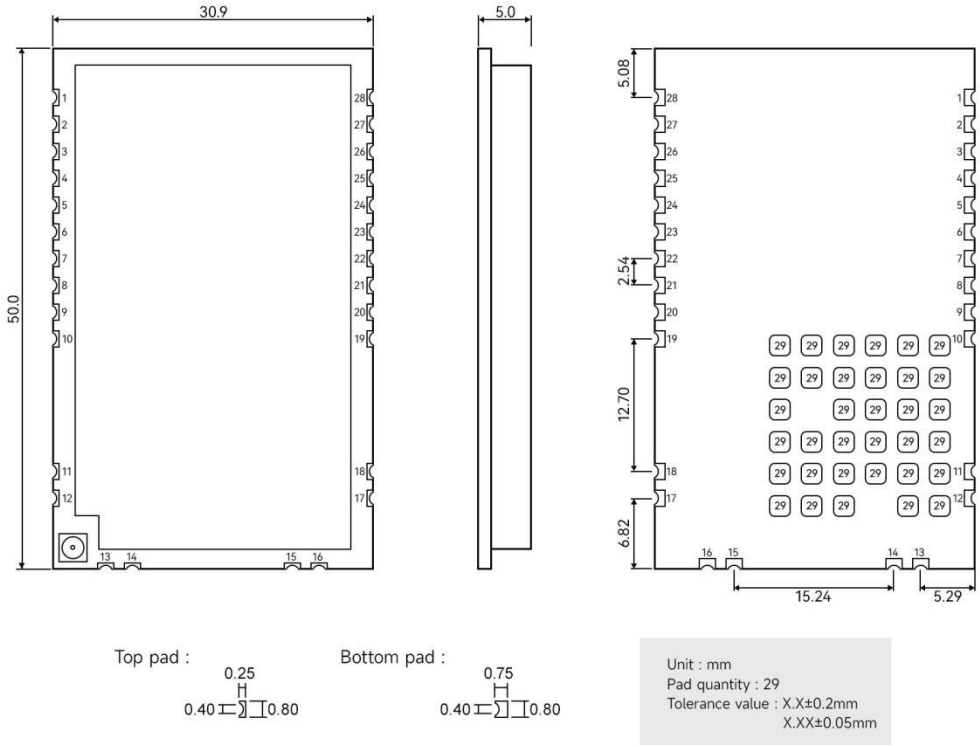
Key Parameters	Description	Note
Crystal oscillator frequency	32MHz	-
Communication Interface	UART/PHY	Serial port parameters (non-modifiable): baud rate 115200, frame format 8N1
Packaging method	SMD/Pin Hole	-
FLASH	8MB	-
SRAM	704KB	-
External Dimensions（IPEX）	50*30.9mm	Tolerance range ±0.2mm
Antenna Interface	IPEX/Pin Hole	Equivalent impedance approximately 50Ω
Product Net Weight	9.0g	Tolerance range ±0.2g

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Chapter 3：Mechanical Dimensions and Pin Definitions

3.1 E611-868/915NW33S Pin Definition



Pin Number	Name	Function	Note
1	GND	-	Power ground
2	TX+	I/0	Transceiver Data+(Send Data+)
3	TX-	I/0	Transceiver Data-(Send Data-)
4	RX+	I/0	Receive Data+(Receiving data+)
5	RX-	I/0	Receive Data-(Receiving data-)
6	GND	-	Power ground
7	VIN	-	Power input: 4.2V to 28V, recommended 5V or 12V
8	GND	-	Power ground
9	UART_RX	I/0	RXD is the receive pin, TTL level
10	UART_TX	I/0	TX is the transmit pin, TTL level
11	GND	-	Power ground
12	GND	-	Power ground
13	ANT	-	Antenna interface, equivalent impedance approximately 50 Ω
14	GND	-	Power ground
15	GND	-	Power ground
16	GND	-	Power ground

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17	GND	-	Power ground
18	GND	-	Power ground
19	DBUG_IO	I/0	RSSI Signal Strength Indicator I/O, Low Level Active
20	DBUG_CLK	I/0	RSSI Signal Strength Indicator I/O, Low Level Active
21	PA7	I/0	RSSI Signal Strength Indicator I/O, Low Level Active
22	PA6	I/0	Connection indicator I/O, low-level active
23	PA8	I/0	Mode selection controls I/O: High level indicates host mode, low level indicates slave mode
24	PA9	I/0	Internal pull-up modules, paired control I/O. Users may refer to the recommended schematic on the official website for design reference
25	PB1	I/0	-
26	+3.3V	-	Connect to the internal 3.3V supply; No load capacity; recommended to leave suspended
27	LED0	I/0	PHY Indicator
28	LED1	I/0	PHY Indicator

Note: RSSI signal strength indicators trigger sequentially, with the trigger sequence being：PA7→DebugCLK→DebugIO。

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Chapter 4：Module Parameter Specifications

4.1 Role Description

The module supports the following four operating modes：

NO	Working Mode	Mode Details
1	Host Mode ap	The central role in star-shaped networking
2	Supporting Role mode sta	Supporting Role
3	Multicast Mode group	Multicast, see the multicast command for details
4	Relay Mode apsta	Devices operating in relay mode function both as slaves connected to an upstream host and as hosts providing connection services to other slaves

Note: Host mode (AP) and slave mode (STA) can be controlled via pin PA8. For details, refer to the pin definition documentation.

Chapter 5：Usage Examples

The following demonstration will be conducted using our company's base plate.

5.1 Module 1-to-1 Connection Serial Port Transparent Transmission

1、Prepare two E611 modules and install the antennas.

2、Connect the type-c to a PC.

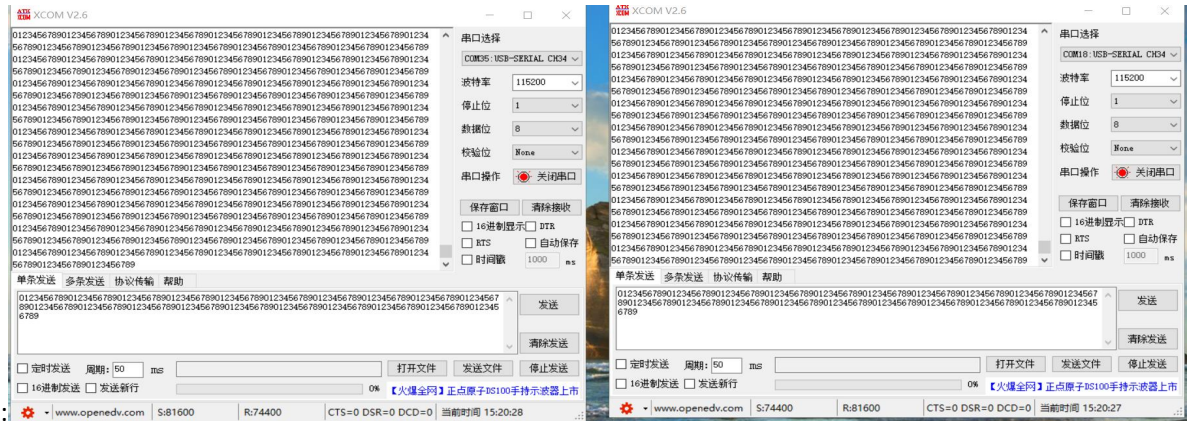
3、 Press and hold the CON button (PA9 pin) on both modules simultaneously. After waiting for 2 seconds, release the buttons. You will observe that the connection indicator light and the RSSI signal indicator light remain steadily illuminated.。

4、Open XCOM Serial Assistant and open the corresponding serial port (note the serial port parameters: 115200, 8N1).

5、The serial port can send data directly. As shown in the figure below:

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5.2 Module 1-to-1 Connection: Bridging Two PC

1、Prepare two E611 modules and install the antennas.

2、Ethernet connection to PC

3、After correct connection, power on the module. You will observe the phy0 indicator light remain steadily illuminated, and an unidentified network will appear in the computer's network interface.



Manually modify the corresponding static IP addresses on both PCs. Ensure that the IP addresses of both devices are within the same subnet and disable firewall software to prevent communication failures.

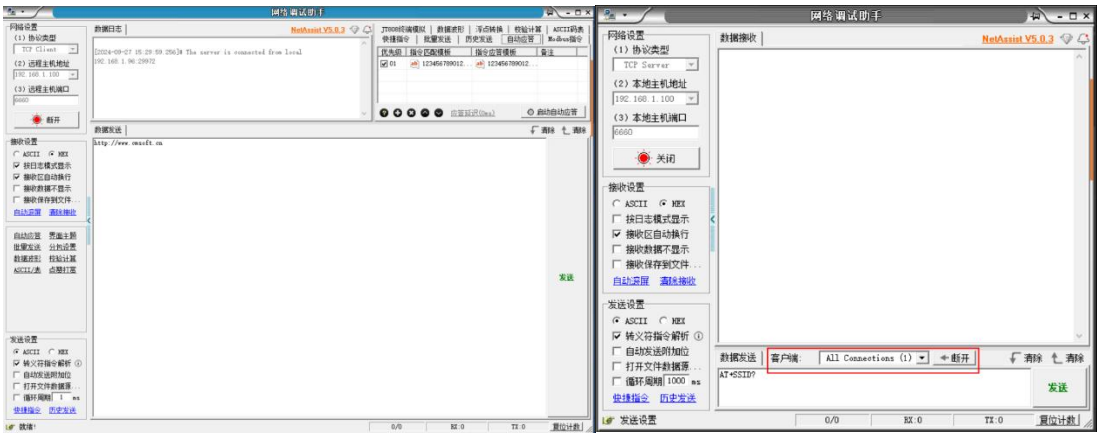
5、Using the network debugging assistant, start a TCP server on a PC as shown below. Note that the IP address corresponds to the modified Ethernet IP.



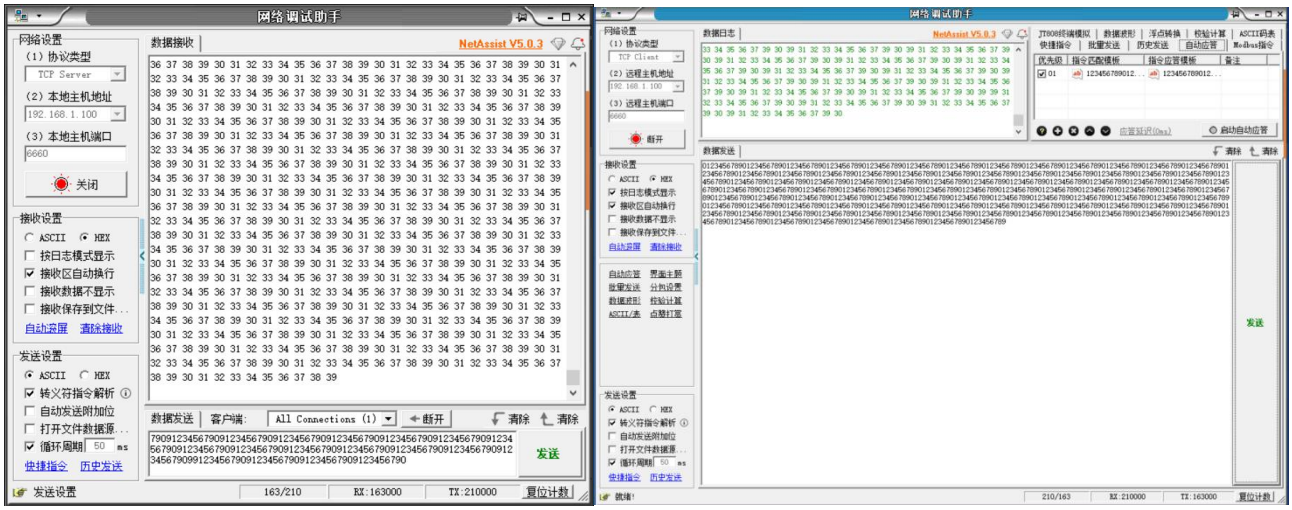
6、Another device connected to the corresponding IP port successfully established a connection.

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7、Data testing with 50ms packet intervals and 1000 bytes per packet. The following diagram shows the data between the server and client.

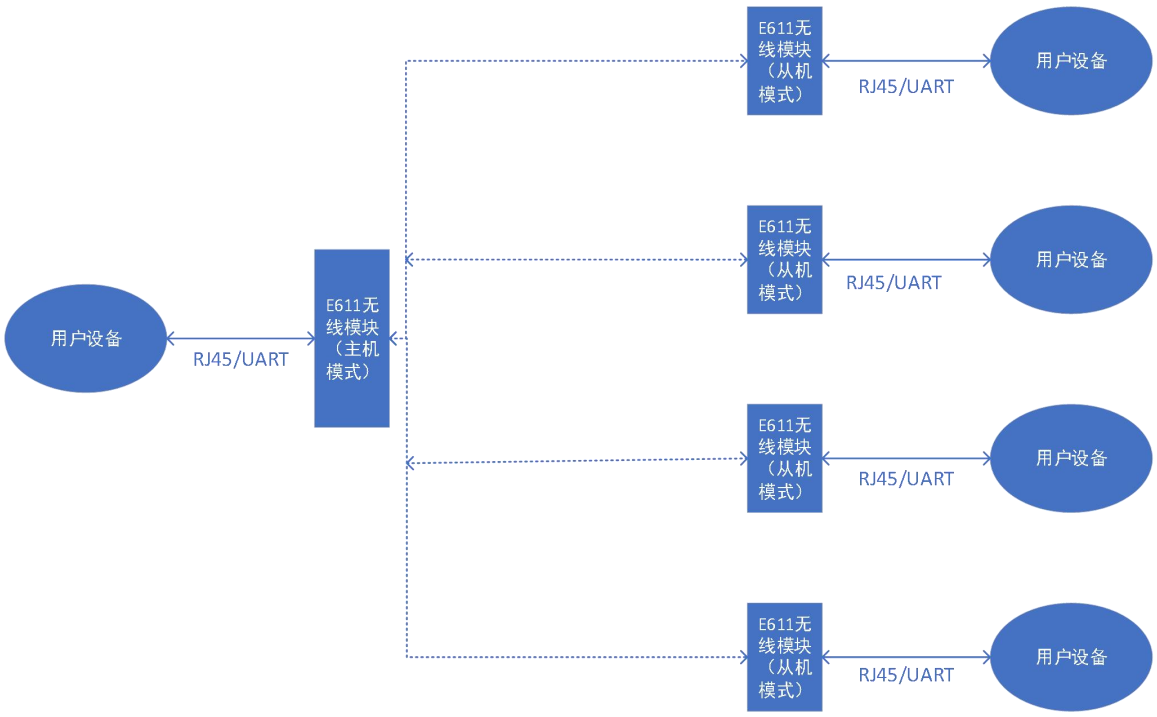


5.3 Module One-to-Many Star Topology

The network topology diagram is as follows:

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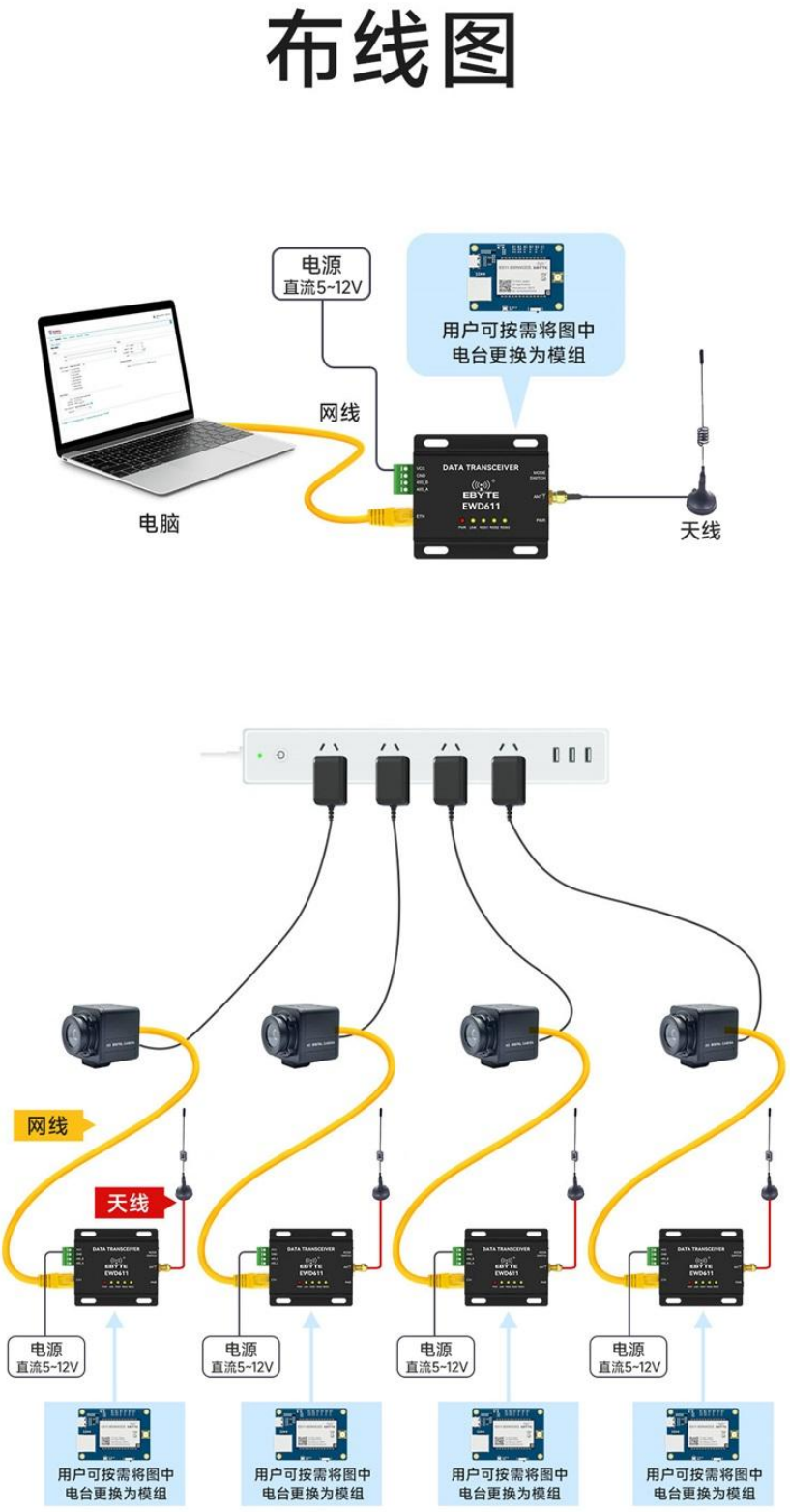


This product employs a star-shaped network topology, consisting of one host device and multiple slave nodes. A single host node can support up to eight slave devices. For a detailed network configuration demonstration, please refer to the official website video.

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5.3.1 Reference Wiring Diagram



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5.4 AT Command Usage Examples

5.4.1 Basic Commands for Establishing Connections in Modules

Use the AT commands to perform initial configuration settings for the E611 module, primarily including frequency point settings, bandwidth settings, SSID and password settings.

Host module configuration:
1） AT+CHAN_LIST=9080,9160,9240 Set three frequency points
2） AT+BSS_BW=8 Set 8M bandwidth
3） AT+SSID=hgic_ah_test Set SSID
4） AT+KEYMGMT=WPA-PSK Enable encryption
5） AT+PSK=baa58569a9edd7c3a55e446bc658ef76a7173d023d256786832474d737756a82 Set encryption password
6） AT+MODE=ap Set the module to host mode

Slave Module Configuration:
Except for AT+MODE=sta, all other configurations remain consistent with the host.

5.4.2 Configure Relay Network Instructions

Host module configuration:
1） Configure the SSID for each AP. Each AP should have a unique SSID. Consider using sequential names like SSID1, SSID2, etc. For example: at+ssid=ssid1
2） Configuration without encryption (for simplicity, this example uses no encryption)
at+keymgmt=none

Relay Module:
1） at+mode=apsta
2） Configuration is not encrypted
at+keymgmt=none
3） Configure the r_ssid for the repeater to connect to the host. It should match the SSID of the target host, for example: at+r_ssid=ssid1
4）Configure the SSID for the repeater to enable connection with the client device. For easier management, consider using the same prefix as the main host's SSID followed by a suffix, such as ssid1_r1, ssid1_r2, ssid2_r1, etc. For example: at+ssid=ssid1_r1

Slave Module Configuration:
1) Configure the SSID for the sta to enable connection between the slave and repeater. It should match the SSID of the connected repeater. For example: at+ssid=ssid1_r1
2) Configure as unencrypted: at+keymgmt=none

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Chapter 6：AT Commands

6.1 Command Description

Command Type	Command Format	Description
Query Command	AT+[X]?	This command is used to query the parameters of the configuration command.
Configuration Command	AT+[X]=<…>	This command is used to set user-defined parameters.
Execute command	AT+[X]	For commands without parameters, such as module reset.

6.2 Configuring the Module via the Network Port

6.2.1 Module Ethernet Cable Connection to PC



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6.2.2 Manually modify the IP address for the corresponding network to a static IP address.



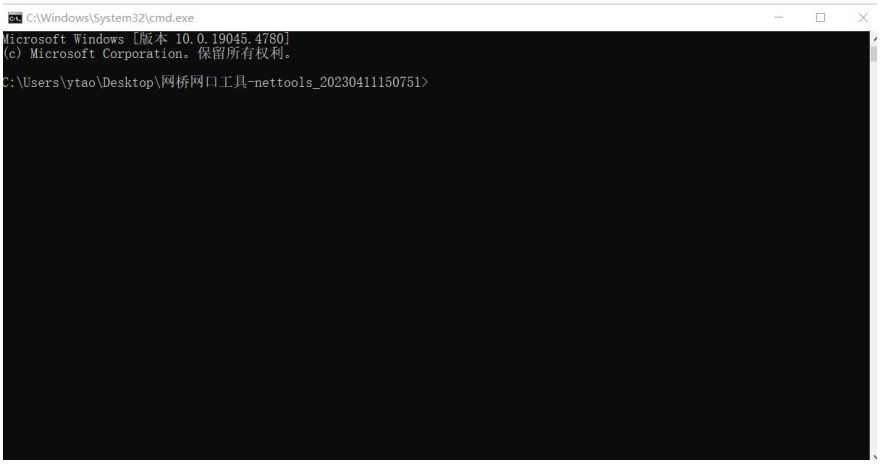
6.2.3 Open the Network Port Tools folder and enter CMD in the search bar.



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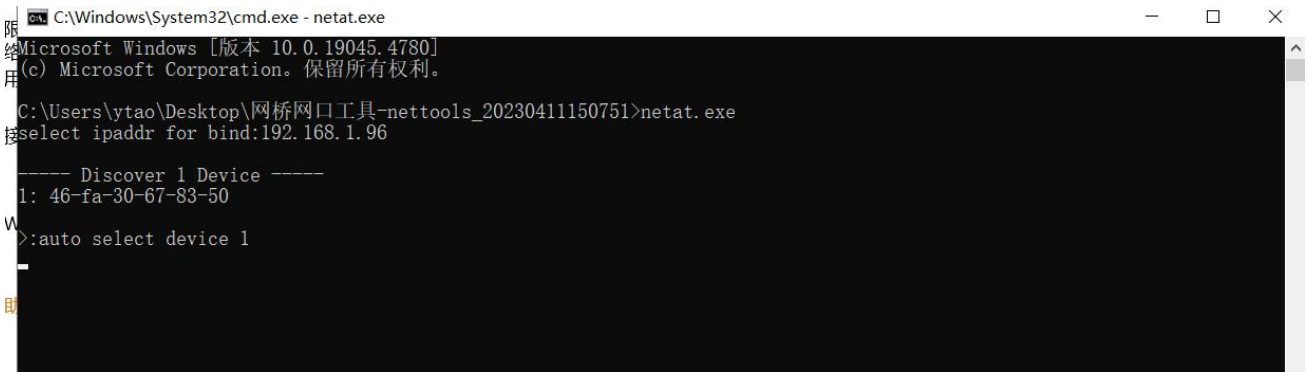
6.2.4 Press Enter to enter the command line interface



6.2.5 Type netat.exe and press Enter.



6.2.6 After entering the newly modified IP address, subsequent commands can be sent normally to configure the device.



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6.3 Command Reference

6.3.1 Operating Modes

Command	AT+MODE?	Response	+MODE:<mode> OK
Description	Read Module Operating Mode		
Parameter	<mode>:ap/sta/group/apsta 4 modes		
Command	**AT+MODE=<mode>**	**Response**	**Success：OK Fail：ERROR**
Description	Configurate Module Operating Mode		
Parameter	<MODE>:ap/sta/group/apsta 4 modes		
Example	AT+MODE=APSTA sets the module to operate in APSTA mode		
Explain	AT+MODE=<mode>The command only saves power-off settings for AT+MODE=APSTA.		

6.3.2 Set SSID

Command	AT+SSID?	Response	+SSID:<ssid> OK
Description	Read the SSID in module host mode		
Parameter	<ssid>: SSID name under the host		
Command	AT+SSID=<ssid>	**Response**	**Success：OK Fail：ERROR**
Description	Set the SSID name in module host mode		
Parameter	<ssid>: Character type with a length less than 32 characters		
Example	AT+SSID=ebyte_test		

6.3.3 Set Encryption Method

Command	AT+KEYMGMT?	Response	+KEYMGMT:<enc> OK
Description	Reading Module Encryption Method		
Parameter	<enc>: WPA-PSK enabled encryption / NONE disabled encryption		
Command	AT+KEYMGMT=<enc>	**Response**	**Success：OK Fail：ERROR**
Description	Set Module Encryption Method		
Parameter	: WPA-PSK enabled encryption / NONE disabled encryption		
Example	AT+KEYMGMT=WPA-PSK		

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6.3.4 Set encryption password

Command	AT+PSK?	Response	+PSK:<psk> OK
Description	Read Module Encryption Password		
Parameter	<psk>: 64 hex characters		
Command	AT+PSK=<psk>	Response	Success：OK Fail：ERROR
Description	Set Module Encryption Password		
Parameter	<MODE>: 64 hex characters		
Example	AT+PSK=baa58569a9edd7c3a55e446bc6 58ef76a7173d023d256786832474d7377 56a82		

6.3.5 Pairing Control

Command	AT+PAIR=<pair>	Response	OK
Description	When the SSID is not set, this command enables quick pairing for network setup. To initiate pairing: 1. The AP has configured the SSID and password, but the STA has not: During the pairing process, the STA will obtain the AP's SSID and password. 2. Neither the AP nor the STA has an SSID or password configured: During the pairing process, the AP generates a random password for each STA. After successful pairing, a PAIR SUCCESS message will be generated, but pairing will not automatically exit. You must execute AT+PAIR=0 to stop pairing. The connection will be established automatically after pairing stops. If both the AP and STA have SSID and other parameters configured, there is no need to initiate PAIR; they will automatically connect based on SSID and other parameters.		
Parameter	<psk>:0/1		
Example	AT+PAIR=1 //Start pairing AT+PAIR=0 //Stop pairing		

6.3.6 Set BSS Bandwidth

Command	AT+BSS_BW?	Response	+BSS_BW:<bw> OK
Description	Read module BSS bandwidth		
Parameter	<bw>: 1:1MHz 2:2MHz		

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	4:4MHz 8:8MHz		
Command	**AT+BSS_BW=<bw>**	**Response**	**Success：OK** **Fail：ERROR**
Description	Set module BSS bandwidth		
Parameter	<bw>: 1:1MHz 2:2MHz 4:4MHz 8:8MHz		
Example	AT+BSS_BW=4 Set the bandwidth to 4MHz		

6.3.7 Set the operating frequency range

Command	**AT+FREQ_RANGE?**	**Response**	**+ FREQ_RANGE:<start>-<end>** **OK**
Description	Read the operating frequency range		
Parameter	<start>:Starting frequency point <end>:Cut-off frequency		
Command	**AT+FREQ_RANGE=<start>,<end>**	**Response**	**Success：OK** **Fail：ERROR**
Description	Set the operating frequency range		
Parameter	1. This command is used to set the frequency range for continuous operation, specifying the start center frequency and end center frequency. The AH module will automatically generate the frequency list. 2. The values of start and end are the center frequency multiplied by 10.		
Description	AT+FREQ_RANGE=9080,9240 Settings start freq=908MHz end freq=924MHz The generated channel list consists of 908M, 916M, and 924M. Note: 1. If both AT+CHAN_LIST and the parameter are set, the CHAN_LIST setting takes precedence. 2. It is recommended that the E611-868NW33S be configured within the 863–873 MHz range, and the E611-915NW33S within the 902–928 MHz range.		

6.3.8 Set the list of operating frequencies

Command	**AT+CHAN_LIST?**	**Response**	**+AT+CHAN_LIST:<freq1>,<freq2>,…<freq16>** **OK**

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Description	Read operating frequency point		
Parameter	1. The specified frequency value is the center frequency multiplied by 10. 2. Supports up to 16 frequency points, separated by commas.		
Command	**AT+CHAN_LIST=<freq1>,<freq2>,…,<freq16>**	**Response**	**Success：OK** **Fail：ERROR**
Description	Set the operating frequency		
Parameter	1. This command is used to set a list of non-contiguous frequencies.。 2. The specified frequency value is the center frequency multiplied by 10 (meaning the minimum unit or step size is 1 MHz). 3. Supports up to 16 frequency points, separated by commas.		
Example	AT+CHAN_LIST=9080,9240 sets two frequency points: 908 MHz and 924 MHz.		

6.3.9 Check device signal quality

Command	**AT+RSSI?**	**Response**	**+RSSI:<rssi>** **OK**
Description	Query device RSSI value		
Parameter	AT+RSSI=index/mac_addr index：Specify the device index for the query, starting from 1. mac_addr：Specify the MAC address of the device to query.		
Example	AT+RSSI //If no parameters are specified, query the RSSI of the first device. AT+RSSI=1 //Query the RSSI of the first device. AT+RSSI=f4:de:09:68:6c:20 //Specify RSSI lookup based on MAC address.		

6.3.10 Check connection status

Command	**AT+CONN_STATE**	**Response**	**+CONNECTED //Connected** **+DISCONNECT //Disconnected**
Description	Check connection status		
Parameter			
Example	AT+CONN_STATE		

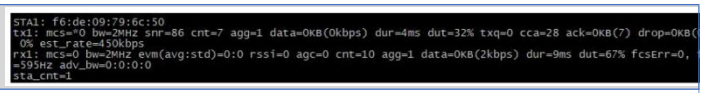
6.3.11 View device parameter information

Command	**AT+WNBCFG**	**Response**	
Description	View device parameter information		
Parameter			
Example	AT+WNBCFG		

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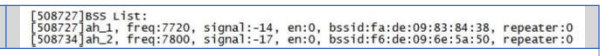
6.3.12 View STA information

Command	AT+STA_INFO=<id>	Response	
Description	View the sta information for the corresponding ID		
Parameter			
Example	View LMAC statistics for the STA corresponding to the specified ID, including RSSI, EVM, and other information. AP can use this command, but STA do not use this command. The ID is the serial number of the STA, starting from 1. When using this command, you can first disable the default LMAC printing: AT+SYSDBG=LMAC.		

6.3.13 Scan nearby AP information

Command	AT+SCAN_AP=2	Response	OK
Description	Scan nearby AP information		
Parameter			
Example	Execute this command in STA mode to scan for surrounding AP information. After scanning, use the BSSLIST command below to query the results.		

6.3.14 Retrieve the scanned AP list

Command	AT+BSSLIST=2	Response	
Description	Retrieve information about nearby access points		
Parameter			
Example	After executing the `scan_ap` command, you can use this command to obtain a list of scanned access points (AP must have an SSID configured to be detected).		

6.3.15 Set Maximum Transmit Power

Command	AT+TXPOWER?	Response	+TXPOWER:<pwr>dbm OK
Description	Query Maximum Transmit Power		
Parameter	<pwr>: Maximum output power		
Command	**AT+TXPOWER=<pwr>**	**Response**	**Success：OK** **Fail：ERROR**
Description	Set Maximum Transmit Power		
Parameter	<pwr>: Maximum transmit power, range 6 – 20		
Example	AT+TXPOWER=20		

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6.3.16 Set ACK TIMEOUT Duration

Command	**AT+ACKTMO?**	**Response**	**+ACKTMO:<time> OK**
Description	Query the ACK timeout duration in the WiFi protocol		
Parameter	<time>:Timeout		
Command	**AT+ACKTMO=<time>**	**Response**	**Success：OK Fail：ERROR**
Description	Set the ACK timeout period for the WiFi protocol type		
Parameter	<time>:Timeout Configure the WiFi protocol parameter acktimeout value for the AH module. The unit is microseconds, with a default value of 0. This parameter only needs to be set when communication exceeds 1 km. The calculation formula is 10 * (distance in kilometers - 1). For example, for 2 km, set ackmo=10. Modified values are retained after power loss.		
Example	AT+ACKTMO=100 Increase the ACK packet timeout by 100 microseconds.		

6.3.17 Set TX MCS

Command	**AT+TX_MCS?**	**Response**	**+TX_MCS:<mcs> OK**
Description	Query module MCS value		
Parameter	<mcs>:MCS index value		
Command	**AT+TX_MCS=<mcs>**	**Response**	**Success：OK Fail：ERROR**
Description	Set the index value for module MCS		
Parameter	Set TX MCS. A value between 0 and 7, or 10 in 1M mode, indicates a fixed MCS setting; other values enable automatic MCS adjustment. This command is power-fail-safe.		
Example	AT+TX_MCS=2		

6.3.18 Set heartbeat packet interval

Command	**AT+HEART_INT?**	**Response**	**+HEART_INT:<time> OK**
Description	Query heartbeat packet interval		
Parameter	<time>:Heartbeat interval (in milliseconds)		
Command	**AT+HEART_INT=<time>**	**Response**	**Success：OK Fail：ERROR**
Description	Set Heartbeat Interval		
Parameter	Set the heartbeat packet interval in milliseconds (mS), with a minimum value of 500. The larger the number of STA, the greater the recommended heartbeat interval. The		

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	approximate optimal heartbeat packet length is STA_count * 500. Earlier software versions required matching heartbeat packet intervals between AP and STA to prevent connection issues. This setting persists after power loss. Starting from V1.6.2, configuring the AP's heartbeat interval suffices—the AP automatically synchronizes it with STA. This command is now obsolete for STA.
Example	AT+HEART_INT=2000 Set the heartbeat packet interval to 2 seconds.

6.3.19 Unpair the specified sta

Command	**AT+UNPAIR?**	**Response**	**No Response**
Description			
Parameter			
Command	**AT+UNPAIR=<mac_addr>**	**Response**	**Success：unpair sta:mac_addr Fail：sta:mac_addr is not exist**
Description	Unpair the specified sta		
Parameter	<mac_addr>: The other party's MAC address		
Example	at+unpair=f6:de:09:75:a3:61		

6.3.20 Restore Factory Settings

Command	**AT+LOADDEF=1**	**Response**	
Description	Restore factory settings		
Parameter			
Example	AT+LOADDEF=1		

6.3.21 Set print information

Command	**AT+SYSDBG=<type>,<vale>**	**Response**	**Success：OK**
Description	Configure printing debug information		
Parameter	<type>: LMAC/WNB <vale>: 0 Off / 1 On LMAC Statistics are enabled by default and are quite extensive; they can be disabled if needed. WNB statistics are disabled by default.		
Example	AT+SYSDBG=LMAC,0 Disable LMAC printing		

6.3.22 Set the serial port baud rate

Command	**AT+BAUDRATE?** **(Not supported temporarily)**	**Response**	**<value>**
Description	Query the baud rate of the serial port		

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Parameter	<value> ： Baud rate value		
Command	**AT+BAUDRATE=<value>** **(Not supported temporarily)**	**Response**	**Success：OK**
Description	Set the serial port baud rate		
Parameter	<value>:Serial Port Baud Rate Range: 9600-400k		
Example	AT+BAUDRATE=115200		
Note	This product does not support port rate modification. The port rate is fixed at 115200, Frame format 8N1		

6.3.23 Join multicast network

Command	**AT+JOINGROUP=<group_addr>,<aid>**	**Response**	**Success：OK** **Fail：ERROR**
Description	Add the configuration module to multicast. After setting the WiFi module's operating mode to group, use this command to configure the WiFi module to join a multicast network. Once joined, the WiFi module will only receive data within that multicast network. All data communication occurs via multicast addresses. If the operating mode is set to group but the module is not joined to a multicast network, all data communication will be transmitted and received in broadcast mode. Note: The JOINGROUP command can only be configured after setting the mode to GROUP.		
Parameter	AT+JOINGROUP=group_addr,AIDgroup_addr: The address of the multicast network to join. AID： The AID of this device in multicast networks, valid AID range: 1 to N (where N is the maximum number of STAs supported by the firmware). The AID of each device in the network must remain unique. Set Valid AID: The WiFi module will periodically send heartbeat signals over the multicast network to announce its presence to other WiFi modules. Invalid AID setting: The WiFi module will not send heartbeat signals and will not notify other WiFi modules. If all devices are configured with an AID of 0, they can operate without being constrained by the maximum STA supported by the firmware.		
Example	AT+JOINGROUP=11:22:33:44:55:66,3 Join multicast address: 11:22:33:44:55:66 AID set to 3		

6.3.24 Set intermediate SSID

Command	**AT+R_SSID?**	**Response**	**+R_SSID:<repeater_ssid>** **OK**
Description	Query the SSID of the upper-level AP connected in relay mode		
Parameter	<value> ： SSID of the parent AP		
Command	**AT+R_SSID=<repeater_ssid>**	**Response**	**Success：OK**

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			Fail：ERROR
Description	Configure the SSID for the intermediate connection to the parent AP.		
Parameter	<repeater_ssid>:ssid		
Example	AT+R_SSID=ebyte_test		

6.3.25 Set the encryption password for the relay

Command	**AT+R_PSK?**	**Respons e**	**+R_PSK:<psk>** **OK**
Descriptio n	Encryption password for connecting to the upper-level AP in query relay mode		
Parameter	<psk> ： Encryption password for the upper-level AP		
Command	**AT+R_PSK=<psk>**	**Respons e**	**Success：OK** **Fail：ERROR**
Descriptio n	Configure the intermediate access point to connect to the upper-level AP using PSK		
Parameter	<psk>:The encryption password must be 64 hex characters.		
Example	AT+R_PSK=baa58569a9edd7c3a55e446bc658ef76a7173d023d256786832474d737756a82		

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Chapter 7: Hardware Design

- It is recommended to power this module using a DC regulated power supply with the lowest possible ripple coefficient. The module must be reliably grounded.
- Please ensure the correct connection of the power supply's positive and negative terminals. Reverse polarity may cause permanent damage to the module.
- Check the power supply to ensure it falls within the recommended voltage range. Exceeding the maximum voltage may cause permanent damage to the module.
- Please check the power supply stability; voltage should not fluctuate significantly or frequently.
- When designing power supply circuits for modules, it is often recommended to maintain a margin of at least 30% to ensure the entire system operates stably over the long term.
- Modules should be placed as far as possible from power supplies, transformers, high-frequency wiring, and other components with significant electromagnetic interference.
- High-frequency digital traces, high-frequency analog traces, and power traces must avoid routing beneath modules. If routing beneath a module is unavoidable—assuming the module is soldered to the Top Layer—a ground plane must be placed on the Top Layer at the module contact area (covering the entire area and properly grounded). This ground plane must be positioned close to the module's digital section, with traces routed on the Bottom Layer.
- Assuming the module is soldered or placed on the Top Layer, routing traces arbitrarily on the Bottom Layer or other layers is also incorrect. This will adversely affect the module's spurious emissions and reception sensitivity to varying degrees.
- The presence of components generating significant electromagnetic interference near the module can also severely impact its performance. Depending on the intensity of the interference, it is recommended to position such components at an appropriate distance from the module. Where feasible, implement suitable isolation and shielding measures.
- If wiring with significant electromagnetic interference (high-frequency digital, high-frequency analog, power lines) is routed near the module, it will severely impact the module's performance. Depending on the interference intensity, it is recommended to position such wiring appropriately away from the module. Where feasible, implement suitable isolation and shielding measures.
- Avoid TTL protocols operating at 2.4GHz in the physical layer, such as USB 3.0.
- The antenna installation structure significantly impacts module performance. Ensure the antenna remains exposed and ideally oriented vertically upward. When installing the module inside an enclosure, use a high-quality antenna extension cable to extend the antenna outside the enclosure.
- The antenna must not be installed inside a metal enclosure, as this will significantly reduce transmission range.

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Chapter 8: Frequently Asked Questions

8.1 Transmission distance is not ideal

- Communication distance will decrease when there are direct line-of-sight obstructions;
- Temperature, humidity, and co-channel interference can increase packet loss rates;
- Ground absorption and reflection of radio waves result in poor testing performance near the ground;
- Seawater strongly absorbs radio waves, leading to poor testing results near the coast;
- Metal objects near the antenna or housing it in a metal enclosure cause severe signal attenuation;
- Incorrect power register settings or excessively high air interface rate (higher rates reduce communication distance);
- Power supply voltage below recommended levels at room temperature reduces transmit power;
- Using antennas poorly matched to the module or of inferior quality.

8.2 Modules are prone to damage

- Check the power supply to ensure it falls within the recommended voltage range. Exceeding the maximum voltage may cause permanent damage to the module.
- Verify power supply stability—voltage must not fluctuate significantly or frequently;
- Ensure anti-static precautions during installation and operation—high-frequency components are sensitive to static electricity;
- Maintain appropriate humidity levels during installation and operation—certain components are moisture-sensitive;
- Avoid operating in excessively high or low temperatures unless specifically required.

8.3 Bit error rate is excessively high.

- Interference from nearby signals operating on the same frequency may occur. Move away from the interference source or modify the frequency/channel to avoid interference.
- Poor power supply can also cause garbled data. Ensure the power supply is reliable.
- Low-quality or excessively long extension cables or feed lines can also lead to high error rates.

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Chapter 9: Welding Operation Guide

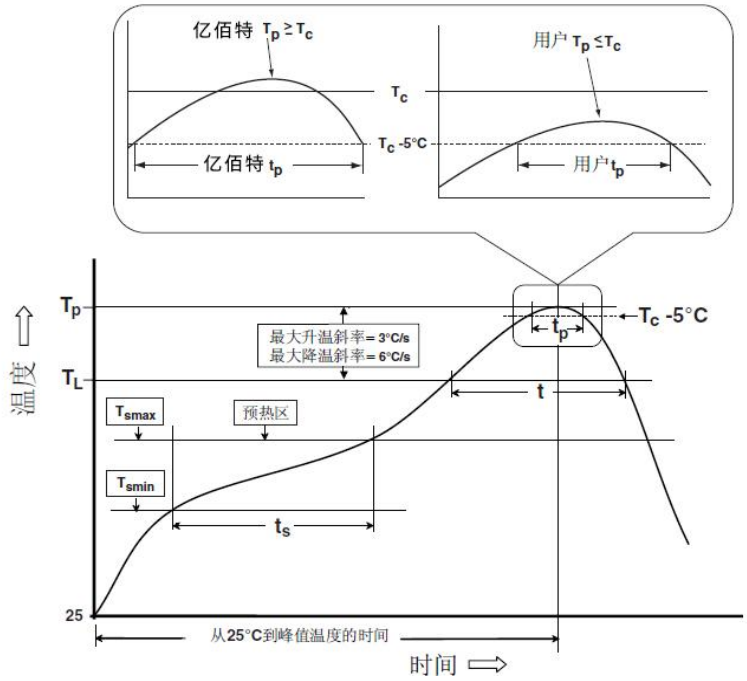
9.1 Reflow Soldering Temperature

Reflow Soldering Profile Characteristics		Lead-based assembly process	Lead-Free Assembly Process
Preheat/Keep Warm	Lowest temperature（Tsmin）	100℃	150℃
	Maximum temperature（Tsmax）	150℃	200℃
	Time（Tsmin~Tsmin）	60-120 seconds	60-120 seconds
Temperature rise slope（TL~Tp）		3°C/s, maximum value	3°C/s, maximum value
Liquid phase temperature（TL）		183℃	217℃
TL dwell time		60~90 seconds	60~90 seconds
Peak Temperature of the PackageTp		Users must not exceed the temperature indicated on the product's “Moisture Sensitivity” label.	Users must not exceed the temperature indicated on the product's moisture sensitivity label.
Within the specified classification temperature (Tc) and time (Tp) of 5°C, see the figure below		20 seconds	30seconds
Temperature drop rate（Tp~TL）		6°C/s, maximum value	6°C/s, maximum value
Time from room temperature to peak temperature		6 minutes, maximum	8 minutes, maximum
※The tolerance for the peak temperature (Tp) of the temperature curve is defined as the user's upper limit.			

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9.2 Reflow Soldering Profile Chart



Chapter 10: Related Models

Product Model	Frequency Hz	Power dBm	Test Distance km	Air Rate bps	Package Type	Size mm	Antenna
E611-900NW20S	868/915M	20	1.0	16M	SMD	40 * 29	IPEX/Stamp Hole
E611-900NW20D	868/915M	20	1.0	16M	SPI	35 * 35	IPEX

Chapter 11: Packaging Methods

Revision History

Version	Revision Date	Revision Notes	Maintainer
1.0	2026-1-19	Initial version	Ning
1.1	2026-6-18	Modified the description of the configuration mode instructions	Lan
1.2	2026-7-1	Modify pin definitions	Lan

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