EWM201-xxxAxxS User Manual

470MHz/900MHz 20dBm/30dBm Wireless Voice Intercom Module



Chengdu Ebyte Electronic Technology Co.,Ltd.

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1 Introduction

1.1 Brief Introduction

The EWM201-xxxAxxS series products are brand-new long-range wireless audio transmission modules launched by Chengdu EBYTE Technology. They feature flexible configuration, convenient use, and compact size. Users can configure various parameters such as transmission power, operating channel, and serial port speed according to actual needs through commands.

The EWM201-xxxAxxS series operates based on a time-division duplex (TDD) mechanism, utilizing precise time slot control and scheduling to enable half-duplex or full-duplex wireless voice communication. It also supports unicast, multicast, and broadcast intercom functions. All models support MIC input and speaker output. The module supports point-to-point, point-to-multipoint half-duplex mode, or full-duplex mode. Simply connect an external MIC, voice amplifier, speaker, antenna, and power supply to form a full-duplex intercom system.

The following four modules are standard models, with typical transmit power of 20/30 dBm, operating in the 470 MHz to 510 MHz frequency band and the 863 MHz to 928 MHz frequency band.

1.2 Features

- Domestic chip solution, utilizing domestic narrowband IoT transmission technology;
- Parameter settings via AT commands, such as switching between half-duplex and full-duplex voice communication;
- Under ideal conditions, battery-powered operation can achieve a communication range of no less than 3.5 km/5 km (tested in open environments);
- Wide data rate range, utilizing full software-based voice compression technology;
- Cost-effective and flexible application;
- Supports unicast, multicast, and broadcast intercom functions;
- Supports power output of 20dBm/30dBm;
- Industrial-grade standard design, supporting long-term use at temperatures ranging from -40° C to +85° C;
- Dual antenna options (IPEX/pinhole), facilitating user-defined secondary development and integration.

1.3 Application

- Digital intercom;
- Building intercom system;
- Command and control system;
- Wireless alarm security system;
- Wireless audio transmission;
- Intelligent voice system;
- Security alarm system.

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2 Specification and parameter

2.1 RF parameters

RF parameters	Parameter		Notice
	EWM201-470A20S EWM201-470A30S	**EWM201-900A20S EWM201-900A30S**	**Notice**
Operating frequency band	470MHz～510MHz	863MHz～928MHz	Frequency band configurable
Airspeed	Full duplex: ≤29.8 kbps Half duplex: ≤14.9 kbps		-
Receiver sensitivity	Full duplex: -121dBm Half duplex: -124dBm		Full duplex: 29.8 kbps Half duplex: 14.9 kbps
Modulation method	DPFSK		Modulation technology
Radio frequency interface	IPEX/Stamp hole		Equivalent impedance approximately 50Ω

2.2 Electrical parameters

Key parameters	**Performance**						Notice
	EWM201-470A20S EWM201-900A20S			**EWM201-470A30S EWM201-900A30S**			
	Minimum value	**Typical value**	**Maximum value**	**Minimum value**	**Typical value**	**Maximum value**	
Working voltage (V)	2.7	3.3	3.6	2.7	3.7	5.5	≥3.3V/3.7V ensures output power; exceeding 3.6V/5.5V poses a risk of burnout.
Transmit power (dBm)	18	20	21	26	30	32	Software adjustable, error ±1dBm
Operating temperature (℃)	-40	-	+85	-40	-	+85	Industrial-grade design
Working humidity (%)	10	-	90	10	-	90	-
Transmit current (mA)	91	94	95	365	680	910	Instantaneous power consumption
Receive current (mA)	28	30	32	28	31	32	

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2.3 Audio parameters

Project	Specification
Encoding algorithm	OPUS
Voice coding rate	10kbps
Audio sampling rate	8 kHz, 16 bits
Audio input	0~708mV
Audio Output	14 mW/differential output 32 Ω load
Intercom mode	Half-duplex/full-duplex

2.4 Hardware Parameters

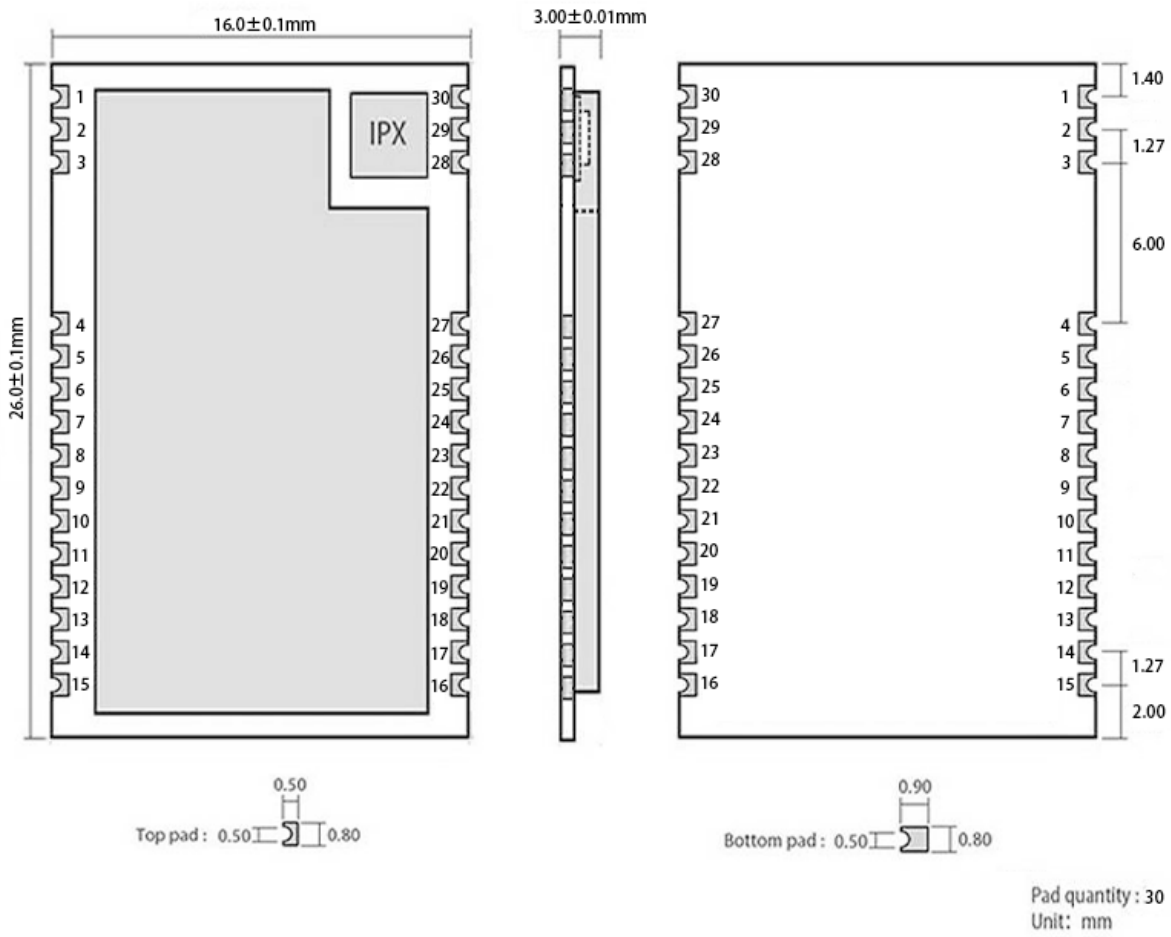
Hardware parameters	Parameter		Notice
	EWM201-470A20S EWM201-900A20S	EWM201-470A30S EWM201-900A30S	
Packaging method	SMD		-
Interface method	Stamp perforation (1.27 mm spacing)	Stamp perforation (2.00 mm spacing)	-
Communication interface	UART		Supports AT commands
Serial port configuration	921600bps 8N1		-
External dimensions	16 * 26 mm	26.5 * 33 mm	-
Product net weight	2.0	4.3	±0.1

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3 Mechanical dimensions and pin definitions

3.1 EWM201-470A20S & EWM201-900A20S Mechanical Dimensions and Pin Definitions



EWM201-470A20S&EWM201-900A20S			
Pin Number	**Pin Name**	**Pin Direction**	**Pin Function**
1	GND	GND	Module ground wire
2	GND	GND	Module ground wire
3	GND	GND	Module ground wire
4	TXEN	Output	Send command signal, high active
5	RXEN	Output	Receive command signal, high active
6	NC	-	Empty foot (not open for use, users do not need to be concerned)
7	NC	-	Empty foot (not open for use, users do not need to be concerned)
8	NC	-	Empty foot (not open for use, users do not need to be concerned)

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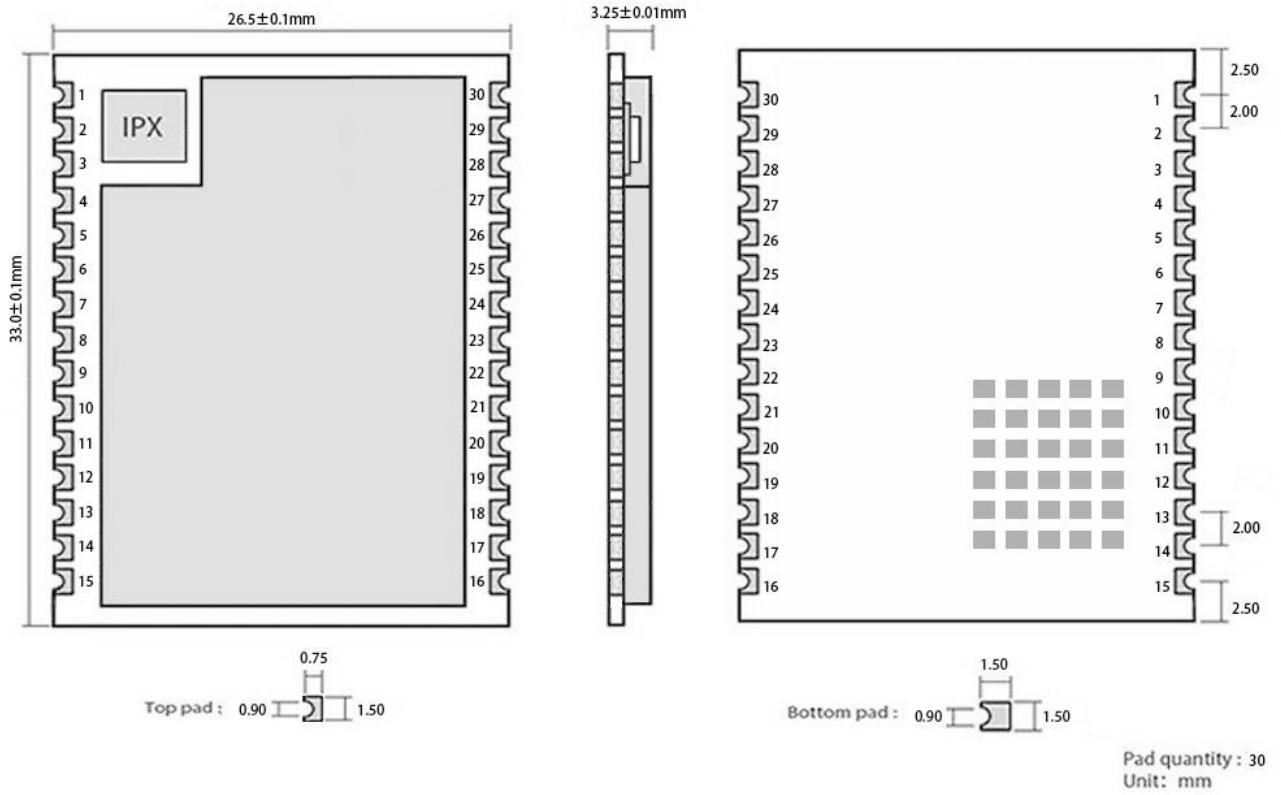
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9	V -	Input	Volume - Button (Low Level Trigger)
10	V +	Input	Volume + button (low level trigger)
11	PTT	Input	PTT voice intercom button (low level trigger, trigger once, switch status once)
12	VCC	3V3	Power supply
13	PG	GND	Module ground wire
14	NC	-	Empty foot (not open for use, users do not need to be concerned)
15	PG	GND	Module ground wire
16	PG	GND	Module ground wire
17	RST	Input	Reset signal interface
18	VDDAC	Output	MIC power pin, dedicated power output,2.9V
19	MICIN	Input	Microphone input jack
20	AG	AGND	Analog signal ground, external MIC input connected to this ground
21	SKP_P	Output	Speaker differential signal P terminal
22	SKP_N	Output	Speaker differential signal N terminal
23	AG	AGND	Analog signal ground
24	RXD	RXD	Configure serial port RXD
25	TXD	TXD	Configure serial port TXD
26	MUTE	Input	Silent button (low level trigger)
27	UPDATE	Input	Firmware Download Pin
28	GND	GND	Module ground wire
29	ANT	RFIO	RF antenna interface
30	GND	GND	Module ground wire

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3.2 EWM201-470A30S & EWM201-900A30S Mechanical Dimensions and Pin Definitions



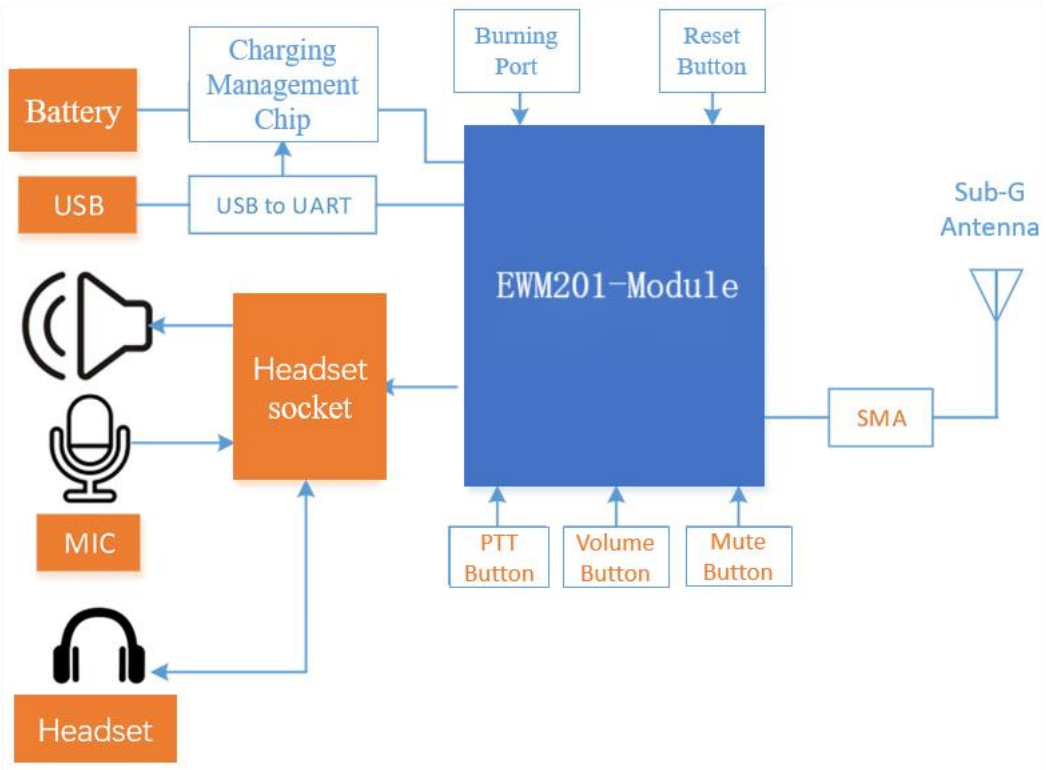
EWM201-470A30S&EWM201-900A30S			
Pin Number	**Pin Name**	**Pin Direction**	**Pin Function**
1	PG	GND	Module ground wire
2	ANT	RFIO	RF antenna interface
3	PG	GND	Module ground wire
4	RXEN	Output	Receive command signal, high active
5	TXEN	Output	Send command signal, high active
6	NC	-	Empty foot (not open for use, users do not need to be concerned)
7	NC	-	Empty foot (not open for use, users do not need to be concerned)
8	NC	-	Empty foot (not open for use, users do not need to be concerned)
9	PG	GND	Module ground wire
10	PTT	Input	PTT voice intercom button (low level trigger)
11	V+	Input	Volume + button (low level trigger)
12	V-	Input	Volume - Button (Low Level Trigger)
13	PG	GND	Module ground wire
14	5V	VCC	Modular power supply interface
15	PG	GND	Module ground wire
16	PG	GND	Module ground wire

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17	RESET	Input	Reset signal interface
18	PG	GND	Module ground wire
19	VDDAC	Output	MIC power pin, dedicated power output,2.9V
20	AG	AGND	Analog signal ground, external MIC input connected to this ground
21	MICIN	Input	Microphone input jack
22	AG	AGND	Analog signal ground
23	SPK_P	Output	Speaker differential signal P terminal
24	SPK_N	Output	Speaker differential signal N terminal
25	RXD	RXD	Configure serial port RXD
26	TXD	TXD	Configure serial port TXD
27	UPDATE	Input	Firmware Download Pin
28	MUTE	Input	Silent button (low level trigger)
29	NC	-	Empty foot (not open for use, users do not need to be concerned)
30	PG	GND	Module ground wire

4 Application diagram



Note: For recommended circuit diagrams, please refer to the attached document “EWM201-xxxAxxS Recommended Schematic Diagram.”

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5 Communication configuration

The serial port baud rate is 921,600 bps, with 8 data bits, 1 stop bit, and no parity. The parameter settings are as follows:

Project	Parameters
baud rate	921600 bps
data bit	8
stop bit	1
check digit	None

6 Instructions and factory settings

6.1 Command format

- The module supports parameter reading and writing. The default baud rate supported by the module's serial port is 921600 bps, 8N1 format.
- AT commands end with <CR><LF>. This will not be repeated in the following description. <CR>: carriage return; <LF>: line feed.

Command format	Description	Example
AT+XXX	run command	AT+RST
AT+XXX?	query command	AT+TXP?
AT+XXX=?	Query command parameter range	AT+TXP=?
AT+XXX=YYYY	Setup instructions	AT+TXP=15

6.2 Return value description

AT command return value	Explanation
AT_OK	correct
AT_ERROR	Error message (syntax error)
AT+PARAM_ERROR	Error message (parameter error)

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6.3 AT command list

Serial number	Basic commands	Response	Description	Example
1	AT	AT_OK	AT Communication Link Check	Send: AT Return: AT_OK
2	AT+RST	AT_OK	Restart module	Send: AT+RST Return: AT_OK
3	AT+RESTORE	AT_OK	reset to factory settings	Send: AT+RST Return: AT_OK
4	AT+VER?	<version> AT_OK <error description>	Check the firmware version number	Send: AT+VER? Return: +VER: xxxxxxx AT_OK

6.3.1 Configuration Command Details

Serial number	Configuration command	Description
1	AT+VOICEMODE	Set/check voice mode
2	AT+FREQ	Set/query channel frequency parameters
3	AT+TXP	Set/check transmission power
4	AT+CHANNEL	Set/query work channel
5	AT+BAUDRATE	Set/query baud rate
6	AT+PANID	Set/query private network ID
7	AT+LOCALID	Set/query local address
8	AT+DESTID	Set/query communication destination address
9	AT+VOLUME	Set/check volume
10	AT+PTT	Set/check voice message status
11	AT+MUTE	Set/check mute status

6.4 AT Command Reference

6.4.1 AT+VOICEMODE Set/query voice mode：

Syntax command:

Instruction	Response	Example
AT+VOICEMODE=<mode>	AT_OK <error description>	Send: AT+VOICEMODE =51 Return: AT_OK
AT+VOICEMODE?	+VOICEMODE: AT_OK <error description>	Send: AT+VOICEMODE? Return: +VOICEMODE:51 AT_OK

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Parameter description:

Parameter	Description	Explanation
<mode>	Voice working modes: **51:** Half-duplex voice mode **61:** Full-duplex P2P voice master mode **62:** Full-duplex P2P voice slave mode **71:** Transmit current and transmit power test mode **72:** Receive sensitivity test mode and receive current test mode	**When =51**, the module operates in half-duplex voice mode. At this time, only one terminal is allowed to be in voice transmission mode at the same time within the same network (control command: AT+PTT=1). Otherwise, voice collisions may occur, resulting in unclear or inaudible voice transmission. **When =61**, the module operates in full-duplex P2P voice master mode. There must be exactly one terminal in this mode within the same network. Theoretically, the number of terminals in full-duplex P2P voice slave mode is unrestricted. During full-duplex intercom communication, only one terminal in voice master mode and one terminal in voice slave mode are permitted to be in voice transmission mode simultaneously. **When =62**, the module operates in full-duplex P2P voice slave mode, which requires coordination with full-duplex P2P voice master mode to function properly. **When =70**, the module operates in receive current test mode, which is used to test the receive current. **When =71**, the module operates in transmit current and transmit power test mode, which is used to test the transmit current and transmit power. **When =72**, the module operates in receive sensitivity test mode, which is used to test the receive sensitivity.
<error description>	Error message	

6.4.2 AT+FREQ Set/query channel frequency parameters

Syntax command:

Instruction	Response	Example
AT+FREQ=<param number>: <param1>,<param2>,…,<param16>	AT_OK <error description>	Send: AT+FREQ=16:471250000,471250000,471250000,...,471250000 Return: AT_OK
AT+FREQ?	+FREQ:<param number>:<param1>,<param2>,…,<param16> AT_OK <error description>	Send: AT+FREQ? Return: +FREQ:16:471250000,471250000,…,471250000 AT_OK

Parameter description:

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Parameter	Description	Explanation
<param number>	Total number of channels	Currently fixed at 16
<param1>,<param2>,…,<param16>	Channel frequency parameters. Range of each channel frequency parameter: 470000000Hz~510000000Hz	To ensure the communication performance of the module, it is recommended to set the frequency points to decimal frequencies such as xxx.3MHz, xxx.6MHz, xxx.75 MHz, xxx.8 MHz, and to avoid frequencies that are multiples of 32 MHz, such as 32 MHz × 13 = 416 MHz, 32 MHz × 14 = 448 MHz, 32 MHz × 15 = 480 MHz, 32 MHz × 16 = 512 MHz, etc. When using multiple channels for communication, it is recommended to use channel intervals that are integer multiples of 550 kHz or 1.25 MHz.
<error description>	error message	

There are a total of 16 frequency point parameters, corresponding to frequency points from 0 to 15 channels. Channels use frequency points as the first physical isolation, PANID as the second grouping parameter, and DESTID as the parameter to determine whether the terminal in this channel is broadcasting (specifically DESTID=0) or unicasting (DESTID is a valid non-zero value). The relationship between the three is shown in the table below:

信道 / 参数	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
AT+FREQ	FREQ0	FREQ1	FREQ2	FREQ3	FREQ4	FREQ5	FREQ6	FREQ7	FREQ8	FREQ9	FREQ10	FREQ11	FREQ12	FREQ13	FREQ14	FREQ15
AT+PANID	PANID															
AT+DESTID	DESTID0	DESTID1	DESTID2	DESTID3	DESTID4	DESTID5	DESTID6	DESTID7	DESTID8	DESTID9	DESTID10	DESTID11	DESTID12	DESTID13	DESTID14	DESTID15

6.4.3 AT+TXP Set/query transmission power

Syntax command:

Instruction	Response	Example
AT+TXP=<power value>	AT_OK <error description>	Send：AT+TXP=15 Return：AT_OK
AT+TXP?	+TXP:<power value> AT_OK <error description>	Send：AT+TXP? Return：+TXP:15 AT_OK

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Parameter description:

Parameter	Description	Explanation	
<power value>	Power index value, range 0-15	**EWM201-470A20S EWM201-900A20S**	**EWM201-470A30S EWM201-900A30S**
		0 --- Transmit power -25 dBm 1 — Transmit power -22 dBm 2 — Transmit power -19 dBm 3 — Transmit power -16 dBm 4 — Transmit power -13 dBm 5 — Transmit power -10 dBm 6 — Transmit power -7 dBm 7 — Transmit power -4 dBm 8 --- Transmit power -1 dBm 9 --- Transmit power 2 dBm 10 --- Transmit power 5 dBm 11 --- Transmit power 8 dBm 12 --- Transmit power 11 dBm 13 --- Transmit power 14 dBm 14 --- Transmit power 17 dBm 15 --- Transmit power 20 dBm	0 --- Transmit power -10 dBm 1 — Transmit power -6 dBm 2 — Transmit power -4 dBm 3 — Transmit power -1 dBm 4 — Transmit power 4 dBm 5 — Transmit power 7 dBm 6 — Transmit power 10 dBm 7 — Transmit power 14 dBm 8 — Transmit power 16 dBm 9 ---Transmit power 19dBm 10 ---Transmit power 21dBm 11 ---Transmit power 24dBm 12 ---Transmit power 26dBm 13 ---Transmit power 29dBm 14 ---Transmit power 30dBm 15 ---Transmit power 30dBm
<error description>	error message		

6.4.4 AT+CHANNEL Set/query working channel

Syntax command:

Instruction	Response	Example
AT+CHANNEL=<channel value>	AT_OK <error description>	Send: AT+CHANNEL=1 Return: AT_OK
AT+CHANNEL?	+CHANNEL:<channel value> AT_OK <error description>	Send: AT+CHANNEL? Return: +CHANNEL:AT_OK

Parameter description:

Parameter	Description	Explanation
<channel value>	channel value	Range 0-15. The working channel setting is only used for channel selection. The frequency point and communication destination address parameters for each channel are set by the AT+FREQ and AT+DESTID commands.
<error description>	error message	

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6.4.5 AT+BAUDRATE Set/query baud rate

Syntax command:

Instruction	Response	Example
AT+BAUDRATE=<baudrate>	AT_OK <error description>	Send: AT+BAUDRATE=115200 Return: AT_OK
AT+BAUDRATE?	+BAUDRATE:115200 AT_OK <error description>	Send: AT+BAUDRATE? Return: +BAUDRATE=115200 AT_OK

Parameter description:

Parameter	Description	Explanation
< baudrate >	baud rate	Range:2400、4800、 9600、19200、38400、57600、115200、 230400、460800、921600、1000000、2000000
<error description>	error message	

6.4.6 AT+PANID Set/query private area network ID

Syntax command:

Instruction	Response	Example
AT+PANID=<id value>	AT_OK <error description>	Send: AT+PANID=1 Return: AT_OK
AT+PANID?	+PANID:<id value> AT_OK <error description>	Send: AT+PANID? Return: +PANID:1 AT_OK

Parameter description:

Parameter	Description	Explanation
<id value>	Private domain network ID value	Range 0-4095
<error description>	error message	

6.4.7 AT+LOCALID Set/query local address

Syntax command:

Instruction	Response	Example
AT+LOCALID=<id value>	AT_OK <error description>	Send: AT+LOCALID=1 Return: AT_OK
AT+LOCALID?	+LOCALID: <id value> AT_OK <error description>	Send: AT+LOCALID? Return: +LOCALID:1 AT_OK

Parameter description:

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Parameter	Description	Explanation
<id value>	Module local ID value	Range 0-1023
<error description>	error message	

6.4.8 AT+DESTID Set/query communication destination address

Syntax command:

Instruction	Response	Example
AT+DESTID=<param number>: <param1>,<param2>,…,<param16>	AT_OK <error description>	Send: AT+DESTID=16:1, 2, 3,..,16 Return: AT_OK
AT+DESTID?	+DESTID:<param number>: <param1>,<param2>,…,<param16> AT_OK <error description>	Send: AT+DESTID? Return: +DESTID:16:1,2,…,16 AT_OK

Parameter description:

Parameter	Description	Explanation
<param number>	Total number of addresses	Currently fixed at 16
<param1>,<param2>,…,<param16>	Target addresses for each channel	param1 indicates the target address for channel 0, param2 indicates the target address for channel 1, and so on. For details, refer to the instructions related to the AT+FREQ command.
<error description>	error message	

6.4.9 AT+VOLUME Set/query volume

Syntax command:

Instruction	Response	Example
AT+VOLUME=<volume value>	AT_OK <error description>	Send: AT+VOLUME=1 Return: AT_OK
AT+VOLUME?	+VOLUME:<volume value> AT_OK <error description>	Send: AT+VOLUME? Return: +VOLUME:1 AT_OK

Parameter description:

Parameter	Description	Explanation
<volume value>	Module volume level	Range 0 to 15, where 0 indicates minimum volume and 15 indicates maximum volume.
<error description>	error message	

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6.4.10 AT+PTT Set/query voice transmission status

Syntax command:

Instruction	Response	Example
AT+PTT=<value>	AT_OK <error description>	Send: AT+PTT=1 Return: AT_OK
AT+PTT?	+PTT:<value> AT_OK <error description>	Send: AT+PTT? Return: +PTT:1 AT_OK

Parameter description:

Parameter	Description	Explanation
<value>	status value	0: Not in voice transmission mode 1: In voice transmission mode
<error description>	error message	

6.4.11 AT+MUTE Set/query mute status

Syntax command:

Instruction	Response	Example
AT+MUTE=<value>	AT_OK <error description>	Send: AT+MUTE=1 Return: AT_OK
AT+MUTE?	+MUTE:<value> AT_OK <error description>	Send: AT+MUTE? Return: +MUTE:1 AT_OK

Parameter description:

Parameter	Description	Explanation
<value>	status value	0: Unmute 1: Mute
<error description>	error message	

6.4.12 AT+SENDB Sends data in hexadecimal format

Syntax command:

Instruction	Response	Example
AT+SENDB=<hex >	AT_OK +SEND_FINISH	Send: AT+SENDB=01020304 Return: AT_OK +SEND_FINISH

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Parameter description:

Parameter	Description	Explanation
<hex >	Data in hexadecimal format	
<error description>	error message	1. When the module is in voice dialogue mode, this feature cannot be used for data transmission, as it will return an "ATBusyError" error. 2. This command is not supported in full-duplex mode. 3. This instruction is exclusively applicable to EWM201-900A series products. For EWM201-470A series products requiring data transmission functionality, please consult EBYTE's technical support team.

6.5 Factory default settings

Model	Voice working mode	Air speed	Baud rate	Serial port format	transmission power
EWM201-470A20S	half-duplex	14.9kbps	921600 bps	8N1	20dbm
EWM201-470A30S	half-duplex	29.8kbps	921600 bps	8N1	30dbm
EWM201-900A20S	half-duplex	14.9kbps	921600 bps	8N1	20dbm
EWM201-900A30S	half-duplex	29.8kbps	921600 bps	8N1	30dbm

7 Precautions

7.1 Half-duplex/full-duplex mode

The module supports half-duplex and full-duplex communication modes. Users can configure the module via the serial port using AT commands as needed.

7.2 Network structure

The module supports point-to-point and point-to-multipoint voice intercom modes. Users can configure the module's PAN ID and target address as needed to achieve this functionality.

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7.3 On-site network deployment

Given the complexity and unpredictability of wireless environments, users should conduct on-site surveys before planning their solutions. For example, they can use modules to conduct communication tests on site and gradually screen and optimize node locations. Reasonable placement in the early stages will greatly improve network communication quality, speed up construction progress, reduce debugging difficulties, and lower later maintenance costs.

7.4 Module integration and installation

Compatibility design is an issue that users need to consider when integrating designs, including structural dimensions, electromagnetic compatibility, and other design factors. Antenna factors must also be taken into account.

- Space should be reserved around external antennas, which should not be placed close to structural components.
- Internal antennas require impedance matching.
- Where construction permits, on-site antenna installation should follow the principles of elevation, openness, and no obstruction as much as possible.

8 Hardware Design

- It is recommended to use a DC regulated power supply to power this module. The power supply ripple coefficient should be as low as possible, and the module must be reliably grounded.
- Please ensure the correct connection of the power supply's positive and negative terminals. Reverse connection may cause permanent damage to the module.
- Please check the power supply voltage to ensure it falls within the recommended voltage range. Exceeding the maximum voltage may cause permanent damage to the module.
- Please check the stability of the power supply; the voltage should not fluctuate significantly or frequently;
- When designing the power supply circuit for the module, it is often recommended to leave a margin of over 30% to ensure the long-term stable operation of the entire system;
- The module should be kept as far as possible from power supplies, transformers, high-frequency traces, and other components with significant electromagnetic interference;
- High-frequency digital traces, high-frequency analog traces, and power traces must avoid passing beneath the module. If it is necessary for traces to pass beneath the module, assuming the module is soldered to the Top Layer, a ground plane (fully copper-plated and properly grounded) must be applied to the Top Layer at the module contact area, and traces must be routed on the Bottom Layer near the module's digital section;
- If the module is soldered or placed on the Top Layer, routing traces arbitrarily on the Bottom Layer or other layers is also incorrect and will adversely affect the module's spurious emissions and reception sensitivity to varying degrees;
- If there are components with significant electromagnetic interference around the module, this will also greatly affect the module's performance. Depending on the intensity of the interference, it is recommended to keep the components appropriately distant from the module. If possible, appropriate isolation and shielding measures can be implemented;

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- If there are traces with significant electromagnetic interference (high-frequency digital, high-frequency analog, power traces) around the module, this will also significantly affect the module's performance. Depending on the intensity of the interference, it is recommended to keep the module at an appropriate distance. If possible, appropriate isolation and shielding should be implemented;
- If the communication line uses a 5V level, a 1k-5.1k resistor must be connected in series (not recommended, as there is still a risk of damage);
- The antenna installation structure has a significant impact on module performance. Ensure the antenna is exposed and preferably oriented vertically upward;
- When the module is installed inside the chassis, use a high-quality antenna extension cable to extend the antenna outside the chassis;
- The antenna must not be installed inside a metal chassis, as this will significantly reduce transmission distance.

9 FAQ

9.1 Power-up module does not respond

- When there are direct line-of-sight communication obstacles, the communication distance will correspondingly decrease;
- Temperature, humidity, and co-channel interference can lead to an increase in communication packet loss rates;
- Ground absorption and reflection of radio waves result in poorer test performance near the ground;
- Seawater has extremely strong radio wave absorption capabilities, so test performance near the coast is poor;
- If there are metal objects near the antenna or if it is placed inside a metal enclosure, signal attenuation will be severe;
- Incorrect power register settings or excessively high air interface rate settings (the higher the air interface rate, the shorter the distance);
- At room temperature, if the power supply voltage is below the recommended value, the lower the voltage, the smaller the transmitted power;
- Using an antenna with poor matching to the module or issues with the antenna's quality.

9.2 Module is easily damaged

- Please check the power supply to ensure that it is within the recommended voltage range. Exceeding the maximum voltage may cause permanent damage to the module.
- Please check the stability of the power supply to ensure that the voltage does not fluctuate significantly or frequently.
- Please ensure that anti-static measures are taken 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 sensitive to humidity.
- Unless there are special requirements, it is not recommended to use the product at extremely high or low temperatures.

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9.3 The sound quality is too poor

- The power supply ripple is too large. Be sure to reduce the power supply ripple by adding decoupling capacitors and EMC filter circuits.
- The audio input wiring is unreasonable. Differential design is required, and the wiring should be as close to the module pins as possible.
- There may be interference from signals of the same frequency nearby. Modify the module channel usage.

9.4 Voice intercom malfunction, no sound or static

- Check the MIC input signal on the bottom board to see if the MIC is working properly.
- Check if the speaker and its amplifier are working properly.
- Check if the headset is plugged into the headphone jack, causing the onboard microphone or speaker to stop working.
- Unplug the headset or continue repairing the faulty circuit.

9.5 Intermittent voice communication

- Wireless environment changes (co-channel interference, adjacent channel interference, antenna damage): Inspect the antenna and change the channel to avoid interference;
- EMC interference module (module accessories include high-power equipment such as motors and variable frequency drives): Add shielding covers and incorporate filter circuit design;
- Module interference with MIC circuits (an uncommon cause): Add shielding covers and incorporate filter circuit design;
- Module transmission distance reaches critical threshold, new shielding factors in the environment, adjust antenna position, replace with high-gain antenna, or relocate antenna placement;
- Network communication timing issues causing air collisions. Adjust communication strategy to avoid multiple modules sending data simultaneously.

9.6 Short transmission distance/becoming shorter

- Module transmission performance deterioration (low transmission power, decreased reception sensitivity), module damage, return to factory for repair;
- Loose, corroded, or damaged antenna, tighten antenna connection, replace antenna;
- New interference sources, prioritize channel replacement, adjust/upgrade antenna;

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10 Welding Work Instruction

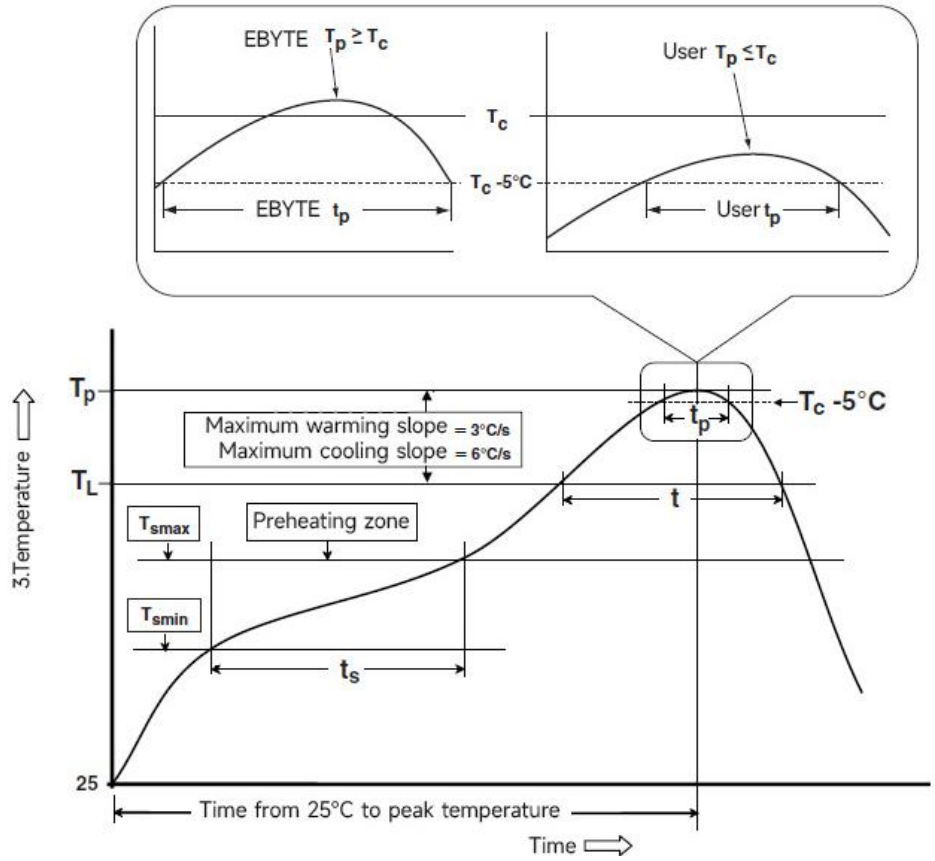
10.1 Reflow soldering temperature

Reflow soldering curve characteristics		Lead-based assembly process	Lead-free assembly process
Preheating/Keeping warm	lowest temperature（Tsmin）	100℃	150℃
	maximum temperature（Tsmax）	150℃	200℃
	time（Tsmin~Tsmin）	60-120 seconds	60-120 seconds
heating slope（TL~Tp）		3°C/second, maximum value	3°C/second, maximum value
liquid phase temperature（TL）		183℃	217℃
TL above holding time		60~90 seconds	60~90 seconds
Peak temperature of the package Tp		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) of 5°C, see the figure below.		20 seconds	30 seconds
cooling slope（Tp~TL）		6°C/second, maximum value	6°C/second, maximum value
Time from room temperature to peak temperature		6 minutes, maximum	8 minutes, maximum
※The tolerance definition for the peak temperature (Tp) of the temperature curve is the upper limit set by the user.			

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10.2 Reflow soldering curve diagram



11 Related Models

Product Model	Frequency Hz	Transmission power dBm	Test distance km	Package type	Product dimensions mm	Communication interface
EWM201-470A20S	470M-510M	20±1	3.5	SMD	16*26	UART
EWM201-470A30S	470M-510M	30±1	5	SMD	26.5*33	UART
E200-900A17S	863MHz～928MHz	17.5	0.3	SMD	16*26	UART
E200-2G4A20S	2405~2478MHz	20	0.3	SMD	16*26	UART

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Revision history

Version	Revision date	Revision Notes	Maintainer
1.0	2024-10-17	Initial version	Lei
1.1	2025-4-16	Supplemental PTT description	Lei
1.2	2025-5-16	New baud rate configuration command	Lei
1.3	2025-6-10	Correcting incorrect descriptions	Lei
1.4	2025-6-23	Model increase, Add voltage description for VDDAC	Hao,Lei
1.5	2025-9-19	Add a description of the data transfer command	Hao

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