E07-M series product specifications

CC1101 10dBm SPI SMD Wireless Module



Chengdu Ebyte Electronic Technology Co.,Ltd.

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1. Overview

1.1 Introduction

The E07-M series of Chengdu Ebyte Electronics Co., Ltd. is a self-developed SMD wireless module using the Texas Instruments (TI) CC1101 chip as the core. High-precision 26MHz crystal oscillator.

Since the very mature CC1101 RF chip is used as the core of the module, its stability has won unanimous praise from users, and there is no need to worry about compatibility. This series of modules is mainly aimed at smart home, industry, scientific research and medical and short-distance wireless communication equipment. Extensive hardware support for packet processing, data buffering, burst transfers, received signal strength indication (RSSI), clear channel assessment (CCA), link quality indication, and wake-on-wireless (WOR) is available.

Because this series of modules are pure RF transceiver modules, it is necessary to use an external MCU driver or use a dedicated SPI debugging tool. The E07-M series module model is shown in the figure below：

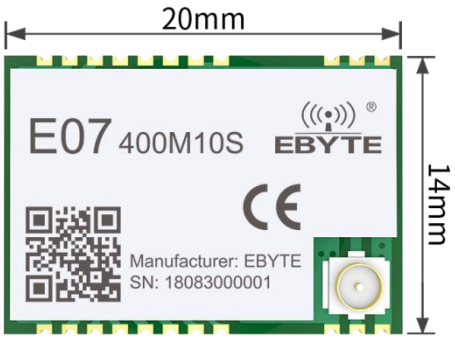


图 1：E07-400M10S

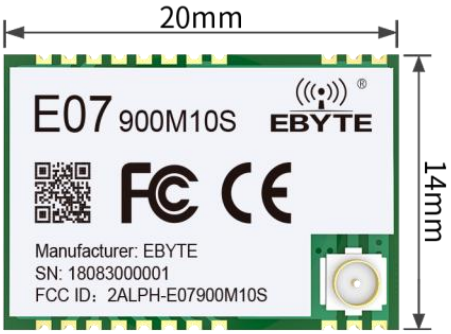


图 2：E07-900M10S

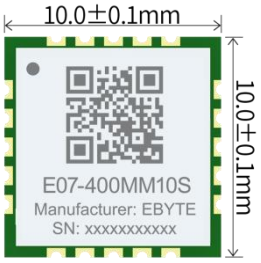


图 3：E07-400MM10S

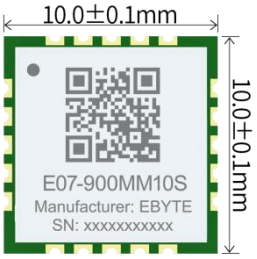


图 4：E07-900MM10S

1.2 Features

- Under ideal conditions, the communication distance can reach 1500m;
- Ultra-small package;
- Maximum transmit power 10dBm, multi-level adjustable by software;
- Support 410/450MHz frequency band and 868MHz/915MHz frequency band;
- Support data transmission rate of 0.6kbps～500kbps;
- Support multiple modulation modes (OOK, ASK, GFSK, 2-FSK, 4-FSK and MSK);
- Independent 64-byte RX FIFO and TX FIFO;
- Support 1.8~3.6V power supply, and the power supply greater than 3.3V can guarantee the best performance;
- Industrial-grade standard design, supporting long-term use at -40-85°C;
- Support RSSI (Received Signal Strength Indication) and LQI (Link Quality Indication);
- Connect with MCU through 4-wire SPI interface, and provide 2 general-purpose digital output pins with settable functions;
- Communication compatible with E07-M series products;
- E07-400M10S and E07-900M10S are in the form of dual antennas (IPEX/stamp hole), which is convenient for users to develop secondary and facilitate integration.

1.3 Application Scenario

- Smart home and industrial sensors, etc.;
- Wireless alarm security system;
- Building automation solutions;
- Wireless industrial grade remote control;
- Health care products;
- Advanced Meter Reading Architecture (AMI);
- Automotive industry application.

2. Specification Parameters

2.1 RF parameters

RF parameters	unit	model				Remark
		E07-400MM10S	E07-900MM10S	E07-400M10S	E07-900M10S	
Maximum transmit power	dBm	9～11	9～11	9～11	9～11	-
Receiver sensitivity	dBm	-107～-109	-107～-109	-107～-109	-107～-109	The air rate is 1.2kbps
Reference	M	1500m				It is clear and open, the

distance						antenna gain is 5dBi, the antenna height is 2.5 meters, and the air rate is 1.2kbps.
Working frequency	MHz	410～450	855～925	410～450	855～925	Supports ISM bands
air speed	bps	0.6k～500k				User Programmable Control
blocking power	dBm	10				Less chance of burning when used at close range

2.2 Electrical parameters

Electrical parameters		unit	model				Remark
			E07-400MM10S	E07-900MM10S	E07-400M10S	E07-900M10S	
Operating Voltage		V	1.8～3.6				≥3.3V can guarantee the output power, more than 3.8V will burn the module permanently.
communication level		V	3.3				Using 5V TTL has the risk of burning
power consumption	emission current	mA	32	32	35	36	Instantaneous power consumption
	receive current	mA	18	18	18	18	-
temperature	Operating temperature	℃	-40～+85				industrial grade
	Storage temperature		-40～+125				-

2.3 hardware parameters

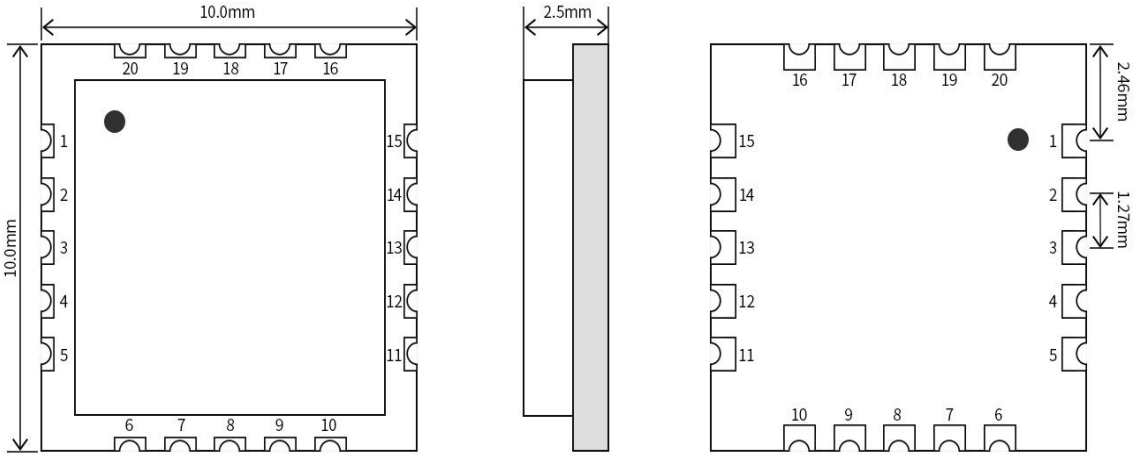
hardware parameters	model				Remark
	E07-400MM10S	E07-900MM10S	E07-400M10S	E07-900M10S	
chip	CC1101				-
Crystal frequency	26MHz				10ppm
Modulation	GFSK(recommended)				Support OOK, ASK, GFSK, 2-FSK, 4-FSK and MSK
Interface	stamp hole				Pitch 1.27mm
Communication Interface	SPI				0～10Mbps

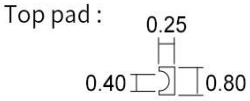
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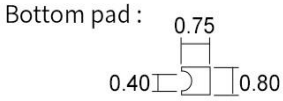
FIFO	64Byte				The maximum length of a single send
Encapsulation	patch				-
Antenna interface	stamp hole	stamp hole	IPEX/stamp hole	IPEX/stamp hole	The characteristic impedance is about 50 ohms
size	10*10mm	10*10mm	14 * 20 mm	14 * 20 mm	±0.1mm
Product Weight	0.5g	0.5g	1.2g	1.2g	±0.05g

3. Mechanical Size and Pin Definition

3.1 E07-400MM10S&E07-900MM10S mechanical size and pin definition





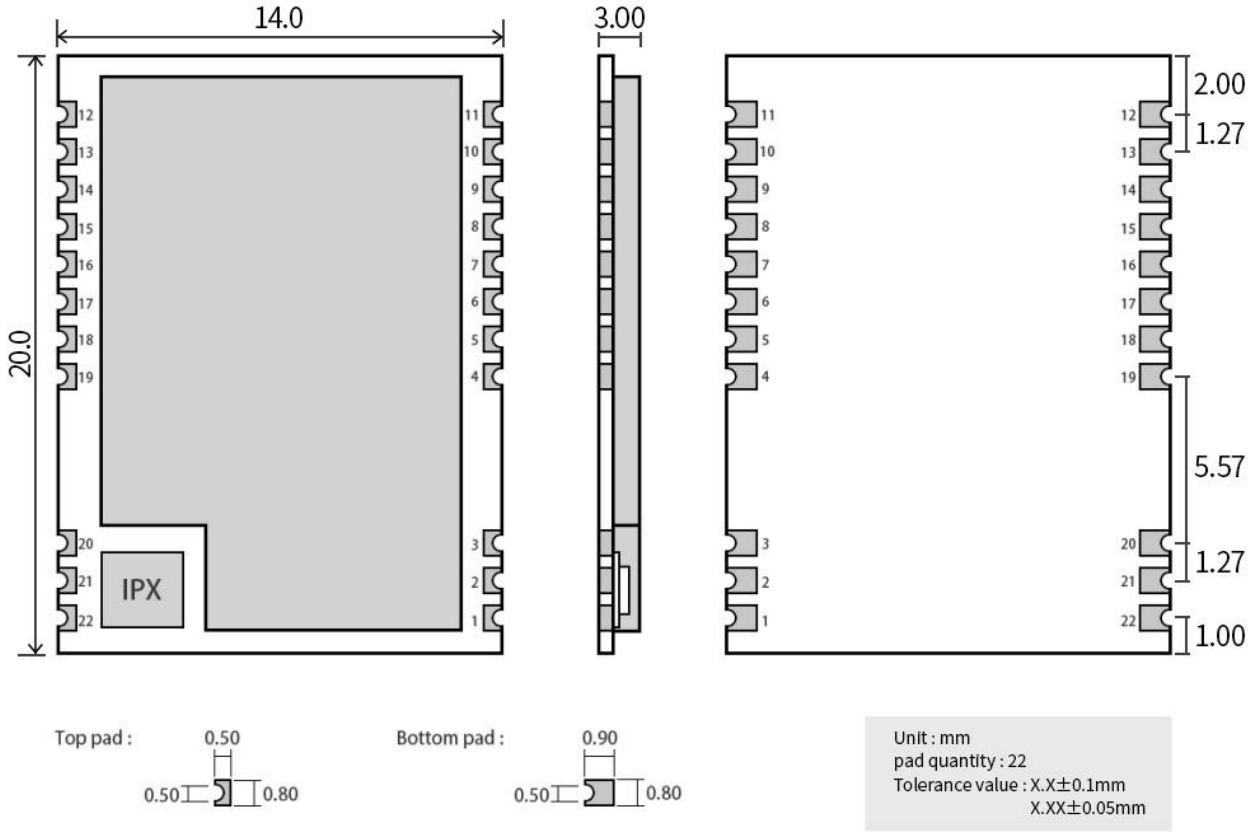


Unit : mm
pad quantity : 20
Tolerance value : X.X±0.1mm
X.XX±0.05mm

pin number	pin name	Pin direction	Pin usage
1	VCC	input	power supply
2	GND	--	power supply
3	NC	--	--
4	NC	--	--
5	NC	--	--
6	ANT	input/output	Antenna interface, stamp hole (50 ohm characteristic impedance)
7	GND	--	power supply
8	NC	--	--
9	NC	--	--
10	NC	--	--
11	NC	--	--
12	MISO/GD01	output	SPI data output

13	MOSI	input	SPI data input
14	CSN	input	Module chip select pin, used to start an SPI communication
15	SCK	input	SPI clock input
16	GND		power supply
17	NC	--	--
18	GD00	input/output	CC1101 chip pins, see the chip official user manual for details
19	NC	--	--
20	GD02	input/output	CC1101 chip pins, see the chip official user manual for details

3.2 E07-400M10S&E07-900M10S Mechanical Dimensions and Pin Definitions



pin number	pin name	Pin direction	Pin usage
1	GND		Ground wire, connected to power reference ground
2	GND		Ground wire, connected to power reference ground
3	GND		Ground wire, connected to power reference ground
4	GND		Ground wire, connected to power reference ground
5	GND		Ground wire, connected to power reference ground
6	NC		no connection required

7	NC		no connection required
8	NC		no connection required
9	VCC		Power supply, ranging from 1.8V to 3.6V (it is recommended to add ceramic filter capacitors externally)
10	NC		no connection required
11	GND		Ground wire, connected to power reference ground
12	GND		Ground wire, connected to power reference ground
13	NC		no connection required
14	GD02		CC1101 chip pins, see the chip official user manual for details
15	GD00		CC1101 chip pins, see the chip official user manual for details
16	MISO/GD01	output	SPI data output pin
17	MOSI	input	SPI data input pin
18	SCK	input	SPI clock input pin
19	CSN	input	Module chip select pin, used to start an SPI communication
20	GND		Ground wire, connected to power reference ground
21	ANT	input/output	Antenna interface, stamp hole (50 ohm characteristic impedance)
22	GND		Ground wire, connected to power reference ground

4. Basic Operation

4.1 Hardware Design

- It is recommended to use a DC regulated power supply to power the module. The ripple coefficient of the power supply should be as small as possible, and the module must be reliably grounded;
- Please pay attention to the correct connection of the positive and negative poles of the power supply, such as 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 cannot fluctuate greatly and frequently;
- When designing the power supply circuit for the module, it is often recommended to reserve more than 30% of the margin, and the whole machine is conducive to long-term stable work;
- The module should be kept as far away as possible from parts with high electromagnetic interference such as power supply, transformer, and high-frequency wiring;
- High-frequency digital traces, high-frequency analog traces, and power traces must avoid the bottom of the module. If it is necessary to pass through the bottom of the module, assuming that the module is soldered to the Top Layer, lay copper on the top layer of the contact part of the module (all Copper and good grounding), must be close to the digital part of the module and routed in the Bottom Layer;
- Assuming that 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 stray and receiving sensitivity of the module to varying degrees;
- Assuming that there are devices with large electromagnetic interference around the module, which will greatly affect

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the performance of the module, it is recommended to keep away from the module according to the intensity of the interference. If the situation permits, appropriate isolation and shielding can be done;

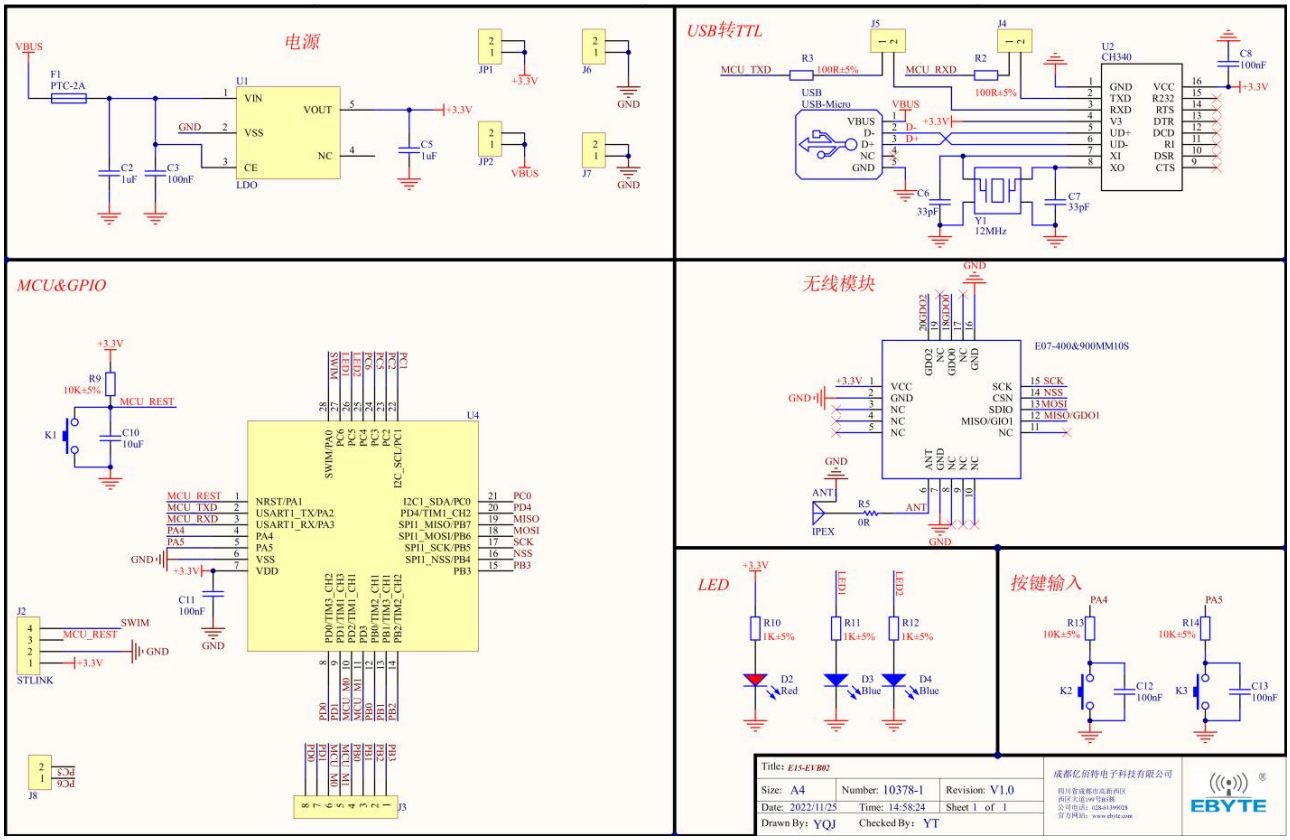
- Assuming that there are traces with large electromagnetic interference around the module (high-frequency digital, high-frequency analog, power supply traces) will also greatly affect the performance of the module. According to the intensity of the interference, it is recommended to keep away from the module appropriately. If the situation permits, it can be done Appropriate isolation and shielding;
- If the communication line uses a 5V level, a 1k-5.1k resistor must be connected in series (not recommended, there is still a risk of damage);
- The antenna installation structure has a great impact on the performance of the module. Make sure that the antenna is exposed, preferably vertically upward. When the module is installed inside the casing, a high-quality antenna extension cable can be used to extend the antenna to the outside of the casing;
- The antenna must not be installed inside the metal shell, which will greatly weaken the transmission distance.

4.2 Software writing

- Command its control register and send and receive cache to operate, that is, the wireless data sending and receiving function can be completed. For the timing operation of module register read and write operations, please refer to the latest CC1101 data sheet;
- GDO0 is a general-purpose I/O port, see CC1101 manual;
- GDO2 is generally configured as an IRQ-like function, or it can be left unconnected, and the interrupt status can be obtained by SPI query, but it is recommended to use the external interrupt of the microcontroller;
- After CC1101 resumes IDLE mode or configures sleep mode, it is recommended to re-initialize the power configuration table.

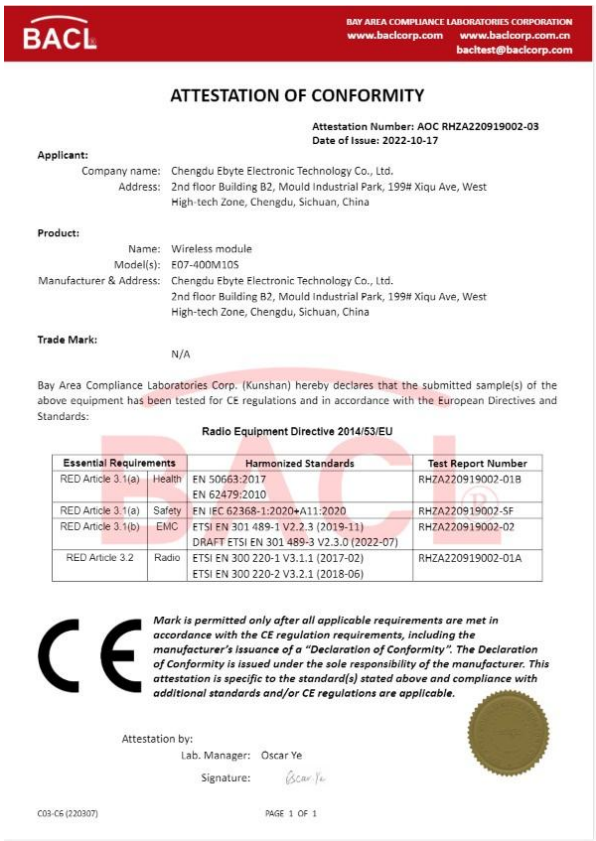
5. Basic Application

5.1 Recommended Connection Diagram



6. Product certification information

6.1 CE certification



BACL

BAY AREA COMPLIANCE LABORATORIES CORPORATION
www.baclcorp.com www.baclcorp.com.cn
baclcorp@baclcorp.com

ATTESTATION OF CONFORMITY

Attestation Number: AOC RHZA220919002-03
Date of Issue: 2022-10-17

Applicant:
Company name: Chengdu Ebyte Electronic Technology Co., Ltd.
Address: 2nd floor Building B2, Mould Industrial Park, 199# Xiqu Ave, West High-tech Zone, Chengdu, Sichuan, China

Product:
Name: Wireless module
Model(s): E07-400M10S
Manufacturer & Address: Chengdu Ebyte Electronic Technology Co., Ltd. 2nd floor Building B2, Mould Industrial Park, 199# Xiqu Ave, West High-tech Zone, Chengdu, Sichuan, China

Trade Mark:
N/A

Bay Area Compliance Laboratories Corp. (Kunshan) hereby declares that the submitted sample(s) of the above equipment has been tested for CE regulations and in accordance with the European Directives and Standards:

Radio Equipment Directive 2014/53/EU

Essential Requirements		Harmonized Standards	Test Report Number
RED Article 3.1(a)	Health	EN 50663:2017 EN 62479:2010	RHZA220919002-01B
RED Article 3.1(a)	Safety	EN IEC 62368-1:2020+A11:2020	RHZA220919002-SF
RED Article 3.1(b)	EMC	ETSI EN 301 489-1 V2.2.3 (2019-11) DRAFT ETSI EN 301 489-3 V2.3.0 (2022-07)	RHZA220919002-02
RED Article 3.2	Radio	ETSI EN 300 220-1 V3.1.1 (2017-02) ETSI EN 300 220-2 V3.2.1 (2018-06)	RHZA220919002-01A

CE

Mark is permitted only after all applicable requirements are met in accordance with the CE regulation requirements, including the manufacturer's issuance of a "Declaration of Conformity". The Declaration of Conformity is issued under the sole responsibility of the manufacturer. This attestation is specific to the standard(s) stated above and compliance with additional standards and/or CE regulations are applicable.

Attestation by:
Lab. Manager: Oscar Ye
Signature:

C03-C6 (220307) PAGE 1 OF 1

E07-400M10S



HTW

Test Verification of Conformity

Certificate No.: CTEW2203010801
Issue Date: Apr.18, 2022
In accordance with the following applicable Directives:
Radio Equipment Directive (RED) 2014/53/EU
The equipment, as described herewith, was tested pursuant to applicable test procedure and complies with the requirements of:

Essential Requirement		Applied Standards	Test Report No.	Result
Art. 3.1a	Health	EN 62479:2010 EN 50663:2017	CHTEW22030110	Conform
	Safety	EN 62368-1:2014+A11:20117	CHTSE22030161	Conform
Art. 3.1b	EMC	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-3 V2.1.1 (2019-03)	CHTEW22030109	Conform
Art. 3.2	Radio	ETSI EN 300 220-1 V3.1.1:2017-02 ETSI EN 300 220-2 V3.1.1:2017-02	CHTEW22030108	Conform

The test results are traceable to the international or national standards.

Applicant: Chengdu Ebyte Electronic Technology Co., Ltd.
Address: Building B5, Mould Industrial Park, 199# Xiqu Ave, West Hightech Zone, Chengdu, 611731, Sichuan, China
EUT Name: wireless module
Trade Mark: EBYTE
Model number: E07-900M10S
Listed Model(s): -
Test Laboratory: **Shenzhen Huatongwei International Inspection Co., Ltd.**
1/F, Bldg 3 and Bldg 9, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, Guangdong, China
Tel: 86-755-26715499 E-mail: cs@szhtw.com.cn Website: Http: //www.szhtw.com.cn

CE

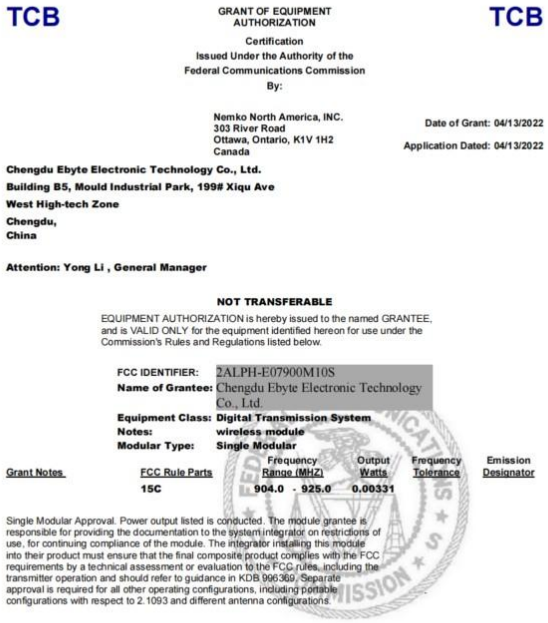
Note:
The certification is only valid for the equipment and configuration described, in conjunction with the test data detailed above. The CE mark as shown beside can be used, under the responsibility of the manufacturer, after completion of an EC Directive of Conformity and compliance with all relevant EC Directive.

For and on behalf of
Shenzhen Huatongwei International Inspection Co., Ltd.

Authorized by:

E07-900M10S

6.2 FCC certification



TCB GRANT OF EQUIPMENT AUTHORIZATION TCB

Certification
Issued Under the Authority of the
Federal Communications Commission
By:

Nemko North America, INC.
303 River Road
Ottawa, Ontario, K1V 1H2
Canada

Date of Grant: 04/13/2022
Application Dated: 04/13/2022

Chengdu Ebyte Electronic Technology Co., Ltd.
Building B5, Mould Industrial Park, 199# Xiqu Ave
West High-tech Zone
Chengdu,
China

Attention: Yong Li , General Manager

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER: 2ALPH-E07900M10S
Name of Grantee: Chengdu Ebyte Electronic Technology Co., Ltd.
Equipment Class: Digital Transmission System
Notes: wireless module
Modular Type: Single Modular

Grant Notes	FCC Rule Parts	Frequency Range (MHz)	Output Watts	Frequency Tolerance	Emission Designator
	15C	904.0 - 925.0	0.00331		

Single Modular Approval. Power output listed is conducted. The module grantee is responsible for providing the documentation to the system integrator on restrictions of use, for continuing compliance of the module. The integrator installing this module into their product must ensure that the final composite product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation and should refer to guidance in KDB 996369. Separate approval is required for all other operating configurations, including portable configurations with respect to 2.1093 and different antenna configurations.

E07-900M10S

7. Frequently Asked Questions

7.1 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 will increase the communication packet loss rate;
- The ground absorbs and reflects radio waves, and the test effect is poor when it is close to the ground;
- Sea water has a strong ability to absorb radio waves, so the seaside test effect is poor;
- There are metal objects near the antenna, or placed in a metal case, the signal attenuation will be very serious;
- The power register is set incorrectly, and the air speed is set too high (the higher the air speed, the closer the distance);
- The low voltage of the power supply at room temperature is lower than the recommended value, and the lower the voltage, the lower the power output;
- The matching degree between the antenna and the module is poor or the quality of the antenna itself is problematic.

7.2 The module is fragile

- 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 cannot fluctuate greatly and frequently;
- Please ensure anti-static operation during installation and use, and high-frequency devices are electrostatically sensitive;
- Please ensure that the humidity during installation and use should not be too high, 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.

7.3 BER is too high

- There is co-channel signal interference nearby, stay away from the source of interference or modify the frequency and channel to avoid interference;
- The clock waveform on the SPI is not standard, check whether there is interference on the SPI line, and the SPI bus line should not be too long;
- Unsatisfactory power supply may also cause garbled characters, so ensure the reliability of the power supply;
- Poor quality or too long extension lines and feeders will also cause high bit error rates.

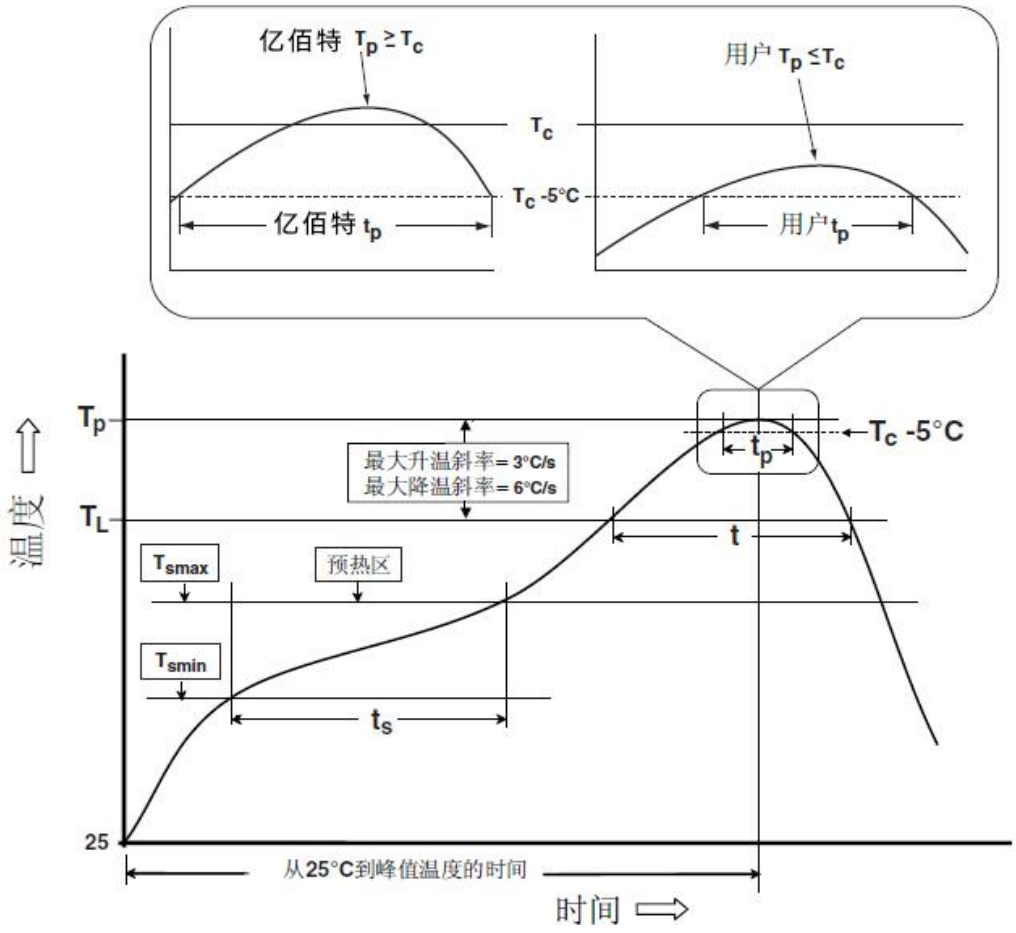
8. Welding Work Instructions

8.1 reflow temperature

Reflow Soldering Profile Characteristics		leaded process assembly	Lead-free process assembly
Preheat/keep warm	Minimum temperature (Tsmin)	100℃	150℃
	Maximum temperature (Tsmax)	150℃	200℃
	Time (Tsmin~Tsmin)	60-120 seconds	60-120 seconds
Heating slope (TL~Tp)		3°C/sec, max.	3°C/sec, max.
Liquidus temperature (TL)		183℃	217℃
Hold time above TL		60~90 seconds	60~90 seconds
Package peak temperature Tp		Users should not exceed the	Users should not exceed the

	temperature indicated on the product's "Moisture Sensitivity" label.	temperature indicated on the product's "Moisture Sensitivity" label.
The time (Tp) within 5°C of the specified classification temperature (Tc), see the figure below	20 seconds	30 seconds
Cooling slope (Tp~TL)	6°C/sec, max.	6°C/sec, max.
Time from room temperature to peak temperature	6 minutes, maximum	8 minutes, maximum
※ The peak temperature (Tp) tolerance definition of the temperature curve is the upper limit of the user		

8.2 Reflow Soldering Profile



9. Related Models

Module model	Chip solution	carrier frequency	transmit power	communication distance	Package form	Antenna form
		Hz	dBm	m		
E07-400M10S	CC1101	433M	10	1500	patch	IPEX/stamp hole
E07-900M10S	CC1101	868M/915M	10	1500	patch	IPEX/stamp hole
All models of E07 series wireless modules can communicate with each other						

10. Antenna Guide

10.1 Antenna recommendation

Antenna is an important role in the communication process, and often inferior antennas will have a great impact on the communication system, so our company recommends some antennas as supporting our wireless modules with excellent performance and reasonable price.

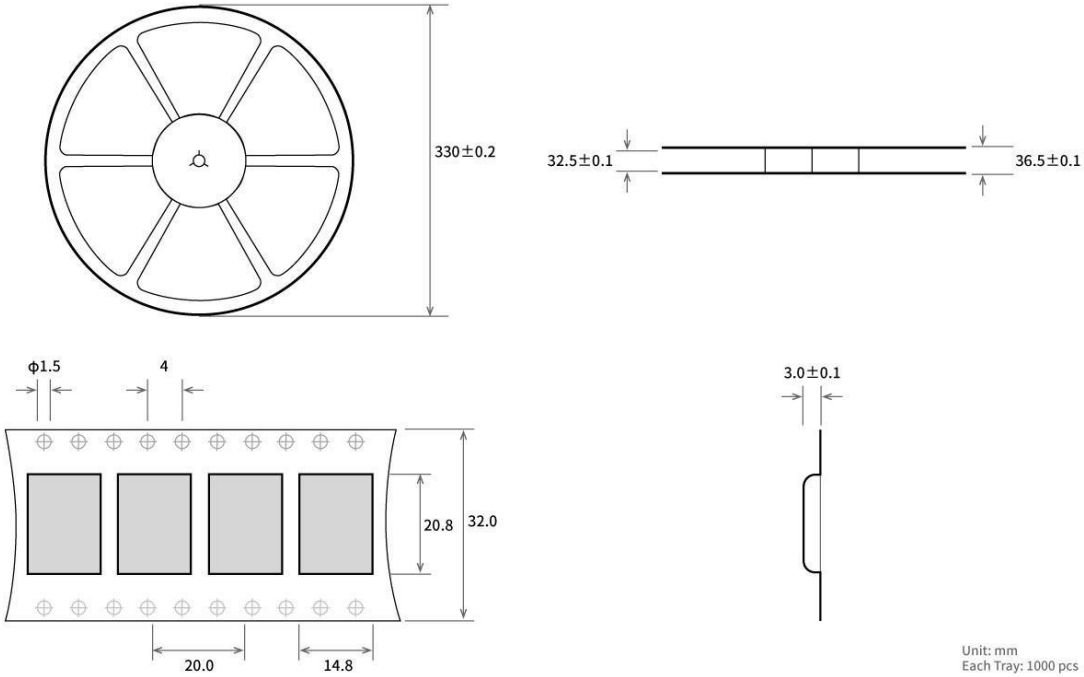
Product number	type	frequency band	gain	size	feeder	interface	features
		Hz	dBi	mm	cm		
TX433-NP-4310	flexible antenna	433M	2.0	10x43	-	welding	Flexible FPC soft antenna
TX433-JZ-5	Glue Stick Antenna	433M	2.0	30	-	SMA-J	Ultra-short straight, omnidirectional antenna
TX433-JZG-6	Glue Stick Antenna	433M	2.5	50	-	SMA-J	Ultra-short straight, omnidirectional antenna
TX433-JW-5	Glue Stick Antenna	433M	2.0	50	-	SMA-J	Fixed bent, omnidirectional antenna
TX433-JWG-7	Glue Stick Antenna	433M	2.5	110	-	SMA-J	Fixed bent, omnidirectional antenna
TX433-JK-11	Glue Stick Antenna	433M	2.5	110	-	SMA-J	Bendable glue stick, omnidirectional antenna
TX433-JK-20	Glue Stick Antenna	433M	3.0	200	-	SMA-J	Bendable glue stick, omnidirectional antenna
TX433-XPL-100	Suction cup antenna	433M	3.5	185	100	SMA-J	Small suction cup antenna, cost-effective

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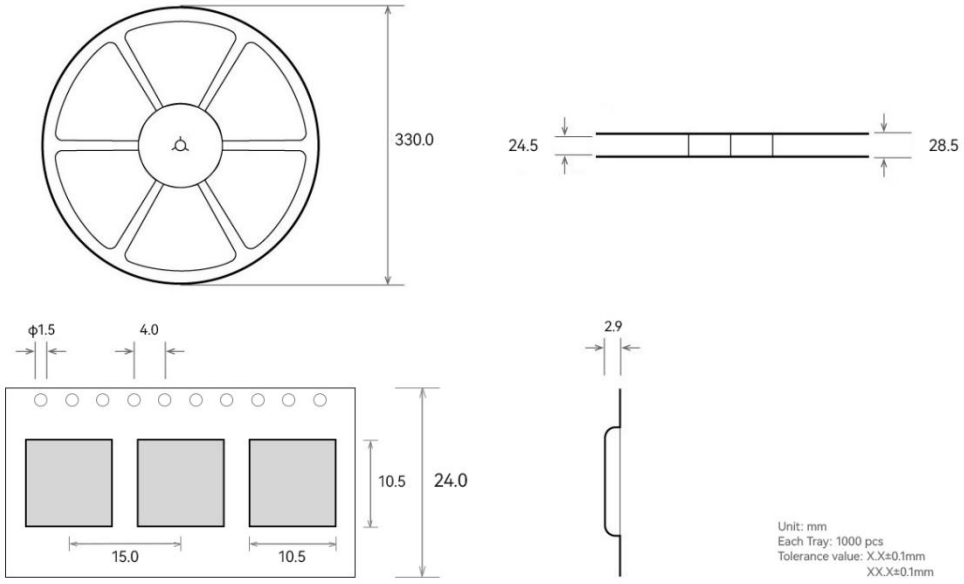
TX433-XP-200	Suction cup antenna	433M	4.0	190	200	SMA-J	Small suction cup antenna, low loss
TX433-XPH-300	Suction cup antenna	433M	6.0	965	300	SMA-J	Small suction cup antenna, high gain

11. Batch packing method

11.1 E07-400M10S&E07-900M10S Batch packing method



11.2 E07-400MM10S&E07-900MM10S Batch packing



Revision History

Version	Date	Description	Issued By
1.0	2022-11-29	Initial version	Hao

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