E49-400M30S User Manual

CMT2300A 433/470MHz Chip Hardware Wireless Module



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Features

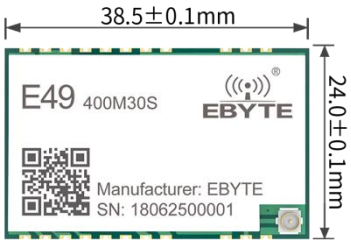
- The measured communication distance can reach 5.5km;
- Maximum transmitting power 1W, multi-level adjustable;
- Support global license-free ISM 433MHz band;
- Support data transmission rate between 0.5Kbps ~ 300Kbps;
- Supports low power mode, suitable for battery;
- Supports GFSK modulation and OOK,(G)MSK;
- Support 3.3V~5.5V power supply;
- Industrial standard design, support -40 ~ 85°C long time operating;
- Support IPEX/ stamp hole interface, users can choose according to their own needs.

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Chapter 1 Overview

1.1 Brief introduction



E49-400M30S is a super cost-effective wireless data transmission module.. It is a hardware module based on CMT2300A. Customers can develop and use it according to the working environment and the application conditions of MUC.

E49-400M30S supports a maximum transmission power of 30dBm, and users can set a lower output power to save consumption. The module works in 433/470MHz frequency band. It features small size and low power consumption.

Because this module is a pure RF transceiver module, you need to use MCU drive or specialized SPI debugging tools

1.2 Application

- Smart home and industrial sensors;
- Security system, positioning system;
- Wireless remote control, UAV;
- Wireless game remote control;
- Healthcare products;
- Wireless microphones, wireless headphones；
- Automotive industry applications.

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Chapter 2 Specification & parameter

2.1 Limit parameter

Main parameters	Performance		Remark
	minimum	maximum	
power supply voltage（V）	0	5.5	Permanently burn modules over 5.5V
Blocking power（dBm）	-	10	The burn rate is low when used at close range
Working temperature（℃）	-40	+85	Industrial-grade

2.2 Operating parameter

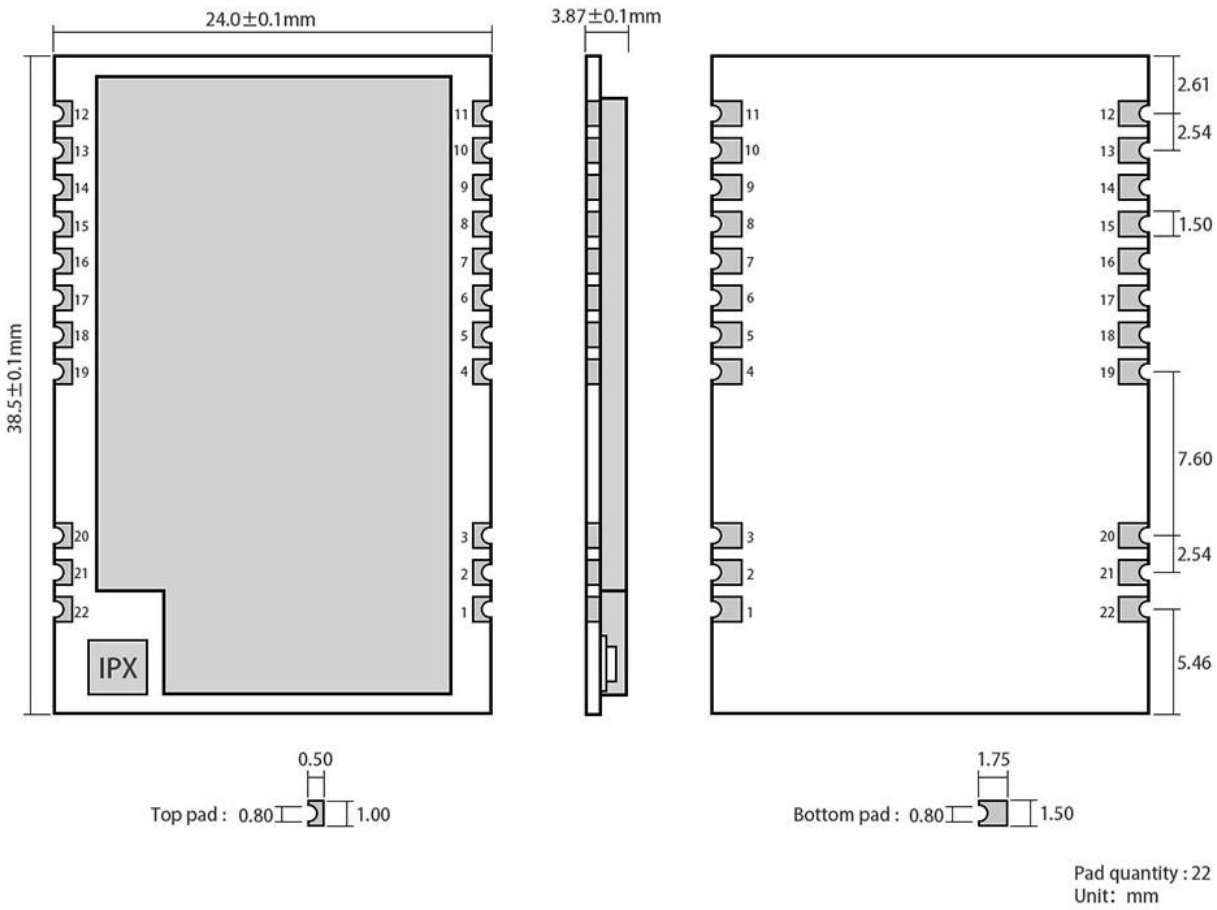
Main parameters		Performance			Remark
		minimum	typical	maximum	
Working voltage（V）		3.3	5	5.5	＞5.5V Can cause permanent module damage
communication level（V）		-	3.3	-	-
Working temperature（℃）		-40	-	+85	Industrial-grade
Working frequency（MHz）		410	433	510	-
Power consumption	Emission current（mA）	-	650	-	-
	Receive current（mA）	-	17	-	-
	Sleep current（μA）	-	2	-	-
Maximum transmitting power（dBm）		-	30	-	-
Receiving sensitivity（dBm）		-121	-122	-123	The air rate 1.2kbps

Main parameters	Description	Remark
Reference range	5.5kM	Clear & empty，Antenna height 2.5m，data rate 2.4kbps
FOSC	26MHz	-
package	SMD	-
Communication interface	SPI	SPI
Dimensions	24*38.5mm	-
radio frequency interface	Stamp hole/IPEX	equivalent impedance about 50Ω

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Chapter 3 Size and pin definition



Pin number	Item	Pin direction	Pin purpose
1	GND	-	Ground
2	GND	-	Ground
3	GND	-	Ground
4	GND	-	Ground
5	GND	-	Ground
6	RXEN	input	RF switch receiving control pin, connected to external MCU IO, high level effective
7	TXEN	input	RF switch receiving control pin, connected to external MCU IO, high level effective
8	GPIO3	Input/output	Configurable general IO port (see CMT2300A manual for details)
9	VCC	-	Power supply, range 3.3 ~ 5.5V (external ceramic filter capacitor is recommended)
10	VCC	-	Power supply, range 3.3 ~ 5.5V (external ceramic filter capacitor is recommended)
11	GND	-	Ground

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12	GND	-	Ground
13	GPIO2	Input/output	Configurable general IO port (see CMT2300A manual for details)
14	GPIO1	Input/output	Configurable general IO port (see CMT2300A manual for details)
15	FCSB	input	SPI accesses FIFO slice selection
16	CSB	input	SPI accesses FIFO slice selection
17	SDIO	Input/output	SPI data input and output
18	SLCK	input	SPI clock pin
19	NC	-	-
20	GND	-	Ground
21	ANT	-	Antenna interface, stamp hole (50Ω characteristic impedance)
22	GND	-	Ground

Chapter 4 Basic operation

4.1 Hardware design

- DC regulated power supply is recommended to power the module, the ripple coefficient of the power supply 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, such as the reverse connection may cause permanent damage to the module;
- Please check the power supply to ensure that between the recommended power supply voltage, if the maximum value is exceeded, it will cause permanent damage to the module;
- Please check the stability of the power supply. The voltage should not fluctuate greatly and frequently;
- In the design of power supply circuit for modules, it is often recommended to retain more than 30% of the allowance, which is conducive to long-term and stable work;
- The module should be far away from the power supply, transformers, high-frequency wiring and other parts with greater electromagnetic interference;
- High-frequency digital wiring, high-frequency analog wiring and power wiring must avoid the Bottom Layer of the module. If it is really necessary to pass through the Bottom Layer of the module, assuming that the module is welded on the Top Layer, the Top Layer in the contact part of the module must be copper paved (all copper paved and well grounded), close to the digital part of the module and wire in the Bottom Layer;
- It is also a mistake to assume that modules are soldered or placed in the Top Layer, and that random wiring in the Bottom Layer or other layers will affect module stray and reception 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. According to the intensity of the interference, it is recommended to stay away from the module appropriately. If the situation permits, appropriate isolation and shielding can be done;
- If there are wires (high frequency digital, high frequency analog, power supply wiring) around the module that have large electromagnetic interference, it will also greatly affect the performance of the module. According to the intensity of the interference, it is recommended to stay away from the module appropriately. If the situation permits, appropriate isolation and shielding can be done;

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- Try to stay away from part of the TTL protocol which is also 2.4GHz physical layer，such as USB3.0;
- Antenna installation structure has a great impact on module performance, be sure to ensure that the antenna is exposed, preferably vertical upward. When the module is installed inside the housing, the antenna can be extended to the outside of the housing by using the high quality antenna extension cord;
- Antenna must not be installed inside the metal shell, will lead to the transmission distance greatly weakened.

4.2 Programming

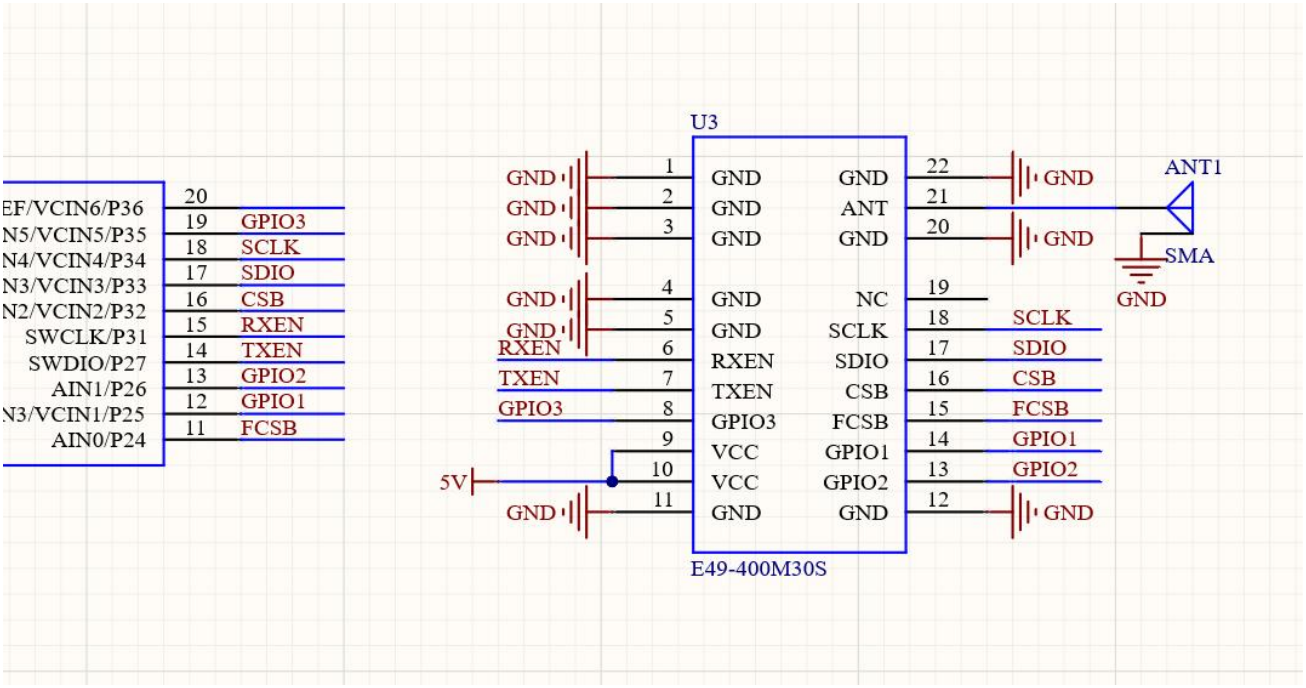
- This module is CMT2300A, and its drive mode is SPI. Users can operate in accordance with the CMT2300A chip book;
- GPIO1/GPIO2/GPIO3 is a general I/O port, see CMT2300A manual for detail

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Chapter 5 Basic application

5.1 Hardware design & schematics



Chapter 6 FAQ

6.1 Transmission distance

- When there is a linear communication barrier, the communication distance will decay accordingly;
- Temperature, humidity and the same frequency interference will lead to the increase of communication packet loss rate;
- The ground absorbs and reflects radio waves, and the test results are poor near the ground;
- Sea water has a strong ability to absorb radio waves, so the seaside test results are poor;
- If there are metal objects near the antenna or placed in a metal shell, the signal attenuation will be very serious;
- Power register set wrong, air speed set too high (the higher the air speed, the closer the distance);
- At indoor temperature, the power supply low voltage is lower than the recommended value, the lower the voltage, the smaller the power;
- The use of antenna and module matching degree is poor or the quality of the antenna itself.

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6.2 Module damage

- Please check the power supply to ensure that between the recommended power supply voltage, if the maximum value is exceeded, it will cause permanent damage to the module;
- Please check the stability of the power supply. The voltage should not fluctuate greatly and frequently;
- Please ensure anti-static operation during installation and use, and high frequency devices are static sensitive;
- Please ensure that the humidity during installation and use is not too high. Some components are humidity sensitive devices;
- If there is no special requirement, it is not recommended to use at too high or too low temperature.

6.3 Bit error

- If there is interference of the same frequency signal nearby, keep away from the interference source or modify the frequency or channel to avoid interference;
- SPI clock waveform is not standard, check whether there is interference on SPI line, SPI bus wiring should not be too long;
- Power supply is not ideal may also cause garbled code, be sure to ensure the reliability of the power supply;
- Poor or too long extension line, feeder quality, will also cause high bit error rate.

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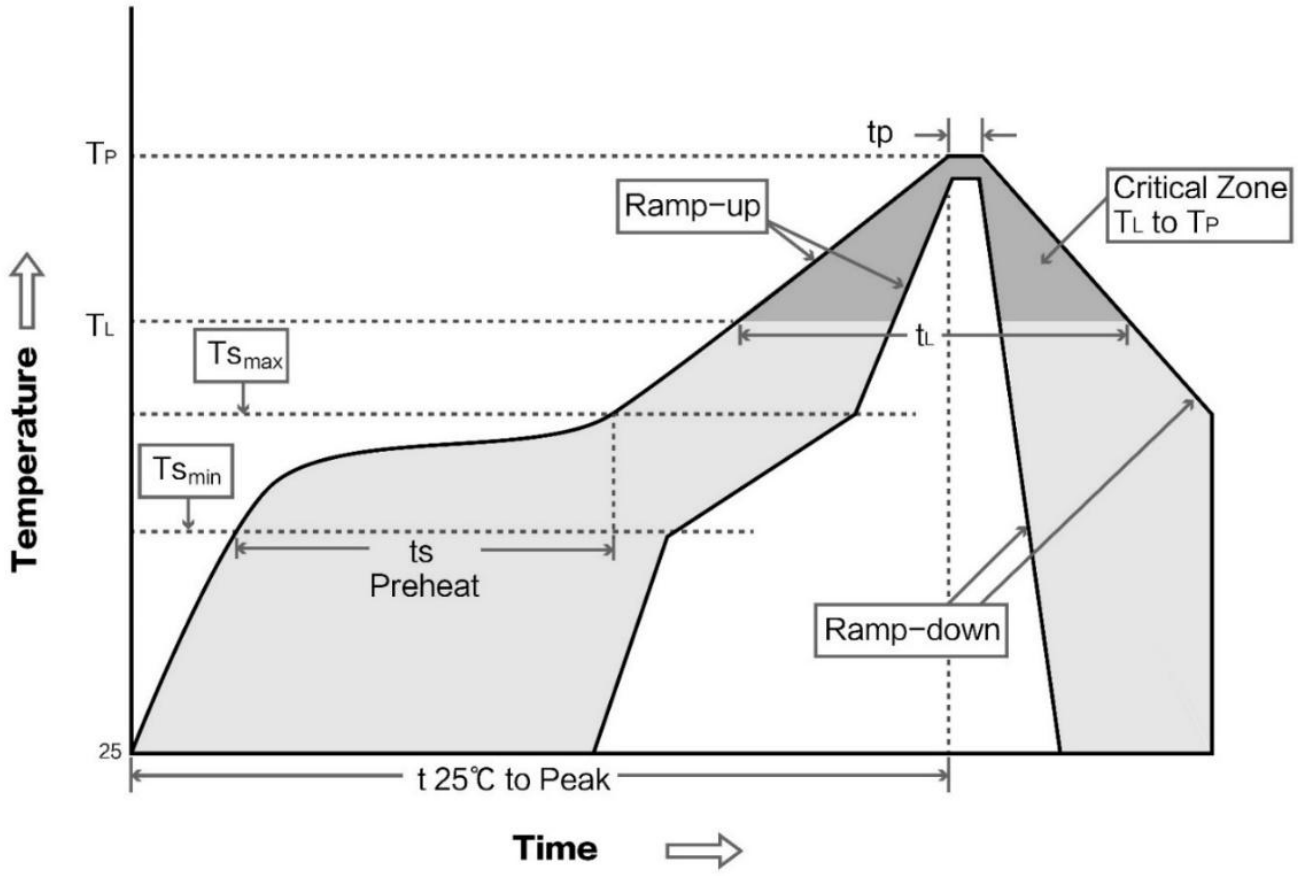
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Chapter 7 Welding instruction

7.1 Reflow soldering temperature

Profile Feature	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Sn63/Pb37	Sn96.5/Ag3/Cu0.5
Preheat Temperature min （Tsmin）	100℃	150℃
Preheat temperature max (Tsmax)	150℃	200℃
Preheat Time (Tsmin to Tsmax)(ts)	60-120 sec	60-120 sec
Average ramp-up rate(Tsmax to Tp)	3℃/second max	3℃/second max
Liquidous Temperature (TL)	183℃	217℃
Time（tL）Maintained Above（TL）	60-90 sec	30-90 sec
Peak temperature（Tp）	220-235℃	230-250℃
Aveage ramp-down rate（Tp to Tsmax）	6℃/second max	6℃/second max
Time 25℃ to peak temperature	6 minutes max	8 minutes max

7.2 Reflow soldering curve



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Chapter 8 E49 series

Product number	Chip	Working frequency	Transmission power	Test distance	Product size	Packaging form	Communication interface
		Hz	dBm	km	mm		
E49-400T20S	CMT2300A	410~450MHz	20	2.5	26*16	SMD	UART
E49-400T20D	CMT2300A	410~450MHz	20	2.5	36*21	DIP	UART
E49-400M30S	CMT2300A	410~450MHz	30	2.5	24*38.5	贴片	SPI
E49-400M20S	CMT2300A	410~450MHz	20	2.5	20*14	贴片	SPI

Chapter 9 Antenna recommendation

9.1 Recommendation

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

Product number	Type	frequency	Gain	Size	Feeder	interface	characteristics
		Hz	dBi	mm	cm		
TX433-NP-4310	Flexible PCB antenna	433M	2	43.8*9.5mm	-	SMA-J	Built-in flexible, FPC soft antenna
TX433-JW-5	Rubber antenna	433M	2	50mm	-	SMA-J	Bendable rubber, omnidirectional antenna
TX433-JWG-7	Rubber antenna	433M	2.5	75mm	-	SMA-J	Bendable rubber, omnidirectional antenna
TX433-JK-20	Rubber antenna	433M	3	210mm	-	SMA-J	Bendable rubber, omnidirectional antenna
TX433-JK-11	Rubber antenna	433M	2.5	110mm	-	SMA-J	Bendable rubber, omnidirectional antenna
TX433-XP-200	Sucker antenna	433M	4	19cm	200cm	SMA-J	Sucker antenna, high gain
TX433-XP-100	Sucker antenna	433M	3.5	18.5cm	100cm	SMA-J	Sucker antenna, high gain
TX433-XPH-300	Sucker antenna	433M	6	96.5cm	300cm	SMA-J	Vehicle-mounted sucker antenna, ultra-high gain
TX433-JZG-6	Rubber antenna	433M	2.5	52mm	-	SMA-J	Ultra-short straight, omnidirectional antenna

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TX433-JZ-5	Rubber antenna	433M	2	52mm	-	SMA-J	Ultra-short straight, omnidirectional antenna
TX490-XP-100	Sucker antenna	490M	50	12cm	100cm	SMA-J	Sucker antenna, high gain
TX490-JZ-5	Rubber antenna	490M	50	50mm	-	SMA-J	Ultra-short straight, omnidirectional antenna

Revision history

Version	Revision date	remark	Reviser
1.0	2021-4-19	initial version	Linson
1.1	2021-6-23	Error correction	Linson
1.2	2024-8-23	Error correction	LAU

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