E49-400M20S4

CMT2300A 433/470MHz SMD UART Wireless Module



Chengdu Ebyte Electronic Technology Co.,Ltd.

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Features

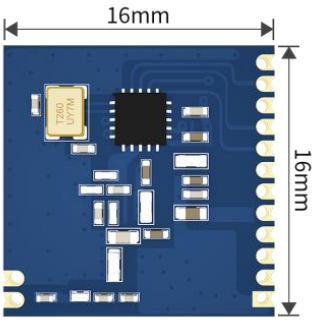
- The measured communication distance can reach 2.5km;
- Maximum transmission power of 100mW, software multi-level adjustable;
- Support the global license-free ISM 433MHz band;
- Support the data transmission rate of 0.5Kbps～300Kbps;
- Support low power consumption mode, suitable for battery applications;
- Support GFSK modulation method and OOK and (G)MSK;
- Support 1.8V~3.6V power supply;
- Industrial grade standard design, support -40 ~ 85 °C for working over a long time;
- Support stamp interface, good for secondary development and integration.

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1 Introduction

1.1 Brief Introduction



E49-400M20S4 is a cost-efective wireless data transmission module launched by Chengdu Ebyte. It is a pure hardware module based on CMT2300A.

E49-400M20S4 supports a maximum transmit power of 20dBm, and users can set a lower output power to save power consumption. The module works in the 433/470MHz frequency band. With small size and low power consumption. Since this module is a pure RF transceiver module, it needs to be driven by an MCU or a dedicated SPI debugging tool.

1.2 Application

- Smart home and industrial sensors, etc;
- Security system, positioning system;
- Wireless remote control, UAV;
- Wireless game remote control;
- Healthcare products;
- Wireless voice, wireless headset;
- Automotive industry applic ations.

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2 Specification and parameter

2.1 Limit parameter

Main parameter	Performance		Remark
	Min.	Max.	
Power supply（V）	0	3.6	Voltage over 3.6V will cause permanent damage to module
Blocking power（dBm）	-	10	Chances of burn is slim when modules are used in short distance
Operating temperature（℃）	-40	+85	Industrial

2.2 Operating parameter

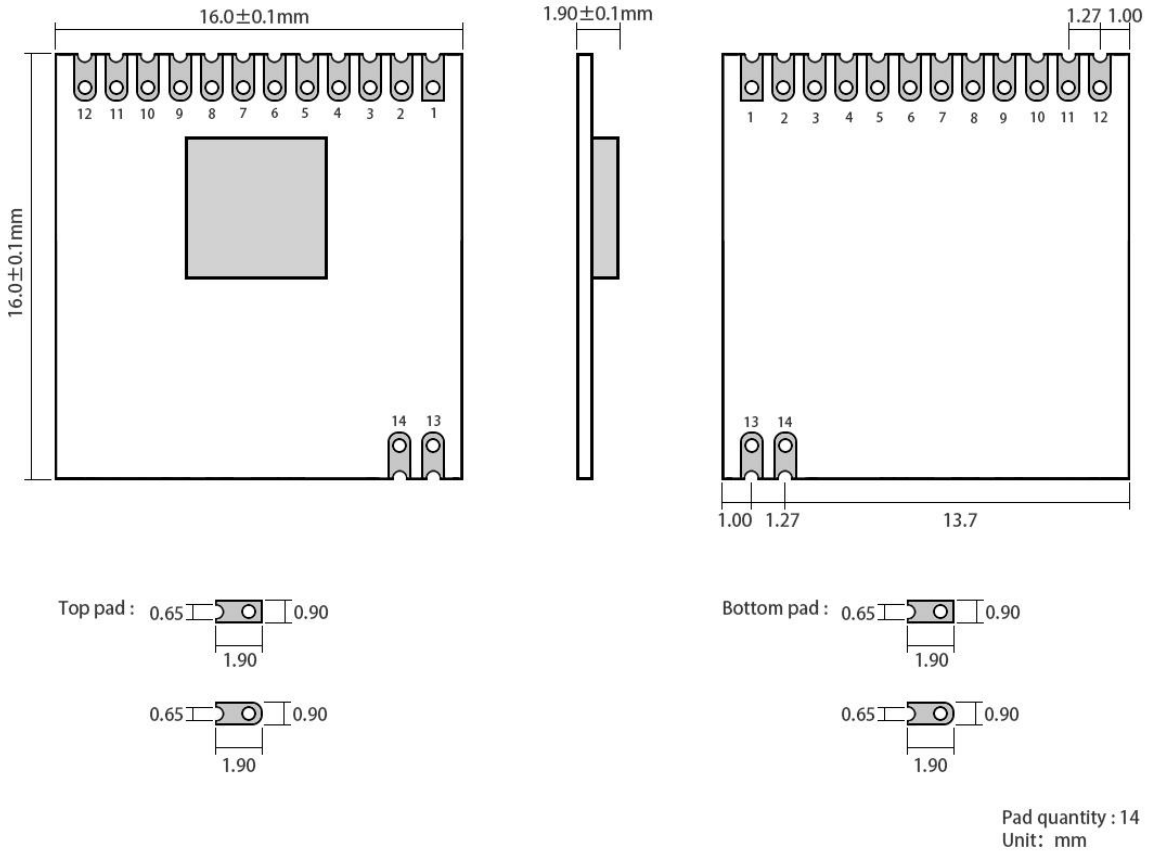
Main parameter		Performance			Remark
		Min	Type	Max	
Operating voltage（V）		1.8	3.3	3.6	Over 3.6V may permanently burn the module
Communication level（V）		-	3.3	-	-
Operating temperature（℃）		-40	-	+85	Industrial grade
Operating frequency（MHz）		410	433	510	-
Power Consump - tion	TX current（mA）	-	85	-	-
	RX current（mA）	-	8.5	-	-
	Sleep current （μA）	-	1	-	DutyCycle=OFF,300nA;DutyCycle=ON,800nA
Max TX power（dBm）		-	20	-	-
Receiving sensitivity（dBm）		-116	-117	-118	Air data rate is 1.2kbps

Main parameter	Description	Remark
Reference distance	2500m	Clear and open, antenna height 2.5 meters, air rate 2.4kbps
Crystal Oscillator	26MHz	-
Package	SMD	-
Interface	SPI	3 lines SPI
Size	16*16mm	-
RF interface	Stamp	Equivalent impedance is about 50Ω

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3 Size and pin definition



Pin No.	Item	Direction	Description
1	GND	-	Ground wire, connect to power reference ground
2	GPIO1	Input/Output	See CMT2300A manual for details
3	GPIO2	Input/Output	See CMT2300A manual for details
4	GPIO3	Input/Output	See CMT2300A manual for details
5	VCC	Input/Output	Power supply, 1.8V - 3.6V
6	NC	-	-
7	SDIO	Input/Output	SPI data pins
8	SLCK	Input	SPI clock pin
9	CSB	Input	Chip seleet for SPI access register
10	NC	-	-
11	FCSB	Input	Chip select for SPI access to FIFO
12	NC	-	-
13	ANT	-	Antenna interface
14	GND	-	Ground wire, connect to power reference ground

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4 Basic operation

4.1 Hardware design

- It is recommended to use a DC stabilized power supply. The power supply ripple factor is as small as possible and the module needs to be reliably grounded;
- Please pay attention to the correct connection of the positive and negative poles of the power supply, reverse connection may cause permanent damage to the module;
- Please check the power supply to ensure that between the recommended supply voltage, if exceeding the maximum, the module will be permanently damaged;
- Please check the stability of the power supply. Voltage can not 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, so the whole machine is beneficial for long-term stable operation;
- The module should be as far away as possible from the power supply, transformers, high-frequency wiring and other parts with large electromagnetic interference;
- Bottom Layer High-frequency digital routing, high-frequency analog routing, and power routing must be avoided under the module. If it is necessary to pass through the module, assume that the module is soldered to the Top Layer, and the copper is spread on the Top Layer of the module contact part(well grounded), it must be close to the digital part of the module and routed in the Bottom Layer;
- Assuming the module is soldered or placed over the Top Layer, it is wrong to randomly route over the Bottom Layer or other layers, which will affect the module's spurs and receiving sensitivity to varying degrees;
- It is assumed that there are devices with large electromagnetic interference around the module that will greatly affect the performance. It is recommended to keep them away from the module according to the strength of the interference. If necessary, appropriate isolation and shielding can be done;
- Assume that there are traces with large electromagnetic interference (high-frequency digital, high-frequency analog, power traces) around the module that will greatly affect the performance of the module. It is recommended to stay away from the module according to the strength of the interference.If necessary, appropriate isolation and shielding can be done;
- Try to stay away from some physical layers such as TTL protocol at 2.4GHz , for example: USB3.0;
- The mounting structure of antenna has a great influence on the performance of the module. It is necessary to ensure that the antenna is exposed, preferably vertically upward. When the module is mounted inside the case, use a good antenna extension cable to extend the antenna to the outside;
- The antenna must not be installed inside the metal case, which will cause the transmission distance to be greatly weakened.

4.1 Programming

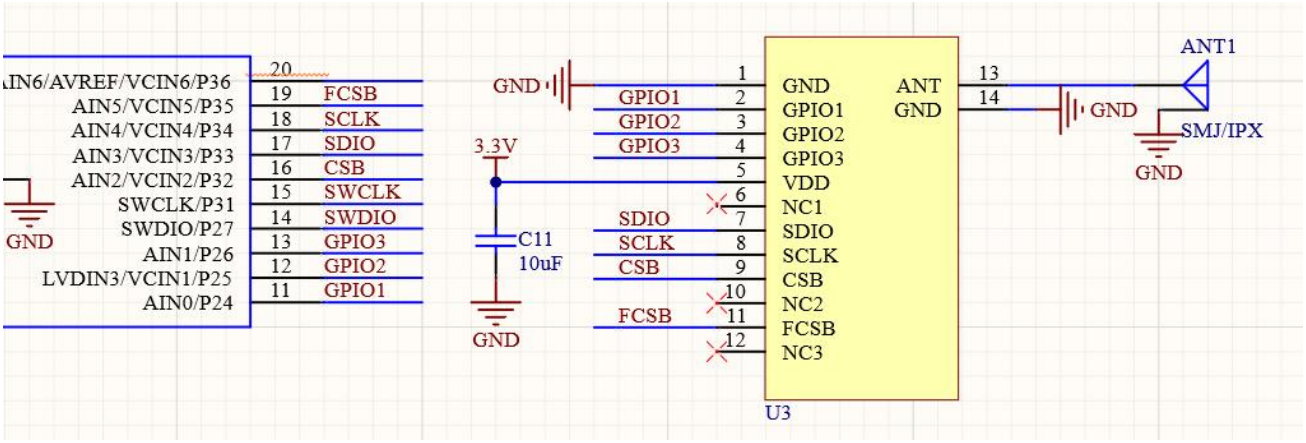
- The chip of this module is CMT2300A, and its driving mode is SPI, and users can operate according to the CMT2300A chip Datasheet;
- GPIO1/GPI02/GPI03 are general-purpose I/O ports, see CMT2300A Datasheet for details

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5 Basic Circuit Diagram

5.1 Hardware design and circuit schematic diagram



6 FAQ

6.1 Communication range is too short

- The communication distance will be affected when obstacle exists;
- Data lose rate will be affected by temperature, humidity and co-channel interference;
- The ground will absorb and reflect wireless radio wave, so the performance will be poor when testing near ground;
- Sea water has great ability in absorbing wireless radio wave, so performance will be poor when testing near the sea;
- The signal will be affected when the antenna is near metal object or put in a metal case;
- Power register was set incorrectly, air data rate is set as too high (the higher the air data rate, the shorter the distance);
- The power supply low voltage under room temperature is lower than 2.5V, the lower the voltage, the lower the transmitting power;
- Due to antenna quality or poor matching between antenna and module.

6.2 Module is easy to damage

- Please check the power supply source, ensure it is within the recommended supply voltage, voltage higher than the Max will damage the module;
- Please check the stability of power source, the voltage cannot fluctuate too much;
- Please make sure antistatic measure are taken when insalling and using high frequency devices have electrostatic susceptibility;

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- Please ensure the humidity is within limited range, some parts are sensitive to humidity
- Please avoid using modules under too high or too low temperature.

6.3 BER(Bit Error Rate) is high

- There are co-channel signal interference nearby, please be away from interference sources or modify frequency and channel to avoid interference;
- The clock waveform on SPI is not standard, check whether there is interference on the SPI line, and the SPI bus line should not be too long;
- Poor power supply may cause messy code. Make sure that the power supply is reliable;
- The extension line and feeder quality are poor or too long, so the bit error rate is high.

7 Guide for Soldering work

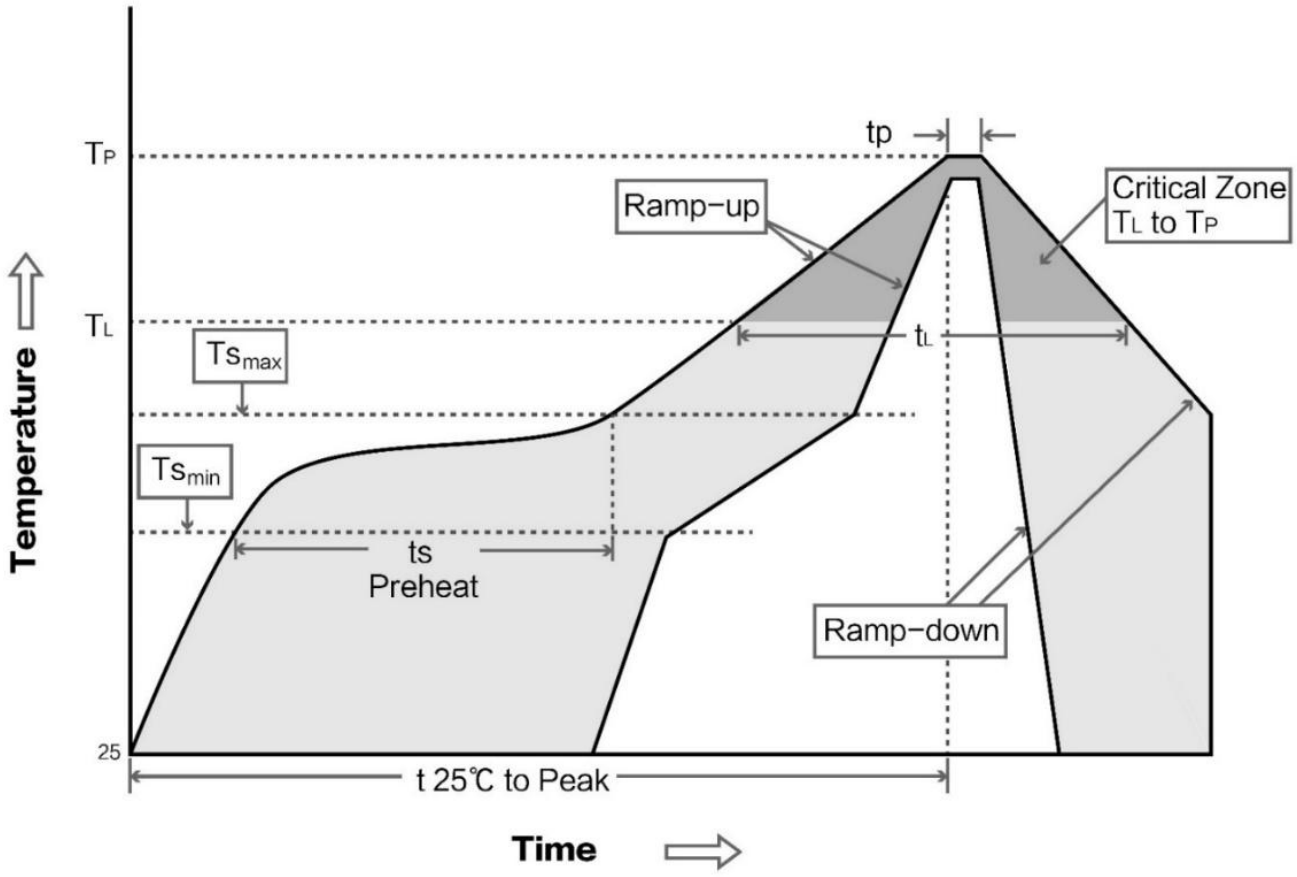
7.1 Reflow soldering temperature

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

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7.2 Reflow soldering curve



8 E49 series

Model No.	IC	Frequency	Tx power	Distance	Size	Package	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
E49-400M20S	CMT2300A	410~450MHz	20	2.5	20*14	SMD	SPI

9 Antenna recommendation

9.1 Recommendation

The antenna is an important role in the communication process. A good antenna can largely improve the communication system. Therefore, we recommend some antennas for wireless modules with excellent performance and reasonable price.

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Model No.	Type	Frequency	Gain	Size	Cable	Interface	Function feature
		Hz	dBi	mm	cm		
TX433-NP-4310	Flexible Antenna	433M	2	43.8*9.5mm	-	SMA-J	FPC soft antenna
TX433-JW-5	Rubber antenna	433M	2	50mm	-	SMA-J	Flexible & omnidirectional
TX433-JWG-7	Rubber antenna	433M	2.5	75mm	-	SMA-J	Flexible & omnidirectional
TX433-JK-20	Rubber antenna	433M	3	210mm	-	SMA-J	Flexible & omnidirectional
TX433-JK-11	Rubber antenna	433M	2.5	110mm	-	SMA-J	Flexible & omnidirectional
TX433-XP-200	Sucker antenna	433M	4	19cm	200cm	SMA-J	High gain
TX433-XP-100	Sucker antenna	433M	3.5	18.5cm	100cm	SMA-J	High gain
TX433-XPH-300	Sucker antenna	433M	6	96.5cm	300cm	SMA-J	High gain
TX433-JZG-6	Rubber antenna	433M	2.5	52mm	-	SMA-J	Short straight & omnidirectional
TX433-JZ-5	Rubber antenna	433M	2	52mm	-	SMA-J	Short straight & omnidirectional
TX490-XP-100	Sucker antenna	490M	50	12cm	100cm	SMA-J	High gain
TX490-JZ-5	Rubber antenna	490M	50	50mm	-	SMA-J	Short straight & omnidirectional

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Revision history

Version	Date	Description	Issued by
1.0	2020-12-09	Initial version	Linson
1.1	2021-6-23	Error correction	Linson
1.2	2025-7-22	Error correction	Hao

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