E49-900M20S-CE User manual

868MHz/915MHz SMD wireless modules



Chengdu Ebyte Electronic Technology Co.,Ltd.

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Chapter 1 Introduction

1.1 Brief introduction



E49-900M20S-CE is a cost-effective wireless data transmission module launched by Chengdu Ebyte. It is A pure hardware module based on CMT2300A.

E49-900M20S-CE Supports the maximum transmission power of 20dBm, users can set a lower output power , thus saving power consumption.The module works in the 850MHz ~ 930MHz frequency band, including the commonly used 868MHz and 915MHz frequency band.

Since this module is a pure RF transceiver module, using SPI interface, needs MCU driver.

1.2 Features

- The measured communication distance can reach 2.5km；
- Maximum transmission power of 20dBm，software multi-level adjustable；
- Supports ISM 868MHz/915MHz band；
- Supports 0.5Kbps～300Kbps transmission rate；
- Supports low power mode, suitable for battery；
- Supports GFSK modulation mode, OOK & (G)MSK；
- Supports 2.6V～3.6V power supply；
- Industrial grade standard design, support -40 ~ 85 °C for working over a long time；
- IPEX and stamp hole optional，good for secondary development and integration.

1.3 Application

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

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Chapter 2 Specification and parameters

2.1 Limit parameter

Chart 2-1 limit paremeters

Main parameters	Performance		Remark
	Min	Max	
Power supply（V）	0	3.6	Voltage over 3.6V will cause permanent damage to module
Operating temperature（℃）	-40	+85	Industrial-grade

2.2 Operating parameter

Chart 2-2 Operating parameters

Main parameters		Performance			Remark
		Min	Type	Max	
Power supply（V）		1.8	3.3	3.6	Voltage over 3.6V will cause permanent damage to module
Communication level（V）		-	3.3	-	For 5V TTL, it may be at risk of burning down
Operating temperature（℃）		-40	-	+85	Industrial grade
Operating frequency（MHz）		850	868	930	-
Power Consump - tion	TX current（mA）	-	75	-	@TX power 20dBm
	RX current（mA）	-	8.5	-	-
	Sleep current（nA）	300	300	800	-
Max TX power（dBm）		-	20	-	-
Receiving sensitivity（dBm）		-116	-117	-118	@Air data rate is 1.2kbps

Main parameters	Description	Remark
Reference distance	3km	Test condition：clear and open area, antenna height: 2.5m，air data rate 2.4kbps
Crystal Oscillator	26MHz	-
Package	SMT	-
Communication interface	SPI	-
Size	20*14mm	-
Antenna	IPEX/stamp hole	50 ohm impedance
Weight	1.2±0.1g	-

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Chapter 3 Size and pin definition

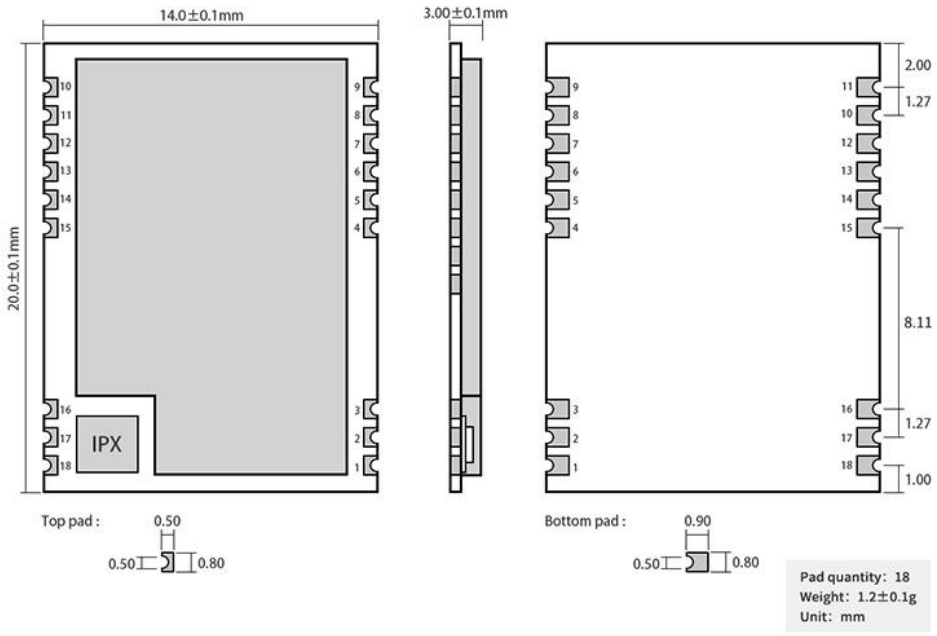


figure 3-1 Size and pin definition

Chart 3-1 pin definition

Pin No.	Item	Direction	Description
1	GND	-	Ground
2	GND	-	Ground
3	GND	-	Ground
4	GND	-	Ground
5	GPIO1	DI/O	Configurable multi-function IO port（see CMT2300A manual for details）
6	GPIO2	DI/O	Configurable multi-function IO port（see CMT2300A manual for details）
7	GPIO3	DI/O	Configurable multi-function IO port（see CMT2300A manual for details）
8	VCC	-	Power supply +3.3V
9	GND	-	Ground
10	GND	-	Ground
11	SCLK	DI	SPI clock pin
12	SDIO	DI/O	SPI data pin
13	CSB	DI	SPI register accesser
14	FCSB	DI	SPI FIFO accesser
15	GND	-	Ground
16	GND	-	Ground
17	ANT	-	RF module stamp hole interface，impedance 50Ω
18	GND	-	Ground

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Chapter 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.

4.2 Programming

- The core of this module is CMT2300A，its driving method is SPI，the user can operate according to the CMT2300A chip manual；
- GPIO1/GPIO2/GPIO3 are general IO port, see CMT2300A manual for details；

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Chapter 5 Basic application

5.1 Basic circuit

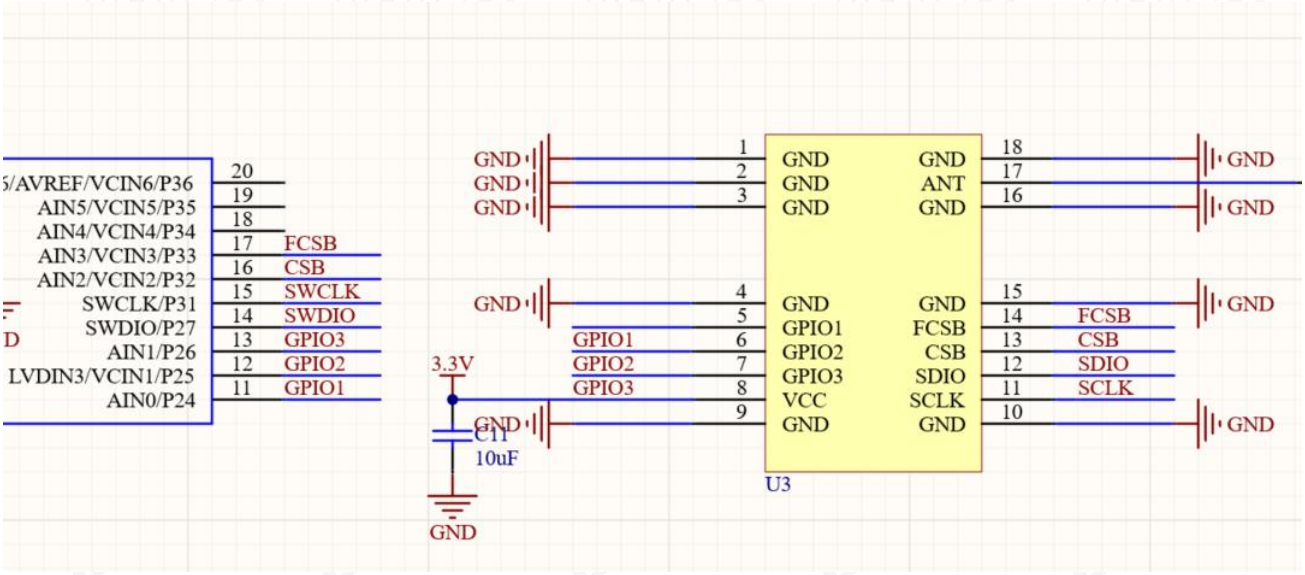


Figure 5-1 circuit

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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 between recommends, voltage higher than the maximum will damage the module;
- Please check the stability of power source, the voltage cannot fluctuate too much;
- Please make sure anti-static measure are taken when installing and using, high frequency devices have electrostatic susceptibility;
- 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;
- SPI clock waveform is not standard, check whether there is interference on the SPI line, SPI bus wiring 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.

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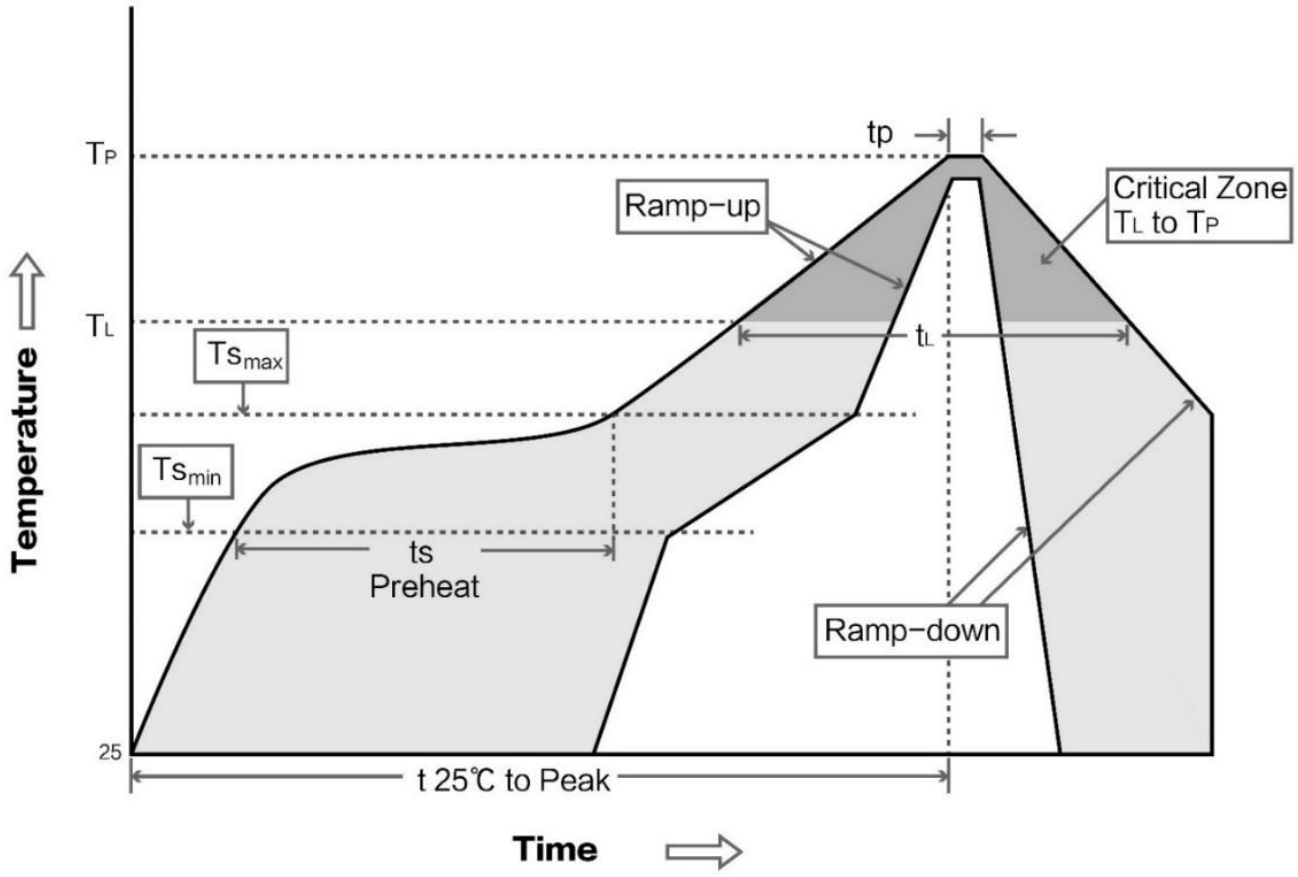
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7 Welding instruction

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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8 Related products

Product No.	Chip	Frequency	Tx power	Distance	Size	Package	Interface
		Hz	dBm	km	mm		
E49-400M20S	CMT2300A	410~510MHz	20	2.5	20*14	SMT	SPI
E49-400M20S4	CMT2300A	410~510MHz	20	2.5	16*16	SMT	SPI
E49-400M30S	CMT2300A	410~510MHz	30	5.5	24*38.5	SMT	SPI

9 Antenna guide

9.1 Antenna 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.

Model No.	Type	Frequency	Gain	Size	Cable	Interface	Function feature
		Hz	dBi	mm	cm		
TX868-JZLW-15	Rubber antenna	868M	3	165	-	IPEX-1	Rubber antenna,Omni-directional antenna
TX915-JZLW-15	Rubber antenna	915M	3	165	-	IPEX-1	Rubber antenna,Omni-directional antenna
TX915-FPC-4510	flexible antenna	915M	2	130	-	IPEX	flexible antenna

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1.0	2021-5-31	Initial version	Linson

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