E01C-2G4M11S Product Specifications

Ci24R1 2.4GHz 12mW SPI SMD Wireless Module

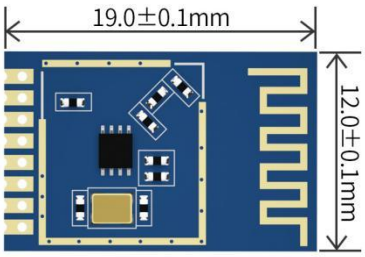


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Ⅰ Introduction

1.1 Introduction



E01C-2G4M11S is a small size, 2.4GHz SMD wireless module with PCB antenna based on the core of Nanjing CSM Ci24R1, which uses industrial grade high precision 16MHz crystal.

Since E01C-2G4M11S is pure RF transceiver module, it needs to use MCU driver or special SPI debugging tool.

1.2 Features

- Maximum transmit power of 11dBm, which can meet the battery power and greatly expand the communication distance.
- Communication distances of up to 120m under ideal conditions.
- Support for the global license-free ISM 2.4 GHz band.
- Support for 2 Mbps, 1 Mbps and 250 kbps air rate.
- 126 communication channels to meet the needs of multi-point communication, grouping, frequency hopping and other applications.
- Connection to MCU via 2-Pin hardware SPI interface at 0 to 10 Mbps.
- Professional RF shield, anti-interference and anti-static.
- Industrial grade standard design, supporting long time use at -40 to +85° C.
- Self-contained PCB onboard antenna, no need for external antenna.

1.3 Application Scenarios

- Wearable devices.
- Smart homes and industrial sensors, etc..
- Security systems, positioning systems.
- Wireless remote control, drones.
- Wireless game remote controls.
- Health care products.
- Wireless voice, wireless headphones.
- Automotive industry applications.

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Ⅱ Specification parameters

2.1 Limit parameters

Main parameters	Performance		Remard
	Min.	Max.	
Supply voltage (V)	0	3.6	Over 3.6V permanently burns out the module
Blocking Power (dBm)	-	-10	The probability of burning is small when used in close proximity
Operating temperature (℃)	-40	85	

2.2 Working parameters

Main parameters		Performance			Remark
		Min.	Typical	Min.	
Operating voltage (V)		2.1	3.3	3.6	≥3.3V ensures output power
Communication level (V)			3.3		Risk of burnout with 5V TTL
Operating temperature (℃)		-40	25	85	Industrial grade design
Operating Frequency Band (GHz)		2.4	-	2.525	Support ISM band
Power consumption	Emission current (mA)	-	46	-	Instantaneous Power Consumption, 11dBm
	Receiving current (mA)	-	20	-	
	Sleeping current (μA)	-	2	-	Software shutdown
Maximum transmit power (dBm)		10.5	11	11.5	Software setup, chip built-in PA
Receiving Sensitivity (dBm)		-80	-84	-90	Different air speed, different sensitivity
Air Rate (bps)		250k	250k	2M	User configurable

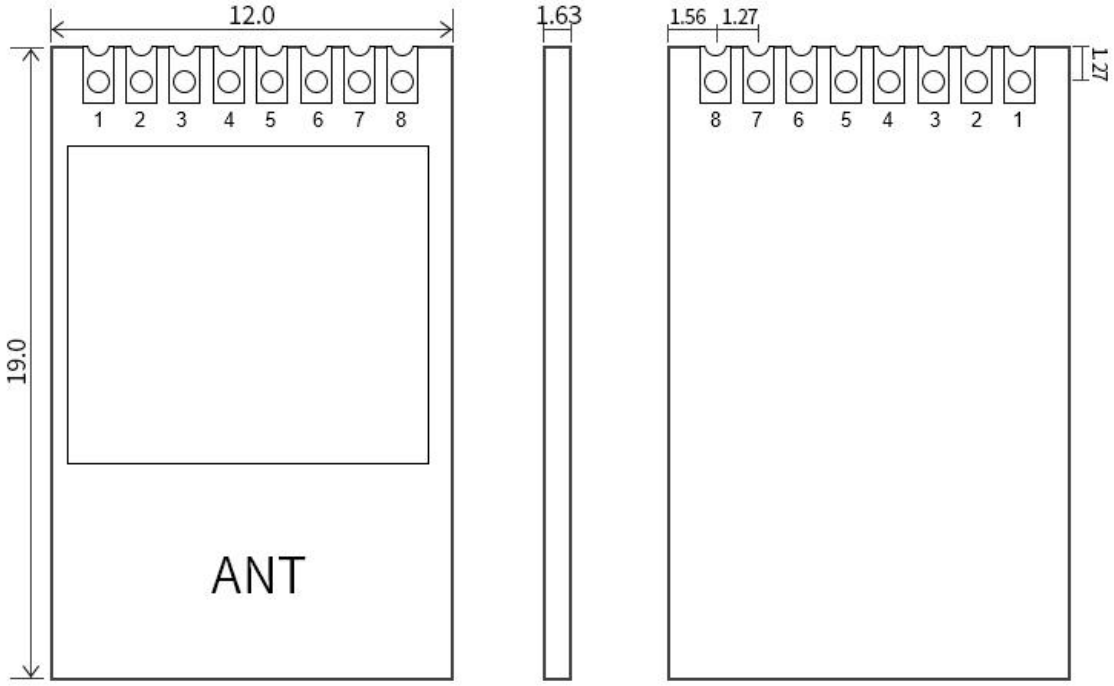
Main parameters	Description	Remark
Reference Distance	100m	250kbps Clear and open environment, air rate 250kbps
FIFO	32Byte	Maximum length of single transmission
Crystal Frequency	16MHz	
Modulation mode	GFSK	
Packaging method	SMD	
Interface method	Half hole 1.27mm	

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Communication Interface	SPI	0-10Mbps
Dimension	19*12mm	On-board PCB antenna included
Antenna Interface	PCB antenna	Characteristic impedance approx. 50 Ω

Ⅲ Mechanical dimensions and pin definition



Pin No.	Pin Name	Pin Direction	Pin Usage
1	VCC	--	Power supply positive: 2.1v~3.6v
2	NC	--	Empty
3	CSN	Input	SPI slice selection
4	SCK	Input	SPI Clock
5	DATA	Input/Output	Data input / data output / interrupt signal
6	NC	--	Empty
7	NC	--	Empty
8	GND	--	Power supply negative

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Ⅳ Basic operation

4.1 Hardware Design

- Recommend using a DC regulated power supply to power the module with as small a ripple coefficient as possible, and the module needs to be reliably grounded.
- Please pay attention to the correct connection of the positive and negative terminals of the power supply, as a reversed connection may cause permanent damage to the module.
- Please check the power supply to ensure that it is between the recommended supply voltage, if it exceeds the maximum value it may cause permanent damage to the module.
- Please check the stability of the power supply, the voltage should not fluctuate significantly and frequently.
- When designing the power supply circuit for the module, it is often recommended to retain more than 30% margin to have the whole machine conducive to long-term stable operation.
- modules should be as far away as possible from the power supply, transformers, high-frequency alignments and other parts of the electromagnetic interference.
- High-frequency digital alignment, high-frequency analog alignment, power supply alignment must be avoided below the module, if it is necessary to pass below the module, assuming that the module is soldered in the Top Layer, in the module contact part of the Top Layer pavement copper (all pavement copper and good grounding), must be close to the digital part of the module and alignment in the Bottom Layer.
- Assuming that the module is soldered or placed in the Top Layer, it is also wrong to run wires randomly in the Bottom Layer or other layers, which will affect the spurious and reception sensitivity of the module to varying degrees.
- Assuming that there are large electromagnetic interference devices around the module will also greatly affect the performance of the module, according to the strength of the interference is recommended to be properly away from the module, if the situation allows the appropriate isolation and shielding.
- Assuming that there are large electromagnetic interference alignments around the module (high-frequency digital, high-frequency analog, power supply alignments) 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, and if the situation permits, appropriate isolation and shielding can be done.
- communication line if the use of 5V level, must be connected in series with 1k-5.1k resistors (not recommended, there is still a risk of damage).
- try to stay away from some of the physical layer is also 2.4GHz TTL protocol, for example: USB3.0.
- Antenna mounting structure has a big impact on the module performance, make sure the antenna is exposed, preferably vertically up. When the module is installed inside the case, you can use a high quality antenna extension cable to extend the antenna to the outside of the case.
- The antenna must not be installed inside the metal case, it will cause the transmission distance to be greatly weakened.
- On-board PCB antenna should try to avoid conductors or other sources of interference.

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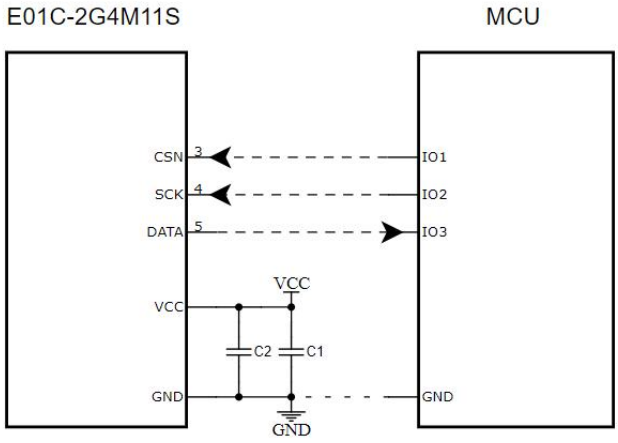
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4.2 Software Writing

- The module is connected to the user's board, and the microcontroller is used to communicate with the module via SPI, and its control registers and transceiver cache are operated via SPI commands to complete the wireless data transmission and reception function; please refer to the latest Ci24R1 datasheet for the timing of the module register reading and writing operations.
- DATA/IRQ for SPI data pins and interrupt pins, that is, including SPI functions and chip interrupt function, you can use this pin to achieve SPI communication, wake up the microcontroller, to achieve fast response, etc.; IRQ function can be used to obtain the interrupt status, or SPI query to obtain the interrupt status (not recommended, not conducive to the overall power consumption, and the efficiency of the bottom) .

V Basic Applications

5.1 Basic Circuit



VI Frequently Asked Questions

6.1 Unsatisfactory transmission distance

- A corresponding attenuation of communication distance when linear communication barriers exist.
- Temperature, humidity, and co-channel interference, which can lead to higher communication packet loss rates.
- The ground absorbs and reflects radio waves, and the test effect is poor near the ground.
- The sea has a very strong ability to absorb radio waves, so the seaside test effect is poor.
- metal objects near the antenna, or placed in a metal shell, signal attenuation will be very serious.
- Wrong setting of power register, too high setting of air rate (the higher the air rate, the closer the distance).
- The low voltage of power supply at room temperature is lower than the recommended value, the lower the voltage

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the less power is generated.

- The use of antenna and module match the degree of poor or antenna itself quality problems.

6.2 Module is vulnerable to damage

- Please check the power supply to ensure that it is between the recommended supply voltages, as exceeding the maximum will cause permanent damage to the module.
- Please check the stability of the power supply, the voltage should not fluctuate significantly and frequently.
- Please ensure that the installation and use process anti-static operation, high-frequency devices electrostatic sensitivity.
- Please ensure that the installation and use of the process of humidity should not be too high, some components for humidity-sensitive devices.
- If there is no special demand is not recommended to use at too high or too low temperature.

Ⅶ Welding work instruction

7.1 Reflow 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）	Minimum preheating temperature	100℃	150℃
Preheat temperature max (Tsmax)	Maximum preheating temperature	150℃	200℃
Preheat Time (Tsmin to Tsmax)(ts)	Warm-up time	60-120 sec	60-120 sec
Average ramp-up rate(Tsmax to Tp)	Average rise rate	3℃/second max	3℃/second max
Liquidous Temperature (TL)	Liquid phase temperature	183℃	217℃
Time（tL）Maintained Above（TL）	Time above the liquid phase line	60-90 sec	30-90 sec
Peak temperature（Tp）	Peak temperature	220-235℃	230-250℃
Aveage ramp-down rate（Tp to Tsmax）	Average decline rate	6℃/second max	6℃/second max
Time 25℃ to peak temperature	Time from 25° C to peak temperature	6 minutes max	8 minutes max

6.3 BER is too high

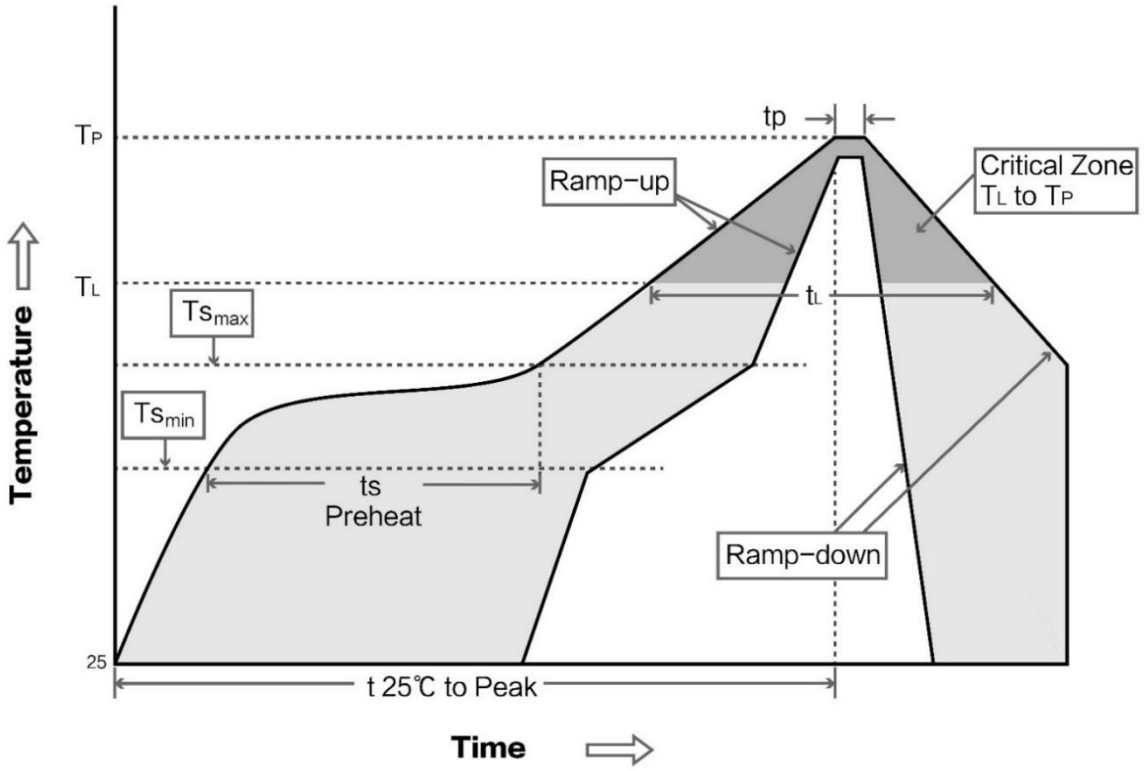
- There is interference from the same frequency signal nearby, stay away from the interference source or modify the frequency and channel to avoid interference.
- The clock waveform on the SPI is not standard, check whether there is interference on the SPI line, and the SPI bus alignment should not be too long.

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- Unsatisfactory power supply may also cause garbled code, be sure to ensure the reliability of the power supply.
- poor quality or too long extension lines or feeders may also cause high BER.

7.2 Reflow Curve Chart



Ⅷ Related Models

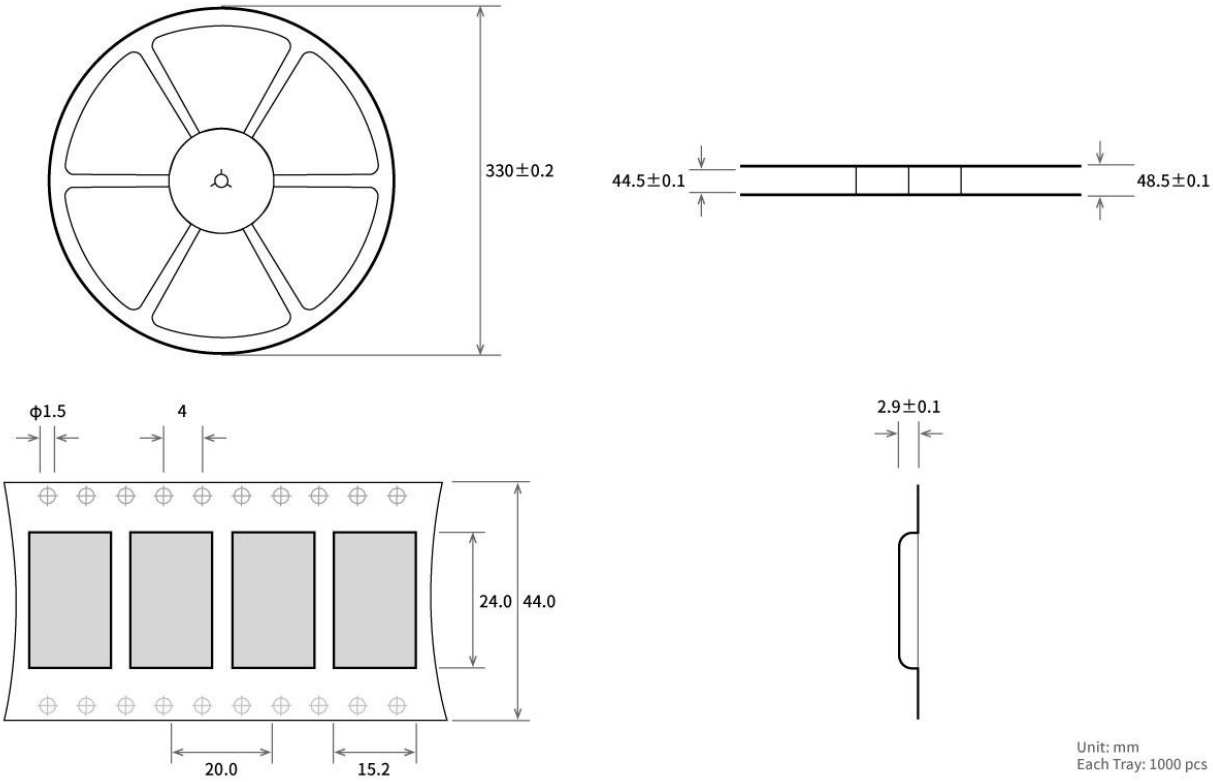
Module Model	Chip	Carrier frequency	Transmitting power	Communication distance	Package form	Antenna Form
		Hz	dBm	m		
E01-ML01S	nRF24L01+	2.4G	0	100	SMD	PCB
E01-ML01D	nRF24L01+	2.4G	0	100	DIP	PCB
E01-ML01IPX	nRF24L01+	2.4G	0	200	SMD	IPEX
E01-2G4M13S	nRF24L01+	2.4G	13	800	SMD	PCB
E01-ML01SP2	nRF24L01+	2.4G	20	1800	SMD	PCB/IPEX
E01-ML01SP4	nRF24L01+	2.4G	20	2000	SMD	IPEX
E01-ML01DP4	nRF24L01+	2.4G	20	1800	DIP	PCB

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E01-ML01DP5	nRF24L01+	2.4G	20	2500	DIP	SMA-K
E01-2G4M27D	nRF24L01+	2.4G	27	5000	DIP	SMA-K
All models of E01 series wireless modules are interoperable						

Ⅸ Batch packing method



Revision History

Version	Revise Date	Revision Notes	Maintainers
1.0	2022-10-9	Initial Version	Yan

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