# E01C-2G4M27D Product Specification

Si24R1 2.4GHz 500mW SPI DIP Wireless Module

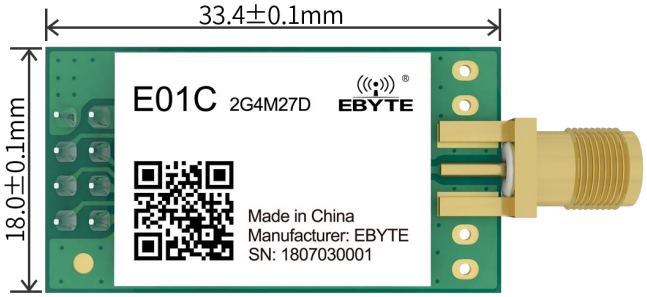


成都亿佰特电子科技有限公司
Chengdu Ebyte Electronic Technology Co.,Ltd.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

# Ⅰ Introduction

## 1.1 Introduction




The E01C-2G4M27D is a 2.4GHz DIP wireless module with a maximum transmit power of 500mW based on the domestic Si24R1.

The module has built-in power amplifier (PA) and low-noise amplifier (LNA), which makes the maximum transmitting power reach 500mW, and the communication stability is greatly improved compared with the products without power amplifier and low-noise amplifier, and the industrial-grade high-precision 16MHz crystal is used.

As the E01C-2G4M27D is a pure RF transceiver module, it needs to be driven by MCU or use a special SPI debugging tool.

## 1.2 Features

- Maximum transmitting power of 27dBm (about 500mW), adjustable at multiple software levels.
- Communication distance up to 5km under ideal conditions.
- Support for the global license-free ISM 2.4 GHz band.
- Support for 2Mbps, 1Mbps and 250kbps air rates.
- 125 communication channels to meet the needs of multi-point communication, packet, frequency hopping and other applications.
- Connection to MCU via SPI interface at 0 to 10Mbps.
- Professional RF shield, anti-interference and anti-static.
- Support 2.5 ~ 5.5V power supply, greater than 3.3V power supply can ensure the best performance.
- 4 fixing holes reserved for module welding and fixing.
- SMA-K male threaded internal hole, can easily connect coaxial cable or external antenna The enhanced ShockBurst.
- Enhanced ShockBurst, can interoperate with Nordic's nRF24L01+, nRF2401 and other 2.4G product series.

## 1.3 Application Scenarios

- 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.

Copyright ©2012–2019， Chengdu Ebyte Electronic Technology Co.,Ltd.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- Automotive industry applications.

# Ⅱ Specification parameters

## 2.1 Limit parameters

| Main Parameters | Performance | | Remark |
|---|---|---|---|
| | Min. value | Max. value | |
| Supply voltage (V) | 0 | 5.5 | Permanent module burnout above 5.5V |
| 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. value | Typical values | Max. value | |
| Operating voltage (V) | | 2.5 | 3.3 | 5.5 | ≥3.3V for guaranteed output power |
| Communication level (V) | | | 3.3 | | Risk of burnout with 5V TTL |
| Operating temperature (℃) | | -40 | - | 85 | Industrial grade design |
| Operating Frequency Band (GHz) | | 2.4 | - | 2.525 | ISM band support |
| Power consumption | Emission current@3.3V (mA) | | 490 | | Instantaneous power consumption |
| | Emission current @5.0V (mA) | | 390 | | Instantaneous power consumption |
| | Receiving current (mA) | | 22 | | |
| | Sleeping current (μA) | | - | | Low power mode not supported |
| Maximum transmitting power (dBm) | | 26.8 | 27 | 27.3 | |
| Reception sensitivity (dBm) | | -98.5 | -99 | -99.5 | Air rate of 250kbps |
| Air rate (bps) | | 250k | - | 2M | User-programmed control |

★ Does not support low-power mode, if low-power users can external power supply directly off.

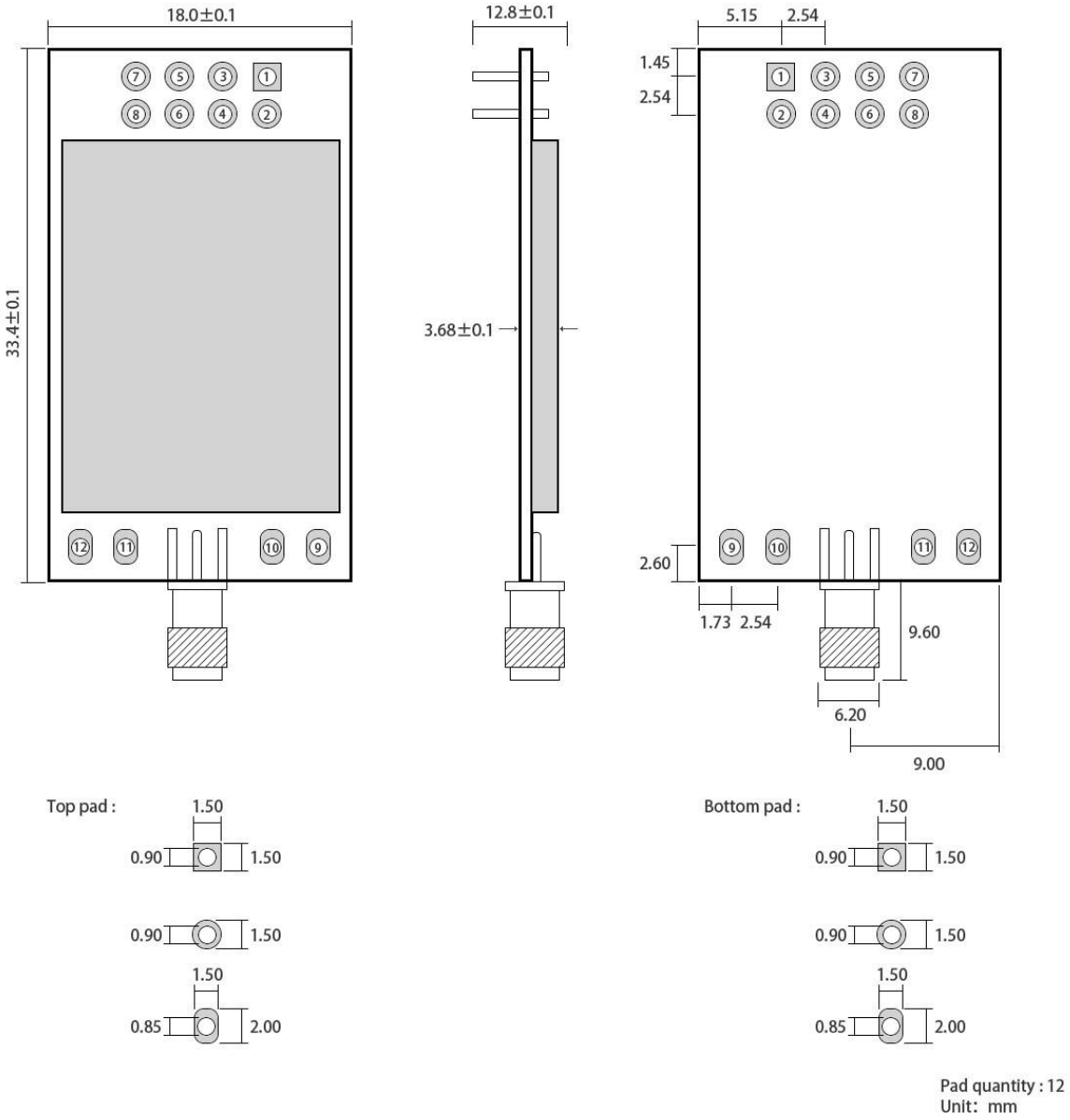
| Main parameters | Description | Remark |
|---|---|---|
| Reference Distance | 5000m | Clear and open, antenna gain 5dBi, antenna height 2.5m, air rate 250kbps |

Copyright ©2012–2019， Chengdu Ebyte Electronic Technology Co.,Ltd.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

| | | |
|---|---|---|
| FIFO | 32Byte | Maximum length of a single transmission |
| Crystal Frequency | 16MHz | |
| Modulation method | GFSK | |
| Packaging method | DIP | |
| Interface method | 2.54mm pin | |
| Communication Interface | SPI | 0～10Mbps |
| Antenna Interface | SMA-K | Equivalent impedance about 50Ω |
| Dimension | 18 * 33.4mm | SMA not included |
| Productweight | 5.0g | ±0.1g |

# Ⅲ Mechanical dimensions and pin definition




Copyright ©2012–2019， Chengdu Ebyte Electronic Technology Co.,Ltd.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

# 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 is a large electromagnetic interference device around the module will also greatly affect the performance of the module, according to the strength of the interference recommended appropriate away from the module, if the situation allows 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.

| Pin Serial Number | Pin Name | Pin Direction | Pin Usage |
|---|---|---|---|
| 1 | GND | | Ground wire, connected to power reference ground |
| 2 | VCC | | Power supply, to ensure full power output, it is recommended to use ≥ 3.3V power supply |
| 3 | CE | Input | Module control pins |
| 4 | CSN | Input | Module chip select pin to start an SPI communication |
| 5 | SCK | Input | Module SPI bus clock |
| 6 | MOSI | Input | Module SPI data input pins |
| 7 | MISO | Output | Module SPI data output pins |
| 8 | IRQ | Output | Module interrupt signal output, active low |
| 9 | GND | | Ground wire, connected to power reference ground |
| 10 | GND | | Ground wire, connected to power reference ground |
| 11 | GND | | Ground wire, connected to power reference ground |
| 12 | GND | | Ground wire, connected to power reference ground |

Copyright ©2012–2019, Chengdu Ebyte Electronic Technology Co.,Ltd.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

- 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 installation 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 housing, a high quality antenna extension cable can be used to extend the antenna to the outside of the housing.
- The antenna must not be installed inside the metal case, it will cause the transmission distance to be greatly weakened.

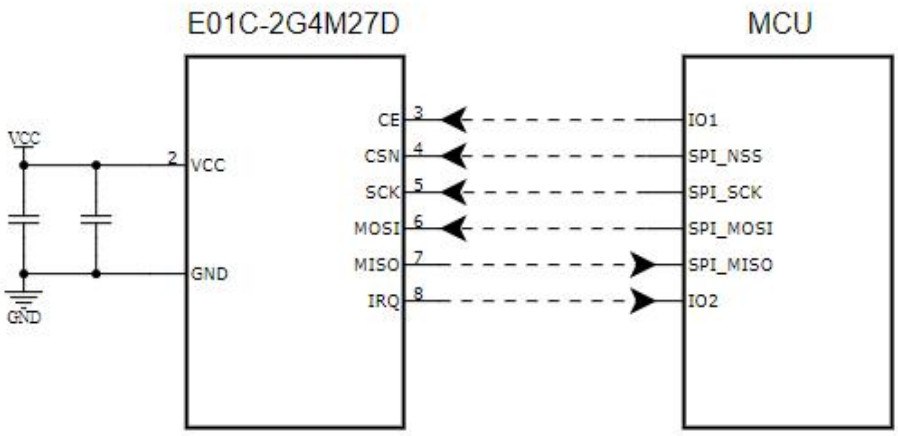
## 4.2 Software Writing

- This module is Si24R1, its driving method is exactly the same as nRF24L01+, users can operate in full accordance with the nRF24L01+ chip manual (see nRF24L01P manual for details).
- IRQ for the interrupt pin, you can use this pin to wake up the microcontroller, to achieve a fast response, etc.; can not be connected to the SPI query to obtain the interrupt status (not recommended, not conducive to the overall power consumption, and the bottom of the efficiency).
- CE can be connected high for a long time, but the module must first be set to POWER DOWN power-down mode when writing registers, and it is recommended that CE be controlled by a microcontroller pin.
- CE pin and LNA enable pin is connected, when CE = 1, LNA is turned on, when CE = 0, LNA is turned off. This operation matches the transceiver mode of the nRF24L01; that is, the user does not need to care about LNA operation at all.
- If the user needs to answer automatically, the CE pin must be kept high during the transmitting process, not high for more than 10us as mentioned in the nRF24L01+ manual. The correct operation is: CE = 1 trigger to send, know that the transmission is complete, only after the CE = 0, rather than 10us after the CE = 0, the reason is: L01 + send, immediately switch to receive mode, at this time, if CE = 0, it has turned off the LNA, will not be conducive to receive sensitivity.

Copyright ©2012–2019， Chengdu Ebyte Electronic Technology Co.,Ltd.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

# V Basic Circuit




# VI Frequently Asked Questions

## 6.1 Unsatisfactory transmission distance

- When a linear communication barrier exists, the communication distance is attenuated accordingly.
- 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.
- seawater 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, the 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 the power supply at room temperature is lower than the recommended value, the lower the voltage 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 process humidity should not be too high, some components are

Copyright ©2012–2019， Chengdu Ebyte Electronic Technology Co.,Ltd.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

humidity-sensitive devices.

- If there is no special demand is not recommended to use at too high or too low temperature.

## 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.
- Unsatisfactory power supply may also cause garbled code, be sure to ensure the reliability of the power supply.
- Poor quality or too long extension cable or feeder line may also cause high BER.

# Ⅶ Welding work instruction

This product is a direct plug-in module. When welding the module, it is important that the welding personnel work in accordance with the discharge specifications.

This product is electrostatic sensitive products, do not follow the specifications of welding modules may be permanent damage to the module.

# Ⅷ Related Model

| Module Model | Chip | Carrier frequency | Transmitting power | Communication distance | Package form | Antenna Form |
|---|---|---|---|---|---|---|
| | | Hz | dBm | m | | |
| E01C-ML01S | Si24R1 | 2.4G | 0 | 100 | SMD | PCB |
| E01C-ML01D | Si24R1 | 2.4G | 0 | 100 | DIP | PCB |
| E01C-ML01DP5 | Si24R1 | 2.4G | 20 | 2500 | DIP | SMA-K |
| E01C-ML01DP4 | Si24R1 | 2.4G | 20 | 1800 | DIP | PCB |
| E01C-ML01SP2 | Si24R1 | 2.4G | 20 | 1800 | SMD | PCB/IPEX |
| E01-2G4M27SX | nRF24L01+ | 2.4G | 20 | 2000 | SMD | IPEX |
| E01-ML01DP4 | nRF24L01+ | 2.4G | 20 | 1800 | DIP | PCB |
| E01-ML01DP5 | nRF24L01+ | 2.4G | 20 | 2500 | DIP | SMA-K |
| E01-2G4M27D | nRF24L01+ | 2.4G | 27 | 5000 | DIP | SMA-K |

Copyright ©2012–2019， Chengdu Ebyte Electronic Technology Co.,Ltd.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

# Ⅸ Antenna Guide

## 9.1 Antenna Recommendations

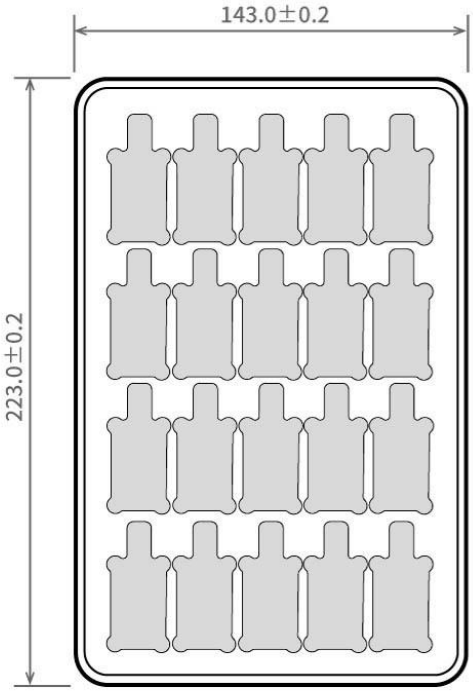
Antenna is an important role in the communication process, often poor quality antenna will have a great impact on the communication system, so we recommend some antennas as supporting our wireless module and more excellent performance and reasonable price.

| Product Model | Type | Frequency | Gain | Size | Feeders | Interface | Features |
|---|---|---|---|---|---|---|---|
| | | Hz | dBi | mm | cm | | |
| TX2400-NP-5010 | Flexible Antenna | 2.4G | 2.0 | 10x50 | - | IPEX | Flexible FPC Soft Antenna |
| TX2400-JZ-3 | Glue Stick Antenna | 2.4G | 2.0 | 30 | - | SMA-J | Ultra Short Straight, Omni-directional Antenna |
| TX2400-JZ-5 | Glue Stick Antenna | 2.4G | 2.0 | 50 | - | SMA-J | Ultra Short Straight, Omni-directional Antenna |
| TX2400-JW-5 | Glue Stick Antenna | 2.4G | 2.0 | 50 | - | SMA-J | Fixed bend, omni-directional antenna |
| TX2400-JK-11 | Glue Stick Antenna | 2.4G | 2.5 | 110 | - | SMA-J | Bendable glue stick, omni-directional antenna |
| TX2400-JK-20 | Glue Stick Antenna | 2.4G | 3.0 | 200 | - | SMA-J | Bendable glue stick, omni-directional antenna |
| TX2400-XPL-150 | Glue Stick Antenna | 2.4G | 3.5 | 150 | 150 | SMA-J | Small suction cup antenna, cost effective |

Copyright ©2012–2019， Chengdu Ebyte Electronic Technology Co.,Ltd.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

# X Batch packing method






Unit: mm
Each Layer: 20 pcs
Each Package: 5 layers

# Revision History

| Version | Revision Date | Revision Notes | Maintainer |
|---|---|---|---|
| 1.0 | 2022-10-9 | Initial Version | Yan |

Copyright ©2012–2019， Chengdu Ebyte Electronic Technology Co.,Ltd.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

# About us

Hotline: 4000-330-990
Tel: 028-61399028
Support: support@cdebyte.com
Website: https://www.cdebyte.com
Address: Building B5, No. 199, West District Avenue, High-tech West District, Chengdu City, Sichuan Province

成都亿佰特电子科技有限公司
Chengdu Ebyte Electronic Technology Co.,Ltd.

Copyright ©2012–2019， Chengdu Ebyte Electronic Technology Co.,Ltd.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000