# E34-2G4D11S Datasheet

## 2.4GHz TTL full-duplex wireless serial module



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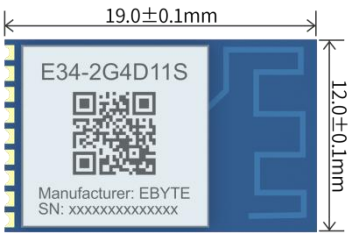
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# Chapter 1 Product Overview

## 1.1 Product Introduction

E34-2G4D11S is a wireless data transmission module that supports full-duplex communication, working in the 2.4~2.518GHz frequency band, TTL level output, using serial port for data transceiver and transmission, reducing none The threshold of line application.

The typical feature of E34-2G4D11S is high-speed transmission, which can




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achieve full-duplex characteristics (two-way simultaneous sending and receiving) under a variety of baud rates, unlimited packet length, support uninterrupted transmission, and support file transfer.

The module has data encryption and compression capabilities. The data transmitted by the module over the air is random, and the data interception is meaningless through a rigorous encryption and decryption algorithm. The data compression function has the probability of reducing the transmission time, reducing the probability of interference, and improving reliability and transmission efficiency.

## 1.2 Features and functions

- Supports full-duplex feature at baud rate up to 57600 (simultaneous sending and receiving in both directions);
- Support uninterrupted transmission, unlimited packet length;
- Support file transfer;
- Maximum transmit power 11dBm, software multi-stage adjustable;
- Supports worldwide license-free ISM 2 4GHz band;
- The air rate automatically adapts to the baud rate;
- Support advanced GFSK modulation mode;
- Support low power mode for battery applications;
- Support 2.5~3.6 V power supply, greater than 3.3V power supply can ensure the best performance;
- Industrial standard design, support -40 ~ +85 °C at long-term use;
- PCB onboard antenna, built-in antenna no need for external antenna.

## 1.3 Scenarios

- Wearable devices;
- Smart home and industrial sensors, etc.;
- Security system, positioning system;
- Wireless remote control, drone;
- Wireless gaming remote control;
- Healthcare products;
- Wireless voice, wireless headphones;
- Automotive applications.

# Chapter 2 Specifications

## 2.1 Limit parameters

| The main parameters | performance | | remark |
|---|---|---|---|
| | minimum | maximum | |
| Supply voltage (V). | 2.5 | 3.6 | Permanently burns modules over 3.6V |
| Blocking power (dBm). | - | 10 | The probability of burning at close range is small |
| Operating temperature (°C). | -40 | +85 | Industrial grade |

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## 2.2 Working parameters

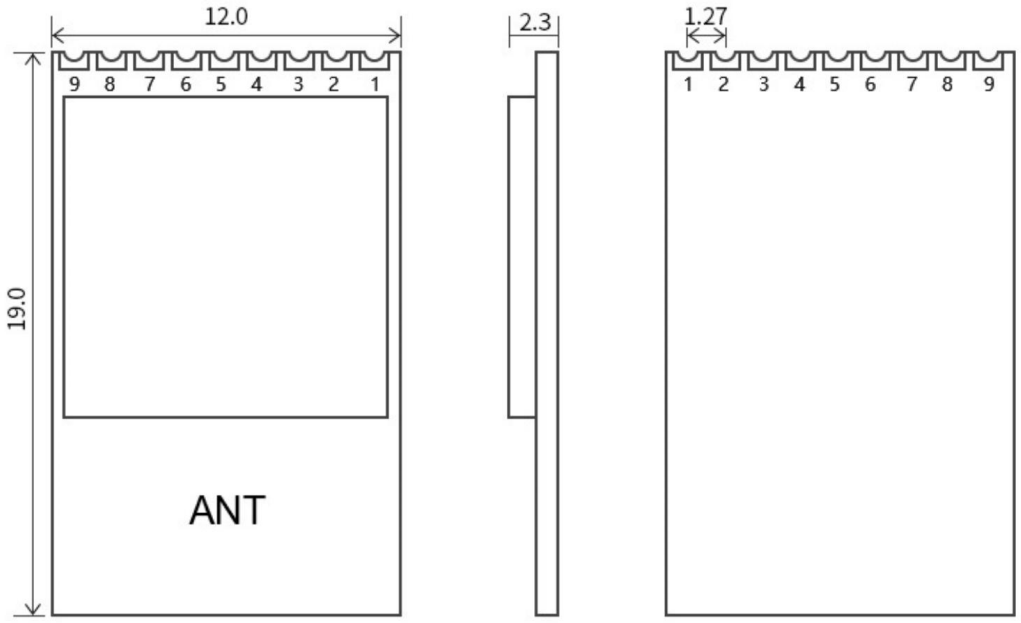
| The main parameters | | performance | | | remark |
|---|---|---|---|---|---|
| | | minimum | Typical value | maximum | |
| Operating voltage (V). | | 2.5 | 3.3 | 3.6 | ≥3.3V guaranteed output power |
| Communication level (V). | | | 3.3 | | |
| Operating temperature (°C). | | -40 | - | +85 | Industrial-grade design |
| Operating frequency band (MHz). | | 2400 | - | 2518 | ISM bands are supported |
| power consumption | Emission current (mA). | | 50 | | Instantaneous power consumption |
| | Receive current (mA). | | 23 | | |
| | Sleep current (μA). | | - | | The software shuts down, and the configuration mode is not sleep mode |
| Maximum transmit power (dBm). | | 10.5 | 11.0 | 11.5 | |
| Reception sensitivity (dBm). | | | -90 | | The air speed is 250kbps |
| Air rate (bps). | | - | Not adjustable | - | The software automatically optimizes and automatically adapts to the baud rate |

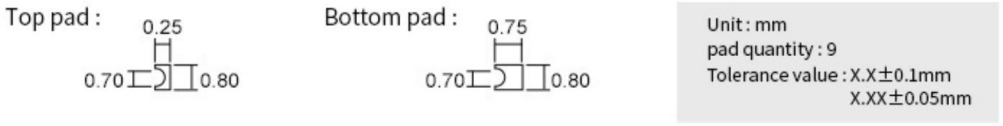
| The main parameters | description | remark |
|---|---|---|
| The reference distance | 130m | Sunny and open environment, antenna height of 2.5 meters, air speed 250kbps |
| Subcontracting | 29 Btye | Maximum length of a single send |
| Cache capacity | 2048 Btye | Unlimited package length |
| Modulation mode | GFSK | |
| Communication interface | UART serial port | TTL level |
| Encapsulation mode | SMD | |
| Interface mode | 1.27mm | |
| Dimensions | 12*19mm | |
| Antenna interface | PCB onboard antenna | The equivalent impedance is approximately 50Ω |

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# Chapter 3 Mechanical Dimensions and Pin Definitions



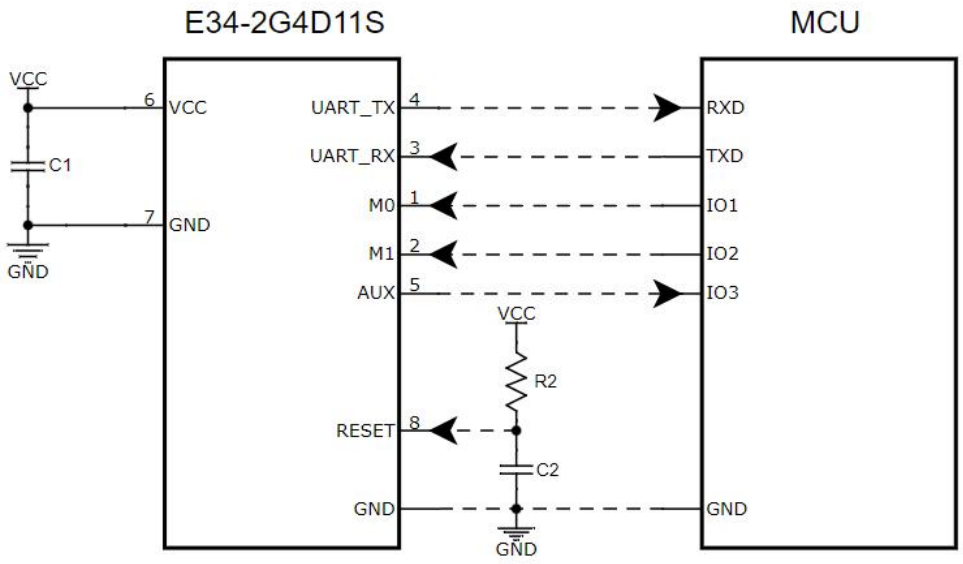




| Pin serial number | Pin name | Pin orientation | Pin use |
|---|---|---|---|
| 1 | M0 | Input (very weak pullup) | In conjunction with M1, the module is determined by 4 modes of operation (not dangling, if not used grounded). |
| 2 | M1 | Input (very weak pullup) | In conjunction with M0, the module is determined by the four modes of operation (not dangling, if not used grounded). |
| 3 | RXD | input | TTL serial input, connected to an external TXD output pin. |
| 4 | TXD | output | TTL serial output connected to an external RXD input pin. |
| 5 | AUX | output | Used to indicate the operating status of the module (can be suspended)<br>The user wakes up the external MCU and outputs a low level during power-on self-test initialization. |
| 6 | VCC | | Module power supply positive reference, voltage range: 2 5～3.6V DC |
| 7 | GND | input | Module ground |
| 8 | RESET | input | Module reset pin, active low |
| 9 | NC | | Reserved feet |

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# Chapter 4 Recommended Connection Diagram




# Chapter 5 Detailed Explanation of Functions

## 5.1 Module reset

- After the module is powered on, the AUX will immediately output a low level, and perform hardware self-test, as well as set the working mode according to user parameters;
  In this process, AUX remains low, after which AUX outputs high and starts working normally according to the working mode formed by M1 and M0;
  Therefore, the user needs to wait for the AUX rising edge as the starting point for the normal operation of the module.

## 5.2 AUX Details

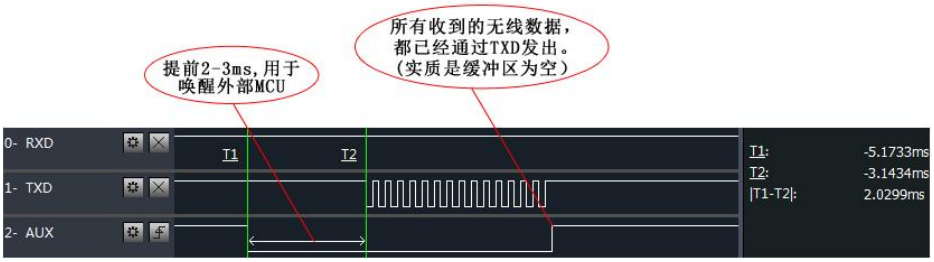
- AUX for wireless sending and receiving buffer indication and self-test indication;
- It indicates whether the module has data that has not been transmitted wirelessly, or whether the wireless data that has been received has not yet been sent out in its entirety through the serial port, or whether the module is in the process of initializing the self-test.

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### 5.2.1 Serial port data output indication

- Used to wake up an external MCU in hibernation;



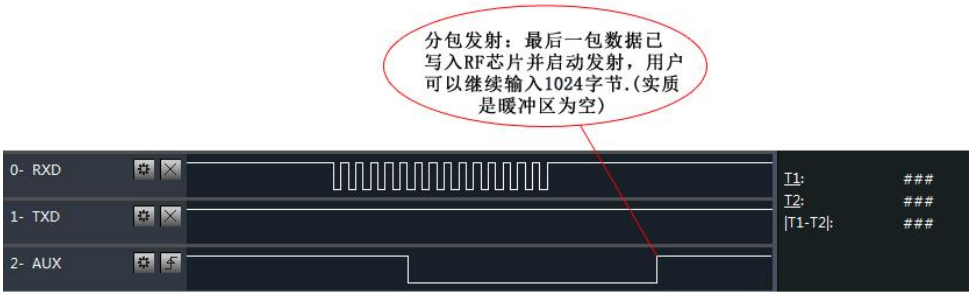

模块串口外发数据时，AUX引脚时序图

### 5.2.2 Wireless transmit indication

- Empty buffer: The data of the internal 2048-byte buffer is written to the wireless chip (automatic packetization). When AUX=1, the user continuously initiates data less than 2048 bytes and does not overflow;

  When AUX=0, the buffer is not empty: the data of the internal 2048 byte buffer has not yet been written to the wireless chip and the transmission is turned on, at this time the module may be waiting for the user data to end the timeout, or the wireless packet transmission is in progress;

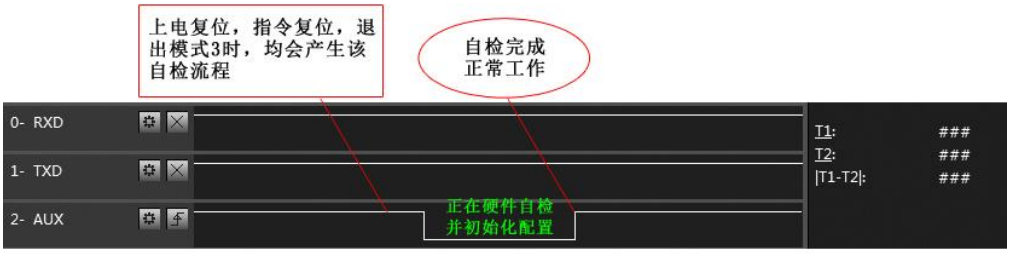
  【Note】:AUX=1 does not mean that all the serial port data of the module has been transmitted wirelessly, and the last packet of data may be transmitted.




模块接收串口数据时，AUX引脚时序图

### 5.2.3 The module is in the process of configuration

- Only when resetting and exiting sleep mode;




自检期间，AUX引脚时序图

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### 5.2.4 AUX Considerations

- Function 1 and function 2 above, the output low level is preferred, that is, if any one of the output low conditions is met, the AUX output low level; The AUX outputs high when all low conditions are not met.
- When the AUX output is low, it means that the module is busy, and the working mode detection will not be carried out at this time; When the AUX output of the module is high within 20ms, the mode switching work will be completed.
- After the user switches to the new working mode, at least 2ms after the AUX ascending edge is required for the module to actually enter the mode; If the AUX is consistently high, then the mode switching will take effect immediately.
- The user enters another mode from mode 3 (sleep mode) or during the reset process, the module resets the user parameters, during which the AUX output is low.

# Chapter VI Working Mode

The module has four operating modes, set by pins M0 and M1; The details are shown in the following table:

| Mode (0-3). | M0 | M1 | Introduction to the pattern | remark |
|---|---|---|---|---|
| 0 Half-duplex mode | 0 | 0 | Serial port open, wireless open, transparent transmission, half-duplex operation | The receiver must have the same address, channel, and baud rate |
| 1 Full duplex mode | 1 | 0 | Serial port open, wireless open, transparent transmission, full-duplex operation | The receiver must have the same address, channel, and baud rate |
| 2 Reservation mode | 0 | 1 | Reservation mode | Temporarily the same as mode 0 |
| 3 Set the mode | 1 | 1 | You can receive parameter setting commands | See the working parameters for details |

## 6.1 Mode switching

- The user can combine M1 and M0 with high and low levels to determine the working mode of the module;
  2 GPIOs of the MCU can be used to control mode switching;
  When changing M1 and M0: If the module is idle, after 15-20ms, you can start working according to the new mode;
  If the serial port data of the module has not been transmitted through the wireless, the new working mode can only be entered after the transmission is completed;
  If the module receives wireless data and sends data out through the serial port, it needs to be sent before it can enter the new working mode;
  So the mode switch can only be valid when AUX outputs 1, otherwise the switch will be delayed.
- For example, in mode 0 or mode 1, the user continuously enters a large amount of data and switches modes at the same time, and the switching mode operation at this time is invalid;
  The module will process all user data before performing new pattern detection;

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Therefore, the general recommendation is: detect the AUX pin output status, wait for the AUX output to be high and then switch for 2ms.

## 6.2 Half-duplex mode (mode 0).

| type | **When M0 = 0 and M1 = 0, the module operates in mode 0** |
|---|---|
| launch | The module receives user data from the serial port, the module transmits wireless packets with a length of 29 bytes, and when the user enters data to 29 bytes, the module will start wireless transmission, at which point the user can continue to enter the data that needs to be transmitted. When the user needs to transmit fewer than 29 bytes, the module waits for 3 bytes of time, if no user data continues to enter, the data is considered to be terminated, at which time the module will send all packets wirelessly. When the module receives the first user data, the AUX output is low, and when the module puts all the data into the RF chip and initiates the transmission, the AUX output is high. At this point, it indicates that the last packet of wireless data has started the transmission, and the user can continue to enter up to 2048 bytes of data. Packets sent through mode 0 can only be received by receiving modules in mode 0, mode 1, and mode 2. |
| reception | The module keeps wireless reception turned on and can receive packets from mode 0, mode 1, and mode 2.<br>After receiving the packet, the module AUX output is low, and the wireless data begins to be emitted through the TXD pin of the serial port, and after all the wireless data is output through the serial port, the module outputs the AUX high. |
| note | When a module transmits data, it cannot receive data.<br>At the same time, when the module receives data, it cannot send data. |

## 6.3 Full-duplex mode (mode 1).

| type | **When M0 = 1 and M1 = 0, the module operates in mode 1** |
|---|---|
| launch | The module receives user data from the serial port, the length of the wireless packet transmitted by the module is 29 bytes, when the user input data reaches 29 bytes, the module will start wireless transmission, at which time the user can continue to enter the data that needs to be transmitted;<br>When the bytes that the user needs to transmit are less than 29 bytes, the module waits for 3 bytes of time, if no user data continues to enter, the data is considered to be terminated, at which time the module will send all packets through the wireless;<br>When the module receives the first user data, the AUX output is low, and when the module puts all the data into the RF chip and starts the transmission, the AUX output is high;<br>At this point, it indicates that the last packet of wireless data has started the transmission, and the user can continue to enter up to 2048 bytes of data;<br>Packets sent through mode 0 can only be received by receiving modules in mode 0, mode 1, and mode 2. |
| reception | The module has been turned on the wireless receiving function, which can receive packets from mode 0, mode 1, mode 2;<br>After receiving the packet, the module AUX output is low, and the wireless data begins to be emitted through the TXD pin of the serial port, and after all the wireless data is output through the serial port, the module outputs the AUX high. |
| note | When a module transmits data, it can receive data.<br>At the same time, when the module receives data, it can send data. |

## 6.4 Reservation mode (mode 2).

| type | **When M0 = 0 and M1 = 1, the module operates in mode 2** |
|---|---|
| launch | Equivalent to mode 0. |

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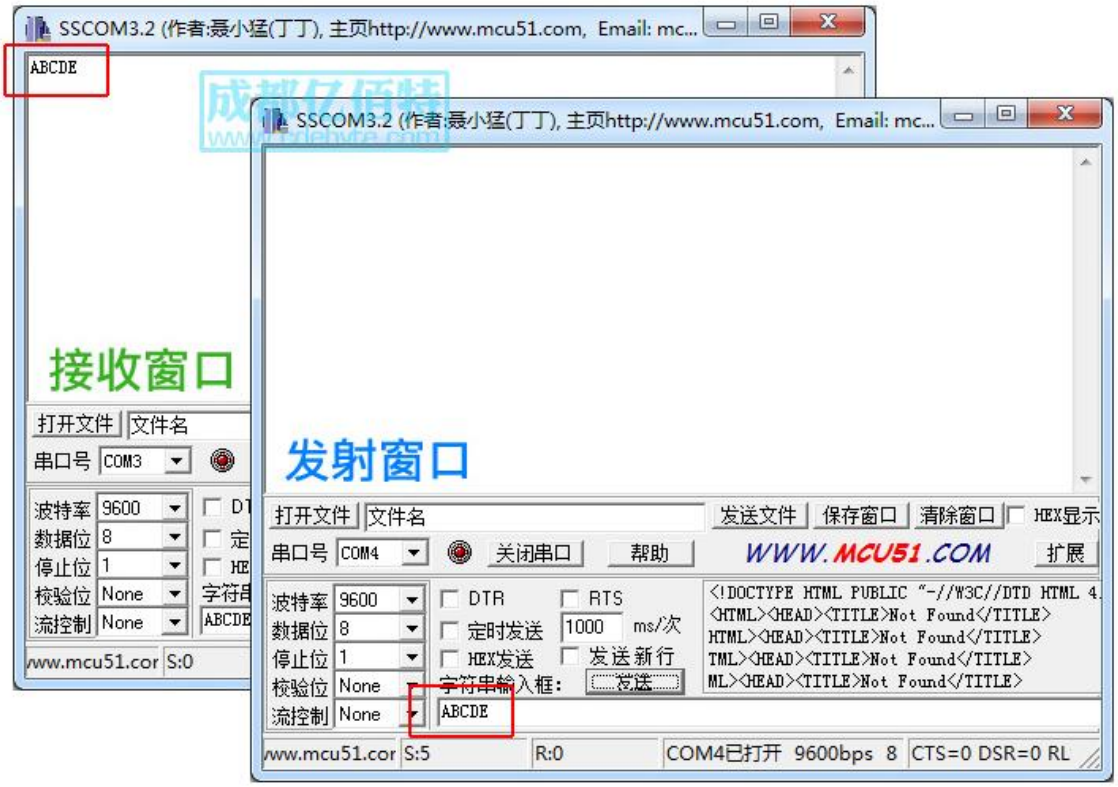
| | |
|---|---|
| reception | Equivalent to mode 0. |

## 6.5 Set Mode (Mode 3).

| type | When M0 = 1 and M1 = 1, the module operates in mode 3 |
|---|---|
| launch | Wireless data cannot be transmitted. |
| reception | Unable to receive wireless data. |
| disposition | The configuration mode can be used for module parameter setting, using serial ports 9600, 8N1, through a specific instruction format to set the module working parameters. |
| note | When entering from the setup mode to other modes, the module will reconfigure the parameters, and during the configuration process, the AUX remains low;<br>The output is high when finished, so it is recommended that the user detect the rising edge of the AUX. |

## 6.6 Fast Communication Test

| steps | Specific operations |
|---|---|
| 1 | Plug the USB test board (E15-USB-T2) into the computer to ensure that the driver is installed correctly;<br>Plug in the mode selection jumper on the USB test board (i.e. M1=0, M0=0). |
| 2 | Select 3.3V power supply (module supports 2 5～3.6V）。 |
| 3 | Run the "Serial Debugging Assistant" software, select the correct serial slogan, observe the sending window and the corresponding receive window. |




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# Chapter 7 Instruction Formats

- In the setting mode (mode 3: M0=1, M1=1), the list of supported instructions is as follows (**when setting, only 9600, 8N1 formats** are supported):

| serial number | The directive format | Detailed instructions |
|---|---|---|
| 1 | C0+ operating parameters | The hexadecimal format sends C0+5 bytes of working parameters, a total of 6 bytes, which must be sent continuously (power-down saving). |
| 2 | C1+C1+C1 | Three C1s are sent in hexadecimal format, and the module returns saved parameters, which must be sent continuously. |
| 3 | C2+ operating parameters | The hexadecimal format sends C2+5 bytes of working parameters, a total of 6 bytes, which must be sent continuously (power down is not saved). |
| 4 | C3+C3+C3 | Three C3s are sent in hexadecimal format, and the module returns version information, which must be sent consecutively. |
| 5 | C4+C4+C4 | Three C4s are sent in hexadecimal format, and the module will produce a reset that must be sent continuously. |

## 7.1 Factory default parameters

| Model | Factory default parameter value: C0 00 00 18 00 40 | | | | | | |
|---|---|---|---|---|---|---|---|
| Module model | frequency | address | channel | Air rate | baud rate | Serial port format | Transmit power |
| E34-2G4D11S | 2.4GHz | 0x0000 | 0x00 | Adaptive baud rate | 9600 | 8N1 | 13mW |

## 7.2 Reading working parameters

| The directive format | Detailed instructions |
|---|---|
| C1+C1+C1 | In sleep mode (M0=1, M1=1), issue a command (HEX format) to the module serial port: C1 C1 C1<br>The module returns the current configuration parameters, such as: C0 00 00 18 00 40. |

## 7.3 Version number read

| The directive format | Detailed instructions |
|---|---|
| C3+C3+C3 | In setup mode (M0=1, M1=1), issue a command (HEX format) to the module serial port: C3 C3 C3<br>The module returns the current configuration parameters, such as: C3 39 xx yy;<br>The 39 here represents the module model (E39 series), xx is the version number, and yy refers to other features of the module. |

## 7.4 Reset instructions

| The directive format | Detailed instructions |
|---|---|

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| | |
|---|---|
| C4+C4+C4 | In setup mode (M0=1, M1=1), issue a command (HEX format) to the module serial port: C4 C4 C4<br>The module will generate a reset;<br>During the reset process, the module self-tests, the AUX output is low, after the reset is completed, the AUX output is high, and the module begins to work normally. At this point, you can switch modes or initiate the next command. |

## 7.5 Parameter setting instructions

| | name | description | | | | remark |
|---|---|---|---|---|---|---|
| 0 | HEAD | Fixed 0xC0 or 0xC2 indicating that this frame data is a control command | | | | Must be 0xC0 or C2<br>C0: The set parameters will be saved by power-down.<br>C2: The set parameter will not be saved by power loss. |
| 1 | ADDH | The module address is high byte (default 00H). | | | | 00H-FFH |
| 2 | ADDL | The module address is low bytes (default 00H). | | | | 00H-FFH |
| 3 | SPED | 7 | 6 | Serial port check bit | | The serial port mode of both sides of the communication can be different |
| | | 0 | 0 | 8N1 (default). | | |
| | | 0 | 1 | 8O1 | | |
| | | 1 | 0 | 8E1 | | |
| | | 1 | 1 | 8N1 (equivalent to 00). | | |
| | | 5 | 4 | 3 | TTL serial port rate (bps). | The baud rate of both sides of the communication can be different<br>The serial port baud rate and the wireless transmission parameters are independent of each other, and do not affect the wireless transceiver characteristics. |
| | | 0 | 0 | 0 | The serial port baud rate is 1200 | |
| | | 0 | 0 | 1 | The serial port baud rate is 2400 | |
| | | 0 | 1 | 0 | The serial port baud rate is 4800 | |
| | | 0 | 1 | 1 | The serial port baud rate is 9600 (default). | |
| | | 1 | 0 | 0 | The serial port baud rate is 19200 | |
| | | 1 | 0 | 1 | The serial port baud rate is 38400 | |
| | | 1 | 1 | 0 | The serial port baud rate is 57600 | |
| | | 1 | 1 | 1 | The serial port baud rate is 115200 | |
| | | 2 | 1 | 0 | Leave unused | It is recommended to write 0 |
| | | | | | | |
| 4 | CHAN | Generic model | | | | |
| | | 7, 6, 5, 4 are retained unused | | | | It is recommended to write 0 |
| | | Communication channel | | | | 00H~1FH, a total of 16 channels;<br>Corresponds to 2400 MHz + CHAN * 7MHz |
| | | 3, 2, 1, 0, default 00H (2400MHz). | | | | |
| 5 | OPTION | 7 | Leave unused | | | It is recommended to write 0 |
| | | 6 | Leave unused | | | It is recommended to write 0 |
| | | 5 | 4 | 3 | Leave unused | It is recommended to write 0 |
| | | 2 | Leave unused | | | It is recommended to write 0 |
| | | 1 | 0 | Transmit power (approximate). | | The external power supply must provide more than 250mA current output capability, and ensure that the power supply ripple is less than 100mV;<br><br>Lower power transmission is not recommended and its power utilization efficiency is not high. |
| | | 0 | 0 | 11dBm (default). | | |
| | | 0 | 1 | 7dBm | | |
| | | 1 | 0 | 3dBm | | |
| | | 1 | 1 | -1dBm | | |

**Illustrative example (meaning of the ordinal number 3 "SPED" byte):**

| The binary bit of the byte | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|
| Specific values (user configuration) | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Represents meaning | The serial port check | | The serial port baud rate is 9600 | | | Air-to-air rate adaptive | | |

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| | | | |
|---|---|---|---|
| | bit is 8N1 | | |
| The corresponding hexadecimal | 1 | 8 | |

# Chapter 8 Hardware Design

- It is recommended to use a DC regulated power supply to power the module, the ripple coefficient of the power supply is as small as possible, and the module needs to be reliably grounded;
- Please note that the correct connection of the positive and negative poles of the power supply, such as reverse connection, may cause permanent damage to the module;
- Please check the power supply to ensure that between the recommended supply voltages, if the maximum value is exceeded, the module will be permanently damaged;
- Please check the stability of the power supply, the voltage can not fluctuate greatly and frequently;
- When designing the power supply circuit for the module, it is often recommended to retain more than 30% of the margin, and the whole machine is conducive to long-term stable work;
- The module should be as far away as possible from the power supply, transformer, high-frequency traces and other parts of electromagnetic interference;
- High-frequency digital trace, high-frequency analog trace, power routing must avoid the module below, if you really need to go through the module below, assuming that the module is soldered in the top layer, the top layer of the module contact part of the copper (all copper and well grounded), must be close to the digital part of the module and the wire is routed in Bottom Layer;
- Assuming that the module is welded or placed in the Top Layer, it is also wrong to arbitrarily route the Bottom Layer or other layers, which will affect the spurious and receiving sensitivity of the module to varying degrees;
- Assuming that there are devices with large electromagnetic interference around the module, it will also greatly affect the performance of the module, and it is recommended to be appropriately away from the module according to the intensity of the interference, and if the situation allows, appropriate isolation and shielding can be done;
- Assuming that there are large electromagnetic interference traces (high-frequency digital, high-frequency analog, power supply traces) around the module will also greatly affect the performance of the module, and according to the intensity of the interference, it is recommended to be appropriately away from the module, and if the situation allows, appropriate isolation and shielding can be done;
- If the communication line uses 5V level, it must be connected in series with 1k-5.1k resistors (not recommended, there is still a risk of damage);
- Try to stay as far away from some of the TTL protocols where the physical layer is also 2.4GHz, e.g. USB3.0;
- When the module is installed inside the chassis, a high-quality antenna extension cord can be used to extend the antenna to the outside of the chassis and preferably vertically upwards.

# Chapter 9 Frequently Asked Questions

## 9.1 The transmission distance is not ideal

- When there is a linear communication obstacle, the communication distance will be attenuated accordingly;

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- Temperature, humidity, and the same frequency interference will lead to increased communication packet loss rate;
- The ground absorbs and reflects radio waves, and the test effect near the ground is poor;
- Seawater has a strong ability to absorb radio waves, so the seaside test effect is poor;
- If there is a metal object near the antenna, or placed in a metal shell, the signal attenuation will be very serious;
- The power register is set incorrectly, the air rate is set too high (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, and the lower the voltage, the smaller the power;
- The antenna used matches the module poorly or the quality of the antenna itself is a problem.

## 9.2 The module is easily damaged

- Please check the power supply to ensure that between the recommended supply voltages, if the maximum value is exceeded, the module will be permanently damaged;
- Please check the stability of the power supply, the voltage can not fluctuate greatly and frequently;
- Please ensure that the installation and use of the process of anti-static operation, high frequency device static sensitivity;
- Please ensure that the humidity during installation and use should not be too high, some components are humidity sensitive devices;
- If there is no special demand, it is not recommended to use it at too high or too low temperatures.

## 9.3 The bit error rate is too high

- There is co-frequency signal interference nearby, stay away from the source of interference or modify the frequency and channel to avoid interference;
- Poor power supply may also cause garbled code, it is necessary to ensure the reliability of the power supply;
- Poor or too long extension lines and feeders can also cause high bit error rates.

# Chapter 10 Welding Work Guidance

This product is an in-line module, welding personnel must work in accordance with the discharge operation specifications when welding the module;

This product is an electrostatic sensitive product, and if the module is not welded according to fouls, the module may be permanently damaged.

# Chapter 11 Related Models

| Product model | Chip solution | Carrier frequency Hz | Transmit power dBm | Test distance km | Air rate Bps | Encapsulated form | Product size mm | Features |
|---|---|---|---|---|---|---|---|---|

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| E34-2G4D20D | nRF24L01+ | 2.4G | 20 | 2.0 | 250k～2M | In-line | 21 * 36 | Full-duplex, file transfer |
| E34-2G4H20D | nRF24L01+ | 2.4G | 20 | 2.5 | 250k～2M | In-line | 21 * 36 | Automatic frequency hopping and anti-interference |
| E34-2G4H27D | nRF24L01+ | 2.4G | 27 | 5.0 | 250k～2M | In-line | 21 * 36 | Automatic frequency hopping and anti-interference |

# Chapter 12 Antenna Guide

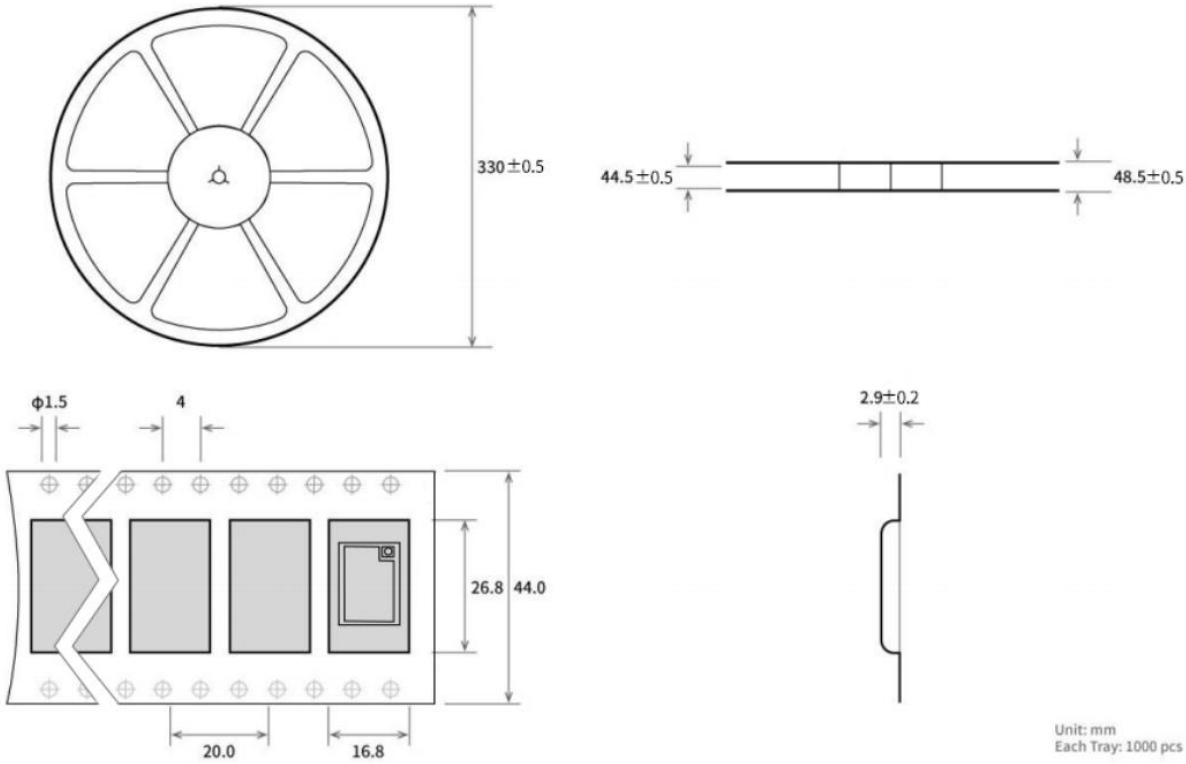
Antenna is an important role in the communication process, often inferior antenna will have a great impact on the communication system, so our company recommends some antennas as supporting our wireless modules and performance is better and more reasonable price.

| Product model | type | Band | gain | size | Feeder | interface | peculiarity |
|---|---|---|---|---|---|---|---|
| | | Hz | dBi | mm | cm | | |
| TX2400-NP-5010 | Flexible antenna | 2.4G | 2.0 | 10x50 | - | IPEX | Flexible FPC soft antenna |
| TX2400-JZ-3 | Glue rod antenna | 2.4G | 2.0 | 30 | - | SMA-J | Ultra-short straight, omnidirectional antenna |
| TX2400-JZ-5 | Glue rod antenna | 2.4G | 2.0 | 50 | - | SMA-J | Ultra-short straight, omnidirectional antenna |
| TX2400-JW-5 | Glue rod antenna | 2.4G | 2.0 | 50 | - | SMA-J | Fixed bent, omnidirectional antenna |
| TX2400-JK-11 | Glue rod antenna | 2.4G | 2.5 | 110 | - | SMA-J | Bending glue rod, omnidirectional antenna |
| TX2400-JK-20 | Glue rod antenna | 2.4G | 3.0 | 200 | - | SMA-J | Bending glue rod, omnidirectional antenna |
| TX2400-XPL-150 | Suction cup antenna | 2.4G | 3.5 | 150 | 150 | SMA-J | Small suction cup antenna, cost-effective |

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# Chapter 13 Bulk Packaging Methods




# Revision history

| version | Revision date | Revision description | Maintainers |
|---|---|---|---|
| v1.0 | 2022-9-19 | Initial version | Yan |
| V1.1 | 2023-9-26 | error corrected | Bin |

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