E280-2G4T12S User Manual

SX1280 2.4GHz TTL High-speed LoRa Wireless Module



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Contents

Disclaimer 3
1 Introduction 4
1.1 Brief Introduction 4
1.2 Features 4
1.3 Application Scenario 5
2 Specifications 5
2.1 Limit parameters 5
2.2 Working parameters 5
3 Hardware description 7
3.1 Mechanical size and pin definition 7
4 Recommended connection diagram 8
5 Detailed function 9
5.1 Fixed-point launch 9
5.2 Broadcast launch 9
5.3 Broadcast address 9
5.4 Listening address 10
5.5 Module reset 10
5.6 AUX detailed 10
5.6.1 Serial data output indication 10
5.6.2 Wireless transmission instructions 10
5.6.3 The module is being configured 11
6 Operating mode 11
6.1 Mode switch 11
6.2 Transmission mode (mode 0) 12
6.3 RSSI mode (mode 1) 12
6.4 Ranging mode (mode 2) 12
6.5 Configuration mode (mode 3) 13
7 Instruction format 13
7.1 Factory default parameters 13

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7.2 Work parameter reading 14
7.3 Version number reading 14
7.4 Reset instruction 14
7.5 Parameter setting command 14
8 Hardware design 16
9 Common problem 17
9.1 Transmission distance is not ideal 17
9.2 Module is easy to damage 17
9.3 The error rate is too high 17
10 Welding operation guidance 18
10.1 Reflow temperature 18
10.2 Reflow solder curve diagram 18
11 Related model 19
12 Antenna Guide 19
12.1 Antenna recommended 19
12.2 Antenna selection 20
13 Batch packaging 20
Revision history 21
About us 21

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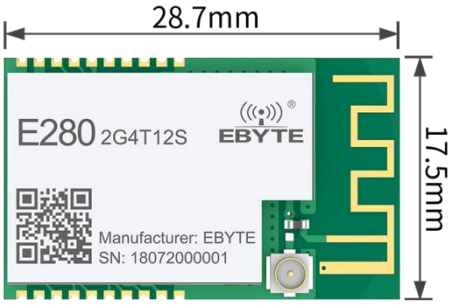
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1 Introduction

1.1 Brief Introduction



E280-2G4T12S is a wireless serial port module (UART) based on SEMTECH's SX1280 RF chip, transparent transmission mode, working in 2.4GHz frequency band, with LoRa, FLRC and GFSK three modulation and demodulation technologies, TTL level output, compatible with 3.3 IO port voltage of V and 5V.

E280-2G4T12S adds a wireless ranging function on the basis of the traditional serial port module. Based on an improved binary backoff algorithm, it uses adaptive frequency hopping technology to integrate Kalman filtering, which can effectively resist wireless interference and improve the ranging accuracy.

LoRa direct sequence spread spectrum technology will bring longer communication distance, and has the advantages of wider power spectrum and strong anti-interference ability. The module has a hardware FEC forward error correction algorithm, which has high coding efficiency and strong error correction ability. In the case of sudden interference, it can actively correct the interfered data packet, which greatly improves the reliability and transmission distance.

The module has data encryption and compression functions. The data transmitted by the module in the air is random, and the data interception is meaningless through strict encryption and decryption algorithms. The data compression function has the possibility to reduce the transmission time, reduce the probability of interference, and improve the reliability and transmission efficiency.

1.2 Features

- Support multiple modulation methods of LoRa, FLRC, GFSK;
- Support high-speed continuous transmission at 460800 serial port baud rate, data is not sub-packaged, and the package length is not limited;
- Support RSSI signal strength reading;
- Support fixed-point transmission/broadcast transmission/channel monitoring;
- Support wireless ranging function, ranging accuracy of ±2 meters;
- Under ideal conditions, the communication distance can reach 3km;
- The maximum transmission power is 18mW, and the software is multi-level adjustable;
- Support the global license-free ISM 2.4GHz frequency band;
- Support the data air transmission rate of 1kbps～2Mbps;
- Support low power consumption mode, suitable for battery applications;
- Support 2.3~5.5V power supply, power supply greater than 5V can guarantee the best performance;

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- Industrial-grade standard design, supporting long-term use at -40～+85℃;
- Dual antennas are optional (PCB/IPEX), which is convenient for users to develop and integrate.

1.3 Application Scenario

- Smart home and industrial sensors, etc.;
- Security system, positioning system;
- Positioning of agriculture and animal husbandry;
- Wireless remote control, UAV;
- Wireless game remote control;
- Medical and healthcare products;
- Wireless voice, wireless headset;
- Application in the automotive industry.

2 Specifications

2.1 Limit parameters

Main Parameters	Performance- Minimum	Performance- Max	Remark
Power supply voltage (V)	0	5.5	Over 5.5V will permanently burn the module
Blocking power (dBm)	-	10	It is less likely to burn when used at close range
Working temperature (℃)	-40	+85	Industrial grade

2.2 Working parameters

Main Parameters		Performance			Remark
		Min	Type	Max	
Working voltage (V)		2.3	5.0	5.5	V
Communication level (V)		0.5	—	—	A
Working temperature (℃)		–40	—	85	℃
Working frequency (MHz)		—	85	—	%RH
Power consumption	Emission current (mA)		46		Instantaneous power consumption
	Receiving current (mA)		20		
	Sleep current (μA)		8		Software shutdown
Maximum transmit power (dBm)		11.5	12.0	13.5	
Receiving sensitivity (dBm)		-130	-132	-134	Air rate is 1kbps

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Air rate (bps)	1k	1k	2M	User programming control

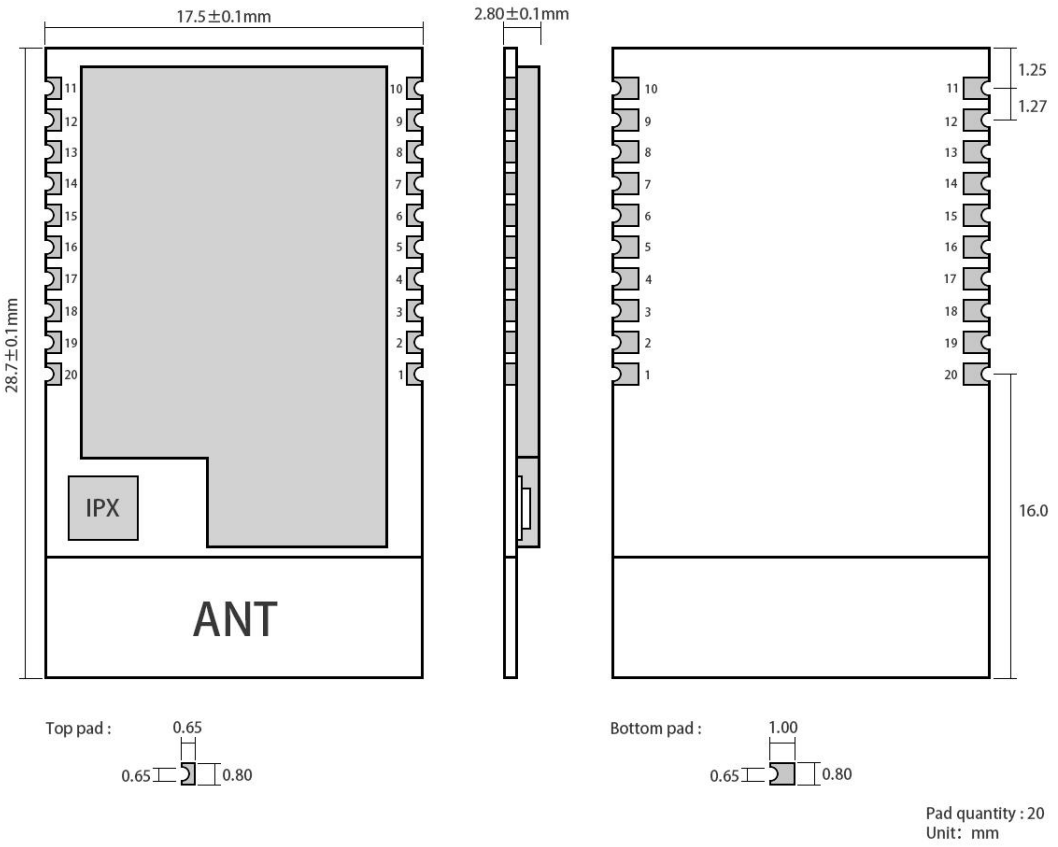
Main Parameters	Description	Remark
Reference distance	3000m	Clear and open environment, antenna gain 5dBi, antenna height 2.5 meters, air rate 1kbps
Launch length	121 Btye	Normal mode, using 1Mbps airspeed
	221 Btye	Continuous transmission mode
Modulation	GFSK	
	LoRa	
	FLRC	
Communication Interface	UART Serial port	TTL Level
Encapsulation method	SMD	
Interface method	1.27mm	
Dimensions	17.5*28.7mm	
Antenna interface	IPEX/PCB	Equivalent impedance is about 50Ω

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3 Hardware description

3.1 Mechanical size and pin definition



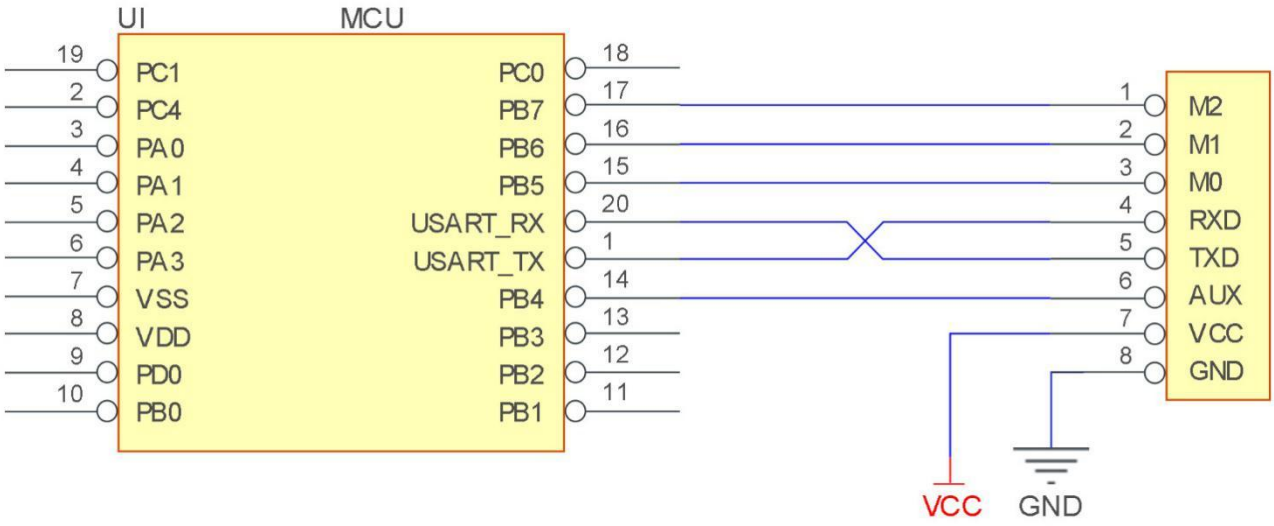
Pin number	Pin name	Pin direction	Pin usage
1	GND	Reference place	Module ground
2	NC		Empty feet not connected
3	M0	enter	The combination of M2, M1, and M0 determines the 8 working modes of the module (cannot be suspended, if not used, it can be grounded)
4	M1	enter	The combination of M2, M1, and M0 determines the 8 working modes of the module (cannot be suspended, if not used, it can be grounded)
5	M2	enter	The combination of M2, M1, and M0 determines the 8 working modes of the module (cannot be suspended, if not used, it can be grounded)
6	RXD	enter	TTL serial port input, connected to the external TXD output pin; can be configured as open-drain or pull-up input, see parameter settings for details
7	TXD	Output	TTL serial port output, connected to the external RXD input pin; can be configured as open-drain or push-pull output, see parameter settings for details

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8	AUX	Output	Used to indicate the working status of the module, the user wakes up the external MCU, and outputs low level during the power-on self-check initialization period. It can be configured as an open-drain output or push-pull output. For details, see parameter settings (can be left floating)
9	VCC		Module power supply positive reference, voltage range: 2.3V ~ 5.5V DC
10	GND	Reference place	Module ground
11	GND	Reference place	Module ground
12～19	NC		Empty feet not connected
20	GND	Reference place	Module ground

4 Recommended connection diagram



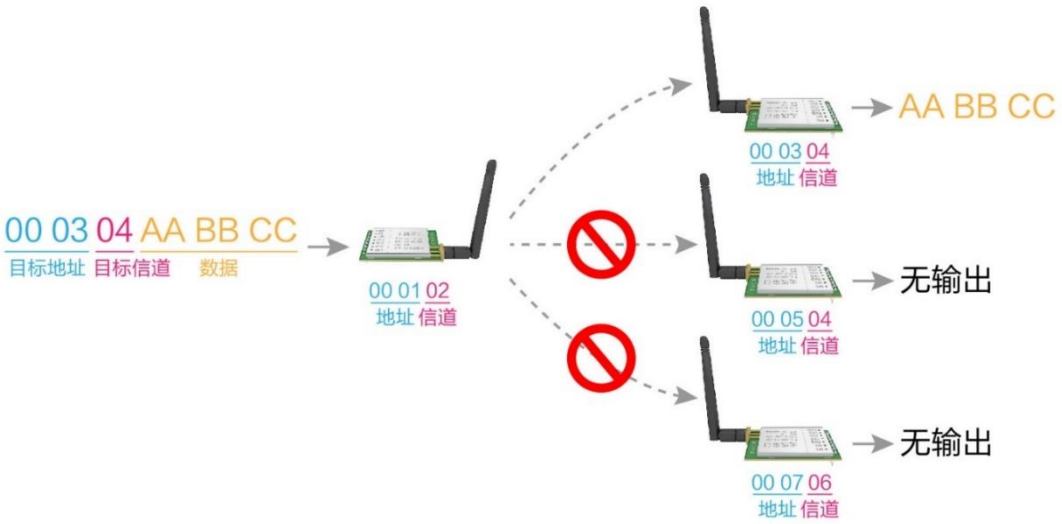
Serial number	Brief description of the connection between the module and the microcontroller (the picture above takes the STM8L microcontroller as an example)
1	The wireless serial port module is TTL level, please connect with TTL level MCU.
2	For some 5V microcontrollers, it may be necessary to add 4-10K pull-up resistors to the TXD and AUX pins of the module.

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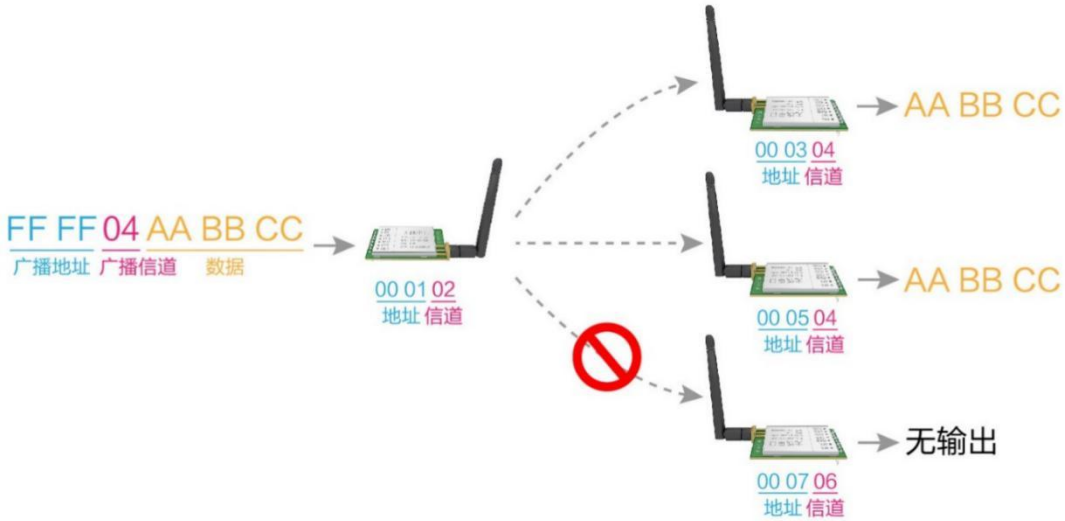
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5 Detailed function

5.1 Fixed-point launch



5.2 Broadcast launch



5.3 Broadcast address

- Example: Set the address of module A to 0xFFFF and the channel to 0x04.
- When module A is used as a transmitter (same mode, transparent transmission mode), all receiving modules under the 0x04

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channel can receive data to achieve the purpose of broadcasting.

5.4 Listening address

- Example: Set the address of module A to 0xFFFF and the channel to 0x04.
- When module A is used as a receiver, it can receive all the data under the 0x04 channel to achieve the purpose of monitoring.

5.5 Module reset

- After the module is powered on, AUX will immediately output low level, perform hardware self-check, and set the working mode according to user parameters. During this process, AUX keeps low level, and after completion, AUX outputs high level, and starts to work normally according to the working mode formed by the combination of M2, M1, and M0. Therefore, the user needs to wait for the rising edge of AUX as the starting point for the normal operation of the module.

5.6 AUX detailed

- It indicates whether the module has data that has not been transmitted wirelessly, or whether it has received wireless data that has not been sent out through the serial port, or whether the module is in the process of initializing and self-checking.

5.6.1 Serial data output indication

- Used to wake up the external MCU in sleep (note that there is no delay in AUX indication in continuous transmission mode)



射频接收到空中数据到 MCU 发送时，AUX 时序图

5.6.2 Wireless transmission instructions

- In sub-packet transmission mode, the internal buffer size is specified by the sub-packet size. For example, if the packet length is set to 221 bytes, the corresponding buffer size is 2048 bytes. When AUX=1, the user can continuously initiate data that does not exceed 2048 bytes.
- In the continuous transmission mode, when AUX=1, it means that the current module is busy, but it is not suitable for waking up the external MCU because the data is sent faster during continuous transmission.
- When AUX=1, it means that all serial port data of the module has been transmitted wirelessly, and the module is in an idle state.



MCU 接收到串口数据到 MCU 启动射频发送时，AUX 时序图

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5.6.3 The module is being configured

- Only when resetting and exiting sleep mode



自检期间，AUX 时序图

6 Operating mode

The module has 4 working modes, which are set by pins M0 and M1; the details are shown in the following table:

Mode (0-3)	M2	M1	M0	Mode introduction	Remark
0 Transmission mode	1	0	0	Serial port open, wireless open, continuous transparent transmission	Airspeed supports manual configuration and self-adaptive automatic adjustment with the baud rate; the baud rate of both parties in the continuous transmission mode must be the same
1 RSSI mode	1	0	1	Serial port open, wireless open, RSSI function open	The module outputs RSSI intensity value every 100ms serial port
2 Ranging mode	1	1	0	Serial port open, wireless open, ranging function open	Ranging supports high-precision and long-distance modes. In the high-precision mode, the host module outputs the ranging result value every 1.5s or so. In the long-distance mode, the host module outputs the ranging result value every 2s or so.
3 Configuration mode	1	1	1	Serial port open, wireless close, used for parameter configuration	Baud rate is fixed 9600 8N1
4 Low power consumption	0	x	x	Low power consumption mode, the power consumption is the lowest	When M2 is set high, it is in normal working condition When M2 is set low, it is in low power consumption.

6.1 Mode switch

- Users can combine high and low levels of M1M0 to determine the working mode of the module. You can use the GPIO of the MCU to control the mode switching; after changing M1M0: if the module is idle (AUX high), it can start working in the new mode; if the module has serial port data that has not been wirelessly transmitted, after the transmission is completed , Can enter the new working mode; if the module receives the wireless data and sends out data through the serial port, it needs to be sent to

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the new working mode; so the mode switch can only be effective when AUX outputs 1, otherwise it will Delay switching.

- For example: In mode 3, the user continuously inputs a large amount of data and performs mode switching at the same time. At this time, the switching mode operation is invalid; the module will process all user data before performing a new mode detection; therefore, the general recommendation is : Detect the output status of the AUX pin, wait 2ms after the AUX output is high, and then switch.
- When the module is switched from another mode to the configuration mode, if there is data that has not been processed; the module will process these data (including receiving and sending) before entering the sleep mode. This feature can be used for fast sleep, thereby saving power consumption; for example: the transmitter module works in mode 0, the user initiates serial data "12345", and then does not need to wait for the AUX pin to be idle (high level), and can directly switch to sleep mode. And the user's main MCU will go to sleep immediately, and the module will automatically send all user data wirelessly, and then automatically go to sleep within 1ms; thereby saving MCU working time and reducing power consumption.
- In the same way, any mode switching can use this feature. After the module processes the current mode event, it will automatically enter the new mode within 1ms; thus eliminating the need for users to query AUX and achieving the purpose of fast switching; For example, switching from the transmitting mode to the receiving mode; the user MCU can also go to sleep before the mode switching, and use the external interrupt function to obtain the AUX changes, thereby performing the mode switching.
- This operation mode is very flexible and efficient. It is designed according to the user's MCU operation convenience, and can reduce the workload of the entire system as much as possible, improve system efficiency, and reduce power consumption.

6.2 Transmission mode (mode 0)

- In this mode, data can be transparently transmitted, that is, what data the sender sends and what data the receiver will receive. In the normal mode, as long as the airspeed, address and channel of the two modules are the same, the two modules can perform normal transparent transmission; in the continuous transmission mode, it is necessary to ensure that the baud rates of the two modules must be the same to ensure that the two modules have the same baud rate. Transparent transmission of each module, continuous transmission mode supports continuous transmission of large files at baud rates of 1200-115200.

6.3 RSSI mode (mode 1)

- In this mode, the module will output the RSSI value of the current 2.4GHz signal in the air at 100ms intervals to detect the channel quality in the air. The output value is in hexadecimal complement format.

6.4 Ranging mode (mode 2)

In this mode, the master module will output the distance between the current master and slave, and the output format is MODE:x+RANG:value. For example, "MODE:A+RNG:365" means that in the high-precision mode, the measurement distance is 365m; "MODE:L+RNG:667" means that in the long-distance mode, the measurement distance is 667m.

note:

1. After the module is powered on, it enters the ranging mode, and the hardware parameter calibration and software algorithm parameter analysis are automatically carried out between the master and slave devices. There will be a waiting period of about 5s during this period.

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2. In the long-distance ranging mode, due to the internal filter algorithm parameter calibration, the error of the first few ranging results just after the device is powered on may be greater than the module's ranging accuracy.

3. The distance measured by the module only represents the one-way transmission distance of the radio between the ranging host and the ranging slave, and does not necessarily represent the true distance. The user should try to measure in an open place.

6.5 Configuration mode (mode 3)

- The fixed baud rate parameter in this mode is 9600, 8N1. You can refer to the instruction format to set the corresponding parameters of the module.

7 Instruction format

- In configuration mode (mode 3: M0=1, M1=1, M2=1), the supported command list is as follows (when setting, only 9600, 8N1 format is supported):

Serial number	Instruction format	Detailed description
1	C0 + operating parameters	16-based format sends a C0 + 5 byte working parameters, a total of 6 bytes, must be sent continuously (power-off saving)
2	C1 + C1 + C1	16 Enciprome format sends three C1, the module returns the saved parameters, and must be sent continuously.
3	C2 + operating parameters	16-based format sends a C2 + 5 byte working parameter, a total of 6 bytes, must be sent continuously (power-off does not save)
4	C3 + C3 + C3	16 Enciprome format sends three C3, the module returns version information, and you must be continuously sent.
5	C4 + C4 + C4	16 The binary format sends three C4, the module will generate a reset and must be sent continuously.
6	E2 + E2 + E2	In transmitting mode, the 16-en-format sends three E2, the module will enter a 10S clock configuration window period, and can pass the corresponding parameters of the C0 command within this 10S clock, the module uses new parameters after the 10S clock is completed. working.
7	E3 + E3 + E3	In transmission mode, the 16-en-format sends three E3, and the corresponding module receiving this instruction will enter a 10S clock configuration window period, and can send 6 bytes of C0 command parameter air configuration module within 10S. After the parameters, after the 10S clock, the receiving module module works with the new parameters.

7.1 Factory default parameters

model	Factory default parameter value:						
Module model	frequency	address	channel	Aerial rate	Baud rate	Serial port format	Transmit power
E28-2G4T12S	2.4GHz	0x0000	0x13	10kbps	9600	8N1	12dbm

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7.2 Work parameter reading

Instruction format	Detailed description
C1+C1+C1	Under configuration (m0 = 1, m1 = 1), issue commands to the module serial port: C1 C1 C1, the module returns the current configuration parameters, such as: c0 00 00 13 18 04.

7.3 Version number reading

Instruction format	Detailed description
C3+C3+C3	Under configuration (M0 = 1, m1 = 1), issue commands to module serial port (HEX format): C3 C3 C3, module returns current configuration parameters, such as: C3 02 80 10 09 01 00; 02 here 80 represents the module model (E280 series), 10 represents version number, 0C represents module power, other parameters represent other characteristics of modules.

7.4 Reset instruction

Instruction format	Detailed description
C4+C4+C4	Under configuration (M0 = 1, m1 = 1,) issue commands to the module serial port (HEX format): C4 C4 C4, module will generate a reset; during the reset, the module performs self-test, AUX output low, reset After the AUX outputs high, the module starts working properly. At this point, mode switching or initiation can be performed.

7.5 Parameter setting command

	name	description				Remark
0	HEAD	Fixed 0xc0 or 0xc2, indicating that this frame data is the control command.				Must be 0xc0 or C2 C0: The parameters set will be saved. C2: The set parameters will not be powered down.
1	ADDH	Module address high byte (default 00h)				00H-FFH
2	ADDL	Module address low byte (default 00h)				00H-FFH
3	SPED	7	6	Serial password bit		Communication two serial port modes can be different
		0	0	8N1(default)		
		0	1	8O1		
		1	0	8E1		
		1	1	8N1(Equivalent 00)		
		5	4	3	TTL serial port rate (BPS)	In normal mode, the serial port mode of communication can be different; In the link mode, the baud rate between communication must be the same;
		0	0	0	The serial port is1200	
		0	0	1	The serial port is4800	
		0	1	0	The serial port is9600(default)	
		0	1	1	The serial port is19200	
		1	0	0	The serial port is57600	

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		1	0	1	The serial port is115200	
		1	1	0	The serial port is460800	
		1	1	1	The serial port is921600	
		2	1	0	Wireless air rate (BPS)	In the air rate non-connection mode, the serial port baud rate and the wireless transmission parameter are independent of the wireless transmission and reception characteristics. In the air rate link mode, the serial port levy determines the air rate. The faster the baud rate, the faster the transmission speed, the closer the transmission distance. The lower the air rate, the farther distance, the stronger the anti-interference performance, the longer the transmission time. Communication two sides air wireless transmission rates must be the same Note: In non-connected mode, when the air rate is 1 MB, the minimum number of bytes sent by the user must be greater than or equal to 2.
		0	0	0	Air speed adaptive (continuous transmission)	
		0	0	1	Air speed is 1K	
		0	1	0	Air speed is5k	
		0	1	1	Air speed is10k(default)	
		1	0	0	Air speed is50k	
		1	0	1	Air speed is100k	
		1	1	0	Air speed is1M（FLRC）	
		1	1	1	Air speed is2M（FSK）	
4	CHAN	Communication letter code				Default: 0x18 Note：In continuous transmission mode, only baud rates of 460800 and below are supported
		Ordinary mode: When the air speed is 1K, 5K, 10K, the channel calculation formula is: 2400 + CHAN * 1MHz; When the vacancy is 50K, 100K, the channel calculation formula is: 2400 + CHAN * 2MHz; When the air speed is 1m, the channel calculation formula is: 2400 + CHAN * 3MHz; When the air speed is 2m, the channel calculation formula is: 2400 + CHAN * 5MHz;				
		Link mode: Porture Rate 1200, 9600, 19200, channel calculation formula is: 2400 + CHAN * 2MHz; Porture Rate 4800, 57600, 115200 The channel calculation formula is: 2400 + CHAN * 4MHz; Porture Rate 460800 The channel calculation formula is: 2400 + CHAN * 5MHz;				
5	OPTION	7	Set point send enable (class modbus)			At 1, the first three bytes of each user data frame are high, low addresses, channels. The emission module changes its address and channel, and then restores the original settings after the completion; the connection mode is transparent.
		0	Transparent transmission mode (default)			
		1	Designation point transmission mode			
		6	Ranging mode			The main address and slave address in the ranging mode are determined by the ADDH and ADDL, and the ranging is to ensure that the host is consistent with the slave address and channel. Users can set channels in fixed frequency mode. Channel setting range (0-39). The channel calculation formula is 2402 + CHAN * 2MHz; The module automatically sets the channel under the frequency hop mode to jump down at 2402-2480 MHz, stepper 2MHz.
		0	High precision mode (default)			
		1	Long distance mode			
		5	Range frequency type			
		0	Fixed frequency (default)			
		1	Frequency hopping			
		4	Test mode device type (reserved)			
		0	From the machine (default)			
		1	Host			
		3	LBT switch			After opening the LBT, check the current channel quality before sending each packet data, if better, direct transmission,
		0	Turn off LBT (default)			

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		1	Open LBT		channel interference is waiting for interference to disappear after sending. 115200 Air speed below, it may affect the linkage function after opening.
		2	IO driver		This bit is used to enable the internal pull-up resistance of the module; the level of the drain opening method is more adaptable, and some cases may require an external pull-up resistor.
		1	TXD, AUX push-pull output, RXD pull-up input (default)		
		0	TXD, AUX Open Output, RXD Opening Enter		
		1	0	Transmit power (approx)	External power supplies must provide 100mA or more current output capabilities and ensure that power ripples are less than 100 mV. It is not recommended to use less power to send, and its power supply is not high.
		0	0	12dBm (default)	
		0	1	10dBm	
		1	0	7dBm	
		1	1	4dBm	

For example, the meaning of the serial number 3 "SPED" byte):								
Bi-bits of this byte	7	6	5	4	3	2	1	0
Specific value (user configuration)	0	0	0	1	0	0	1	1
Representative meaning	Serial passport bit 8N1		The serial port is9600			Aerial rate 10kbps		
Corresponding hexadecimal	0			13				

8 Hardware design

- It is recommended to use DC voltage regulator power supply to power the module, and the power ripple coefficient is small, and the module needs to be reliably grounded;
- Please pay attention to the correct connection of the power supply positive and negative, such as reversing may cause the module to be permanently damaged;
- Check the power supply, make sure there is a need for the power supply voltage, such as exceeding the maximum, causing the module permanent damage;
- Check the power stability, the voltage cannot fluctuate significantly;
- When designing the power supply circuit for the module, it is often recommended to retain more than 30% of the overhead, and the whole machine is good for long-term stable operation.
- The module should be as far as possible from the power supply, transformer, high frequency trace and other electromagnetic interference;
- High frequency digital trace, high frequency simulation line, power line must avoid the module below the module, if it is not necessary to pass through the module, assume that the module is welded in Top Layer, Top Layer, Top Layer, Top Layer, Top Layer (all pair of copper Get a good ground), must be close to the module number and walk in the Bottom Layer;
- Assume that the module is welded or placed in Top Layer, which is also wrong in Bottom Layer or other layers, which will affect the dispersion and receiving sensitivity of the module varying degrees;
- Assuming that there is a device around the module that there is a large electromagnetic interference will also affect the performance of the module, and the intensity of interference is advised to remotely depending on the module. If the situation allows appropriate isolation and shielding;
- Assuming that there is a wire (high frequency digital, high frequency simulation, power line) around the module (high frequency numeral, high frequency simulation, power line), which will greatly affect the performance of the module, and the intensity of

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the interference is recommended to properly away from the module. If the situation allows for appropriate Isolation and shielding;

- If the communication line uses 5V level, it must be connected in series 1K-5.1K resistance (not recommended, there is still damaged risk);
- Try away from some of the physical layer of 2.4GHz TTL protocol, such as USB3.0;
- The antenna mounting structure has a great influence on the performance of the module, and it is important to ensure that the antenna is exposed, it is best to vertical vertically. When the module is mounted inside the casing, high quality antenna can extend the antenna to the outside of the casing;
- The antenna must not be installed inside the metal shell, which will cause the transmission distance to weaken.

9 Common problem

9.1 Transmission distance is not ideal

- When there is a linear communication barrier, the communication distance will attenuate;
- Temperature, humidity, same frequency interference, can result in increased communication packet loss rates;
- The ground absorption, reflecting radio waves, close to the ground test effect;
- Seawater has a strong absorption of radio wave, so the seaside test effect is poor;
- There is a metal object near the antenna, or in a metal shell, the signal attenuation will be very serious;
- Power register setting error, the air rate is too high (the higher the air rate, the closer distance);
- At room temperature, the power supply is lower than the recommended value, the lower the voltage, the smaller the power is;
- Using antenna and module matching degree or antenna itself quality problem.

9.2 Module is easy to damage

- Check the power supply, make sure there is a need for the power supply voltage, such as exceeding the maximum, causing the module permanent damage;
- Check the power stability, the voltage cannot fluctuate significantly;
- Make sure the installation process is an anti-static operation, the high frequency device is electrostatically sensitivity;
- Make sure the installation process is not too high, some components are humidity sensitive devices;
- If there is no special demand, it is not recommended to use it too high, too low temperature.

9.3 The error rate is too high

- There are similar signal interference nearby, away from interference or modified frequencies, and channel avoidance interference;
- Power is not ideal or may cause garbled, and be sure to ensure the reliability of the power supply;
- Extending the line, the feeder is poor or too long, and the error rate is also high.

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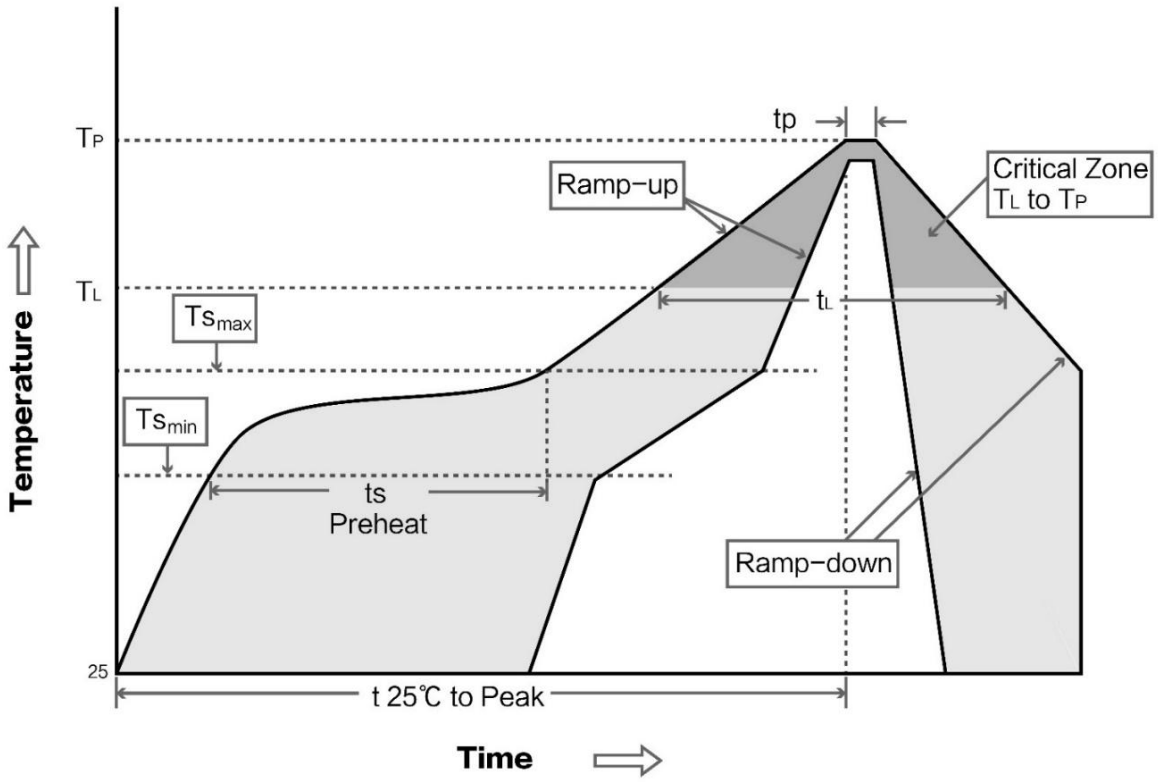
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10 Welding operation guidance

10.1 Reflow temperature

Profile Feature	Curve characteristics	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Solder	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)	Preheat 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）	Liquid phase or more	60-90 sec	30-90 sec
Peak temperature（Tp）	Peak temperature	220-235℃	230-250℃
Aveage ramp-down rate（Tp to Tsmax）	Average drop rate	6℃/second max	6℃/second max
Time 25℃ to peak temperature	25 ° C to peak temperature	6 minutes max	8 minutes max

10.2 Reflow solder curve diagram



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11 Related model

Product number	Chip solution	working frequency	Transmit power	Test distance	Product Size	Encapsulation form	Communication Interface
		Hz	dBm	km	mm		
E28-2G4T12S	SX1280	2.4G	12.5	3	17.5*28.7	Patch	TTL
E28-2G4M27S	SX1280	2.4G	27	8	15*26.5	Patch	SPI
E28-2G4M20S	SX1280	2.4G	20	6	15*26.5	Patch	SPI
E28-2G4M12S	SX1280	2.4G	12.5	3	25*14	Patch	SPI

12 Antenna Guide

12.1 Antenna recommended

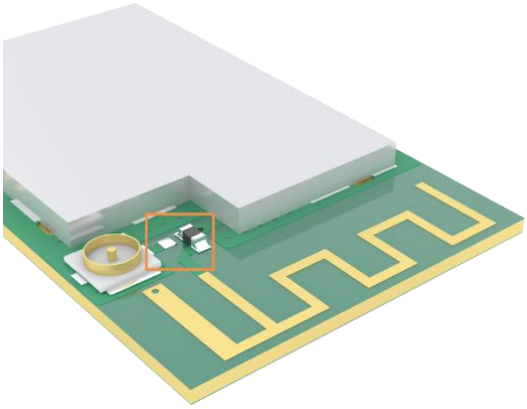
The antenna is an important role in the communication process. It is often inferior to the communications system, so we recommend that some antennas are used as a wireless module with our wireless module and the performance is excellent and reasonable.

Product number	Types	Frequency band	Gain	size	Feeder	interface	Characteristics
		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, all-to-directional antenna
TX2400-JZ-5	Glue rod antenna	2.4G	2.0	50	-	SMA-J	Ultra-short straight, all-to-directional antenna
TX2400-JW-5	Glue rod antenna	2.4G	2.0	50	-	SMA-J	Fixed bending, all-to-directional antenna
TX2400-JK-11	Glue rod antenna	2.4G	2.5	110	-	SMA-J	Bendable rubber stick, all-to-directional antenna
TX2400-JK-20	Glue rod antenna	2.4G	3.0	200	-	SMA-J	Bendable rubber stick, all-to-directional antenna
TX2400-XPL-150	Suction cup antenna	2.4G	3.5	150	150	SMA-J	Small suction cup antenna, cost performance

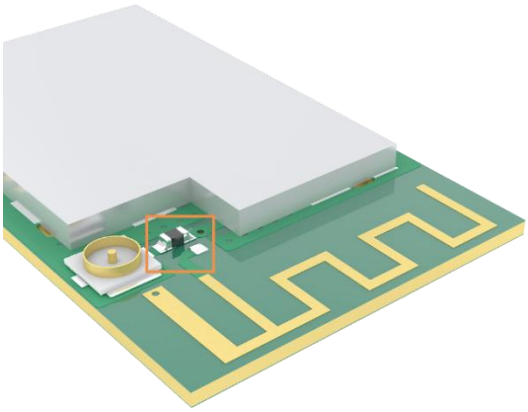
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12.2 Antenna selection

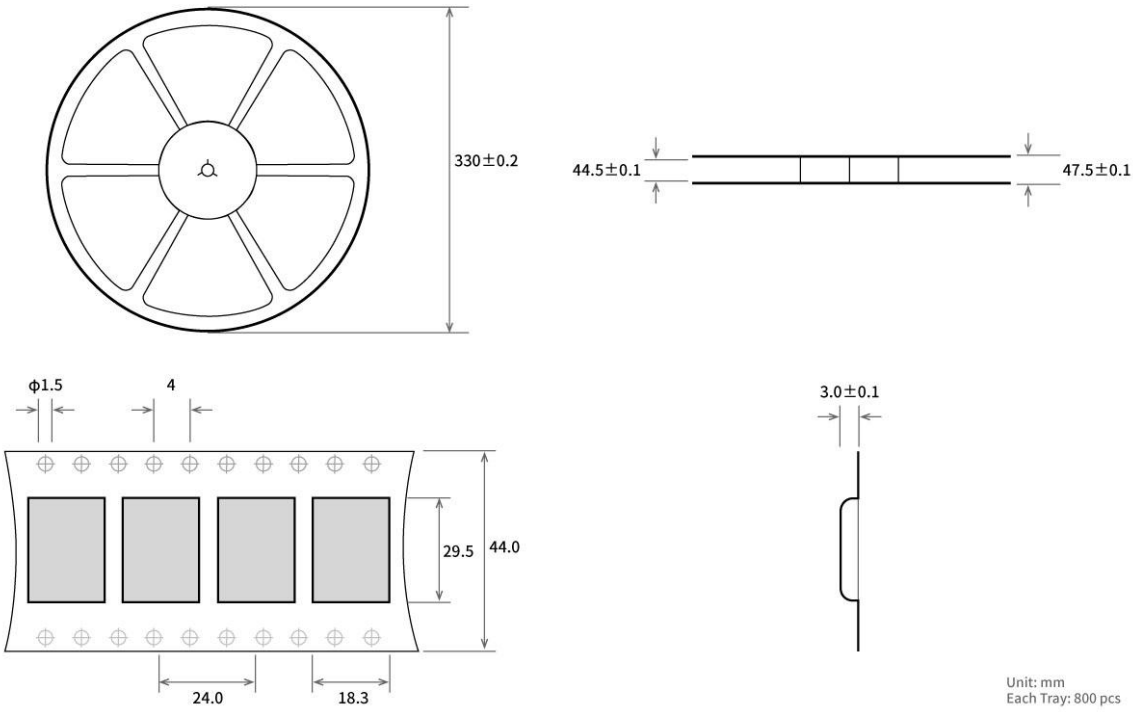


Enable PCB onboard antenna (default)



Enable IPEX interface

13 Batch packaging



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Revision history

Version	Date	Description	Issued by
1.0	2021.5.14	First edition, first public release.	-
1.1	2022-10-27	Bug fixes	Yan
1.2	2023-12-7	Bug fixes	Hao

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