E21-400G30S Product Index

ISM radio band 433 / 470MHz piece type PA / LNA amplifier

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Contents

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Chapter 1 Overview

1.1 Introduction

E21-400G30S is a pure hardware RF mid-power amplifier (PA) launched by Chengdu Ebyte Company, with a maximum output power of 1W, covering a frequency range of 410 to 470MHz. The module has a built-in LNA low-noise amplifier, which can greatly improve wireless communication. Communication distance.

Using imported high-quality PA chips, high efficiency, low temperature rise, greatly improving the working efficiency of the whole machine, it can be continuously transmitted in an environment of +50 degrees Celsius, breaking through the problem of non-continuous transmission in medium power.

Built-in LNA low noise amplifier, filter, limiting device, low noise figure, improve the receiving sensitivity of the receiving channel, and expand the communication distance.

Ultra-low power consumption design, standby current only 3uA, simple control method, only two I/O ports are needed for receiving and sending control switching, SOP patch design method, ultra-small size, very easy to embed, the entire program is designed in accordance with the industrial level, Ultra-high stability, suitable for a variety of application scenarios, has been widely used in various industries, with stable performance, transmission

Long transmission distance, strong penetration and diffraction ability.

1.2 Features

- Under ideal conditions, the communication distance can reach 5km;
- Maximum transmit power 1W;
- 400~470MHz broadband;
- High efficiency PA power amplifier, PA efficiency 42.5%;
- LNA low noise amplifier, the sensitivity is increased by 3dB;
- Built-in limiting device to limit the input power range of the receiving channel;
- Ultra-low power consumption design, standby current is only 3uA;
- Support 3.3~5.5V power supply, 5V power supply can guarantee the best performance;
- Industrial-grade standard design, supporting long-term use at -40～+85℃;
- The stamp hole patch installation is conducive to integration and mass production.

Chapter 2 Specifications

2.1 Limit parameters

The main parameters	performance		Remark
	Minimum	Maximum	

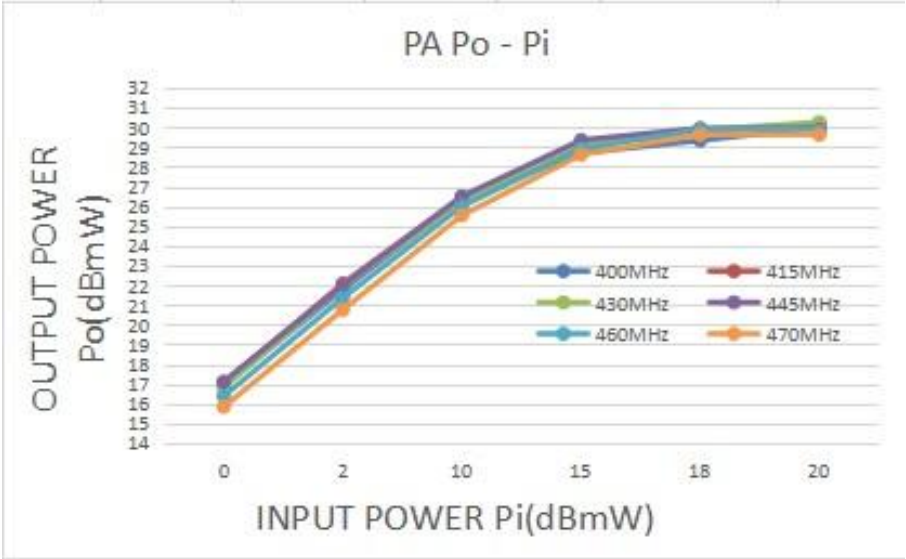
Power supply voltage (V)	3.0	5.5	Over 6V will permanently burn the module
Blocking power (dBm)	-	18	It is less likely to burn when used at close range
Working temperature (℃)	-40	+85	Industrial grade

2.2 Working parameters

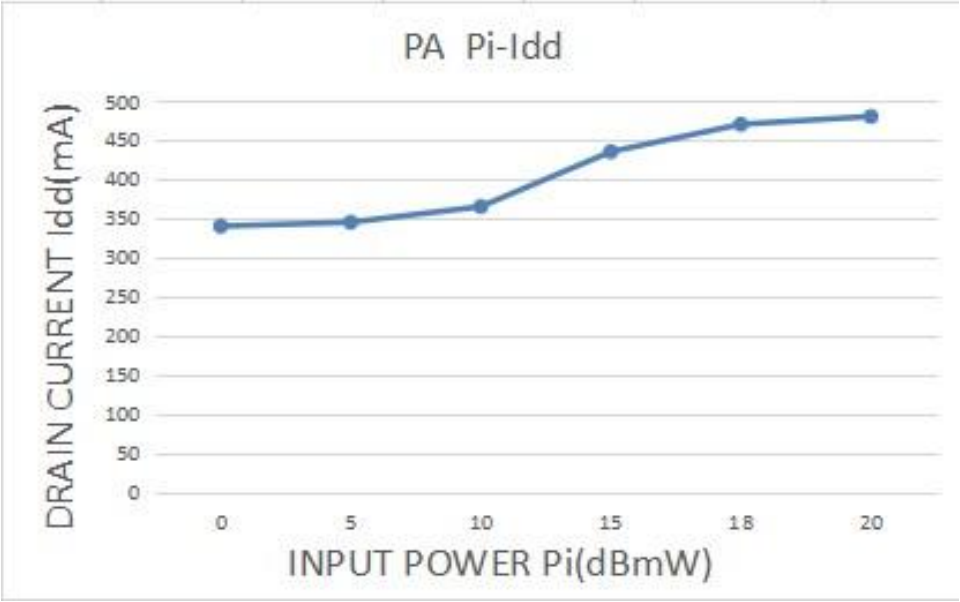
The main parameters		performance			Remark
		Minimum	Typical value	Maximum	
Working voltage (V)		3.3	5	5.25	≥4.75V can guarantee output power
Control level (V)		3.0	3.3	5.25	Recommend to use 3.3V
Working temperature (℃)		-40	25	+85	Industrial design
Working frequency (MHz)		400	-	470	ISM frequency band
Power consumption	Emission current (mA)	450	480	500	Instantaneous power consumption 30dBm
	Receiving current (mA)	6.5	8	-	-100dBm input current 8mA
	Sleep current (μA)		3.0		T/RX_EN = 0
Maximum transmit power (dBm)		29.5	30	30.5	Input power = 20dBm
Receiving gain (dBm)		14	15	17	-100dBm input
Transmission gain (dBm)			12		+20dBm

The main parameters	Describe	Remark
Reference distance	5000m	Clear and open environment, antenna gain 5dBi, antenna height 2 meters, air rate 2.4kbps GFSK
Encapsulation method	SMD	/
Interface method	2.0mm	Stamp hole
Dimensions	27.5*18mm	/
RF input and output interface	Stamp hole	Equivalent impedance is about 50Ω

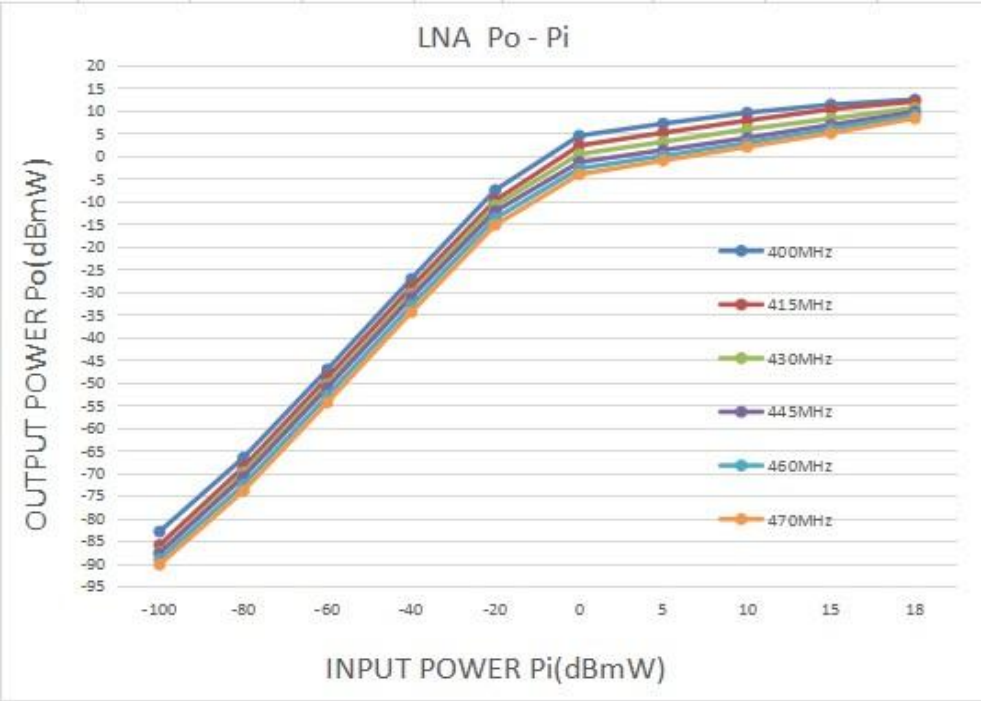
2.4 Parametric curve



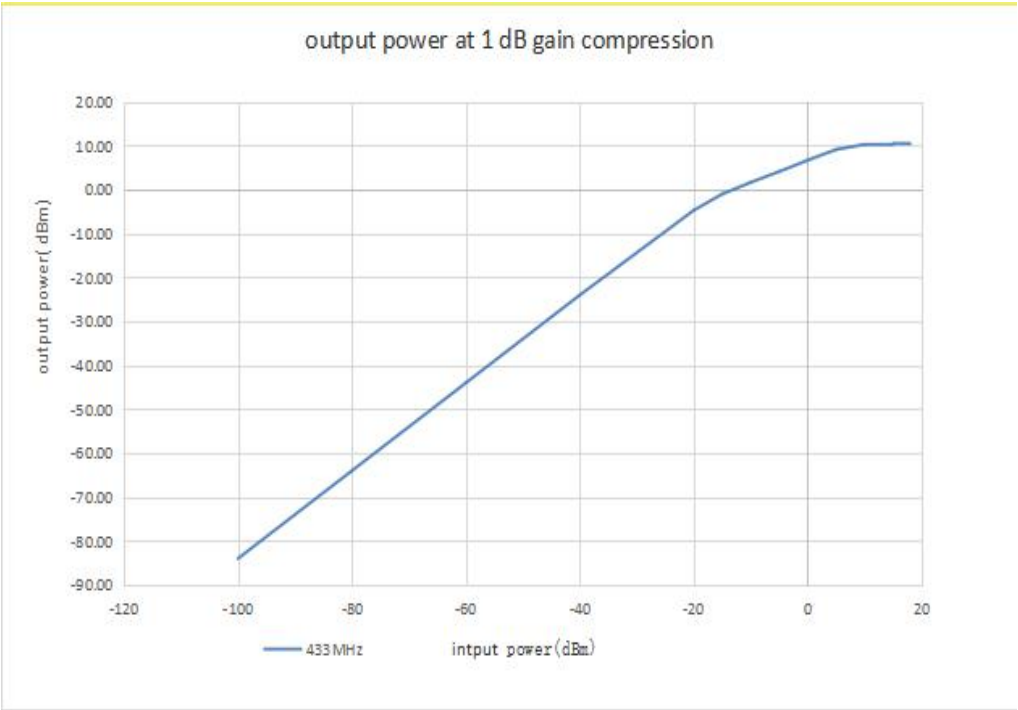
Correspondence between PA input and output power



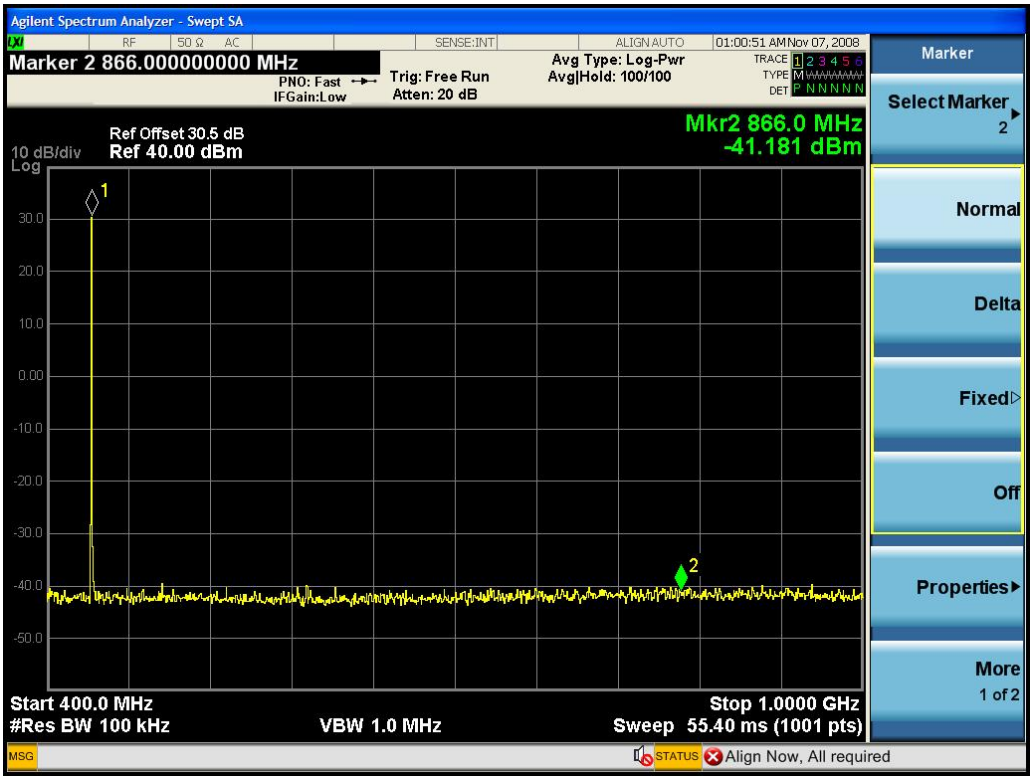
Correspondence between PA input power and current



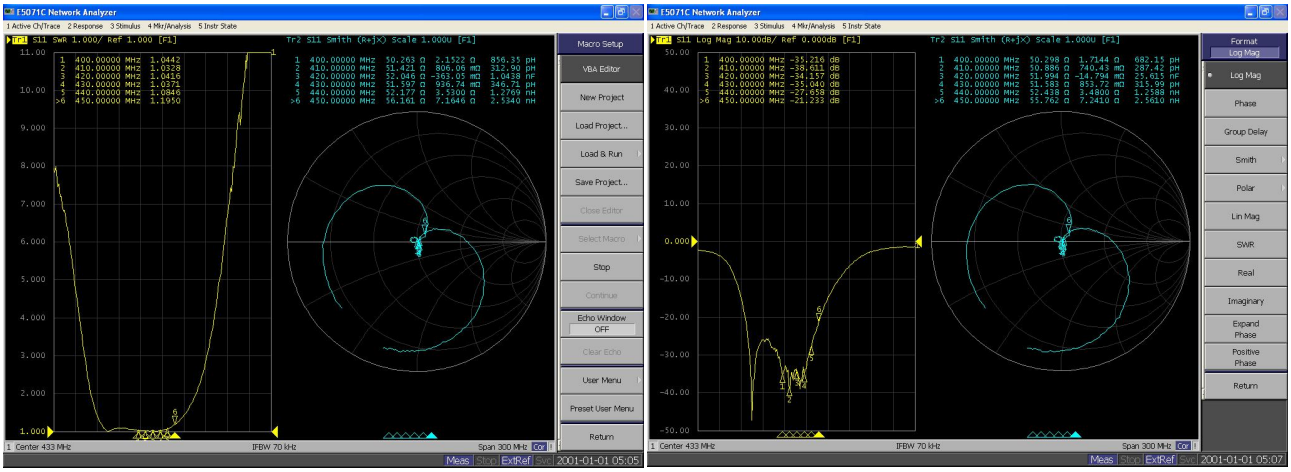
Correspondence between LNA input and output power



LNA input curve characteristics

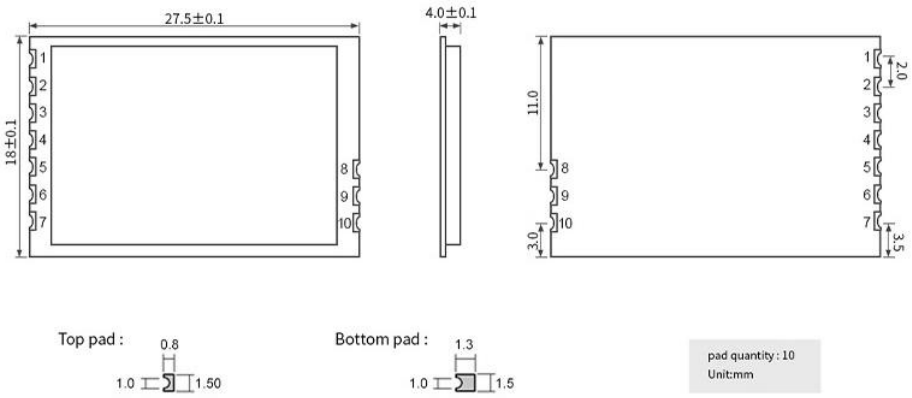


Harmonic suppression



SWR+Smith

Chapter 3 Mechanical Dimensions and Pin Definition



Pin number	Pin name	Pin direction	Pin usage
1	VCC	enter	Power supply, range 3.3~5.5V (5V recommended, ceramic filter capacitor is recommended to be added externally)
2	GND	enter	Ground wire, connected to the power reference ground
3	TX_EN	enter	RF switch pin control; when transmitting, TX_EN is high and RX_EN is low
4	RX_EN	enter	RF switch pin control; when receiving, RX_EN is high and TX_EN is low
5	GND	input/Output	Ground wire, RF reference ground
6	PIN	input/Output	Sending mode: RF signal input, receiving mode: RF signal output, impedance 50ohm
7	GND	input/Output	Ground wire, RF reference ground
8	GND	inputOutput	Ground wire, RF reference ground
9	ANT	input/Output	Sending mode: RF signal output, receiving mode: RF signal input, impedance 50ohm
10	GND	input/Output	Ground wire, RF reference ground

Chapter 4 Basic Operation

4.1 Hardware design

- It is recommended to use a DC stabilized power supply to supply power to the module, and the power ripple coefficient should be as small as possible, and the module must be reliably grounded;
- Please pay attention to the correct connection of the positive and negative poles of the power supply. Reverse connection may cause permanent damage to the module;
- Please check the power supply to ensure that it is within the recommended power supply voltage. If it exceeds the maximum value, it will cause permanent damage to the module;
- Please check the stability of the power supply, and the voltage should not fluctuate greatly and frequently;

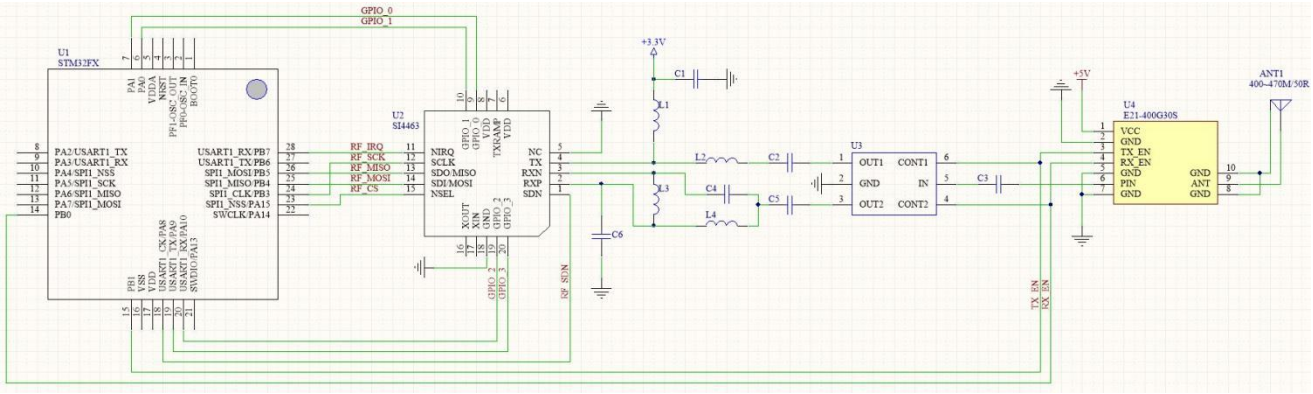
- When designing the power supply circuit for the module, it is often recommended to reserve more than 30% margin, and the whole machine is conducive to long-term stable operation;
- The module should be as far away as possible from the power supply, transformer, high-frequency wiring and other parts with large electromagnetic interference;
- High-frequency digital wiring, high-frequency analog wiring, and power wiring must avoid under the module. If it is necessary to pass under the module, assume that the module is soldered to the Top Layer, and the top layer of the contact part of the module is covered with copper (all laid Copper and well grounded), it must be close to the digital part of the module and routed in the Bottom Layer;
- Assuming that the module is soldered or placed on the Top Layer, it is also wrong to randomly route the wires on the Bottom Layer or other layers, which will affect the stray and receiving sensitivity of the module to varying degrees;
- Assuming that there are devices with large electromagnetic interference around the module, it will greatly affect the performance of the module. According to the intensity of the interference, it is recommended to stay away from the module. If the situation permits, proper isolation and shielding can be done;
- Assuming that there are traces with large electromagnetic interference around the module (high-frequency digital, high-frequency analog, power wiring) will greatly affect the performance of the module, according to the intensity of the interference, it is recommended to stay away from the module, if the situation permits Appropriate isolation and shielding;
- The antenna installation structure has a great influence on the performance of the module. Make sure that the antenna is exposed, preferably vertically upward. When the module is installed inside the case, a high-quality antenna extension cable can be used to extend the antenna to the outside of the case;
- The antenna must not be installed inside the metal shell, which will greatly reduce the transmission distance.
- Pay attention to good grounding, a large area of ground, and small power supply ripple. Filter capacitors should be added and placed as close as possible to the VCC and GND pins of the module;

4.2 Software writing

- Turn on TX_EN 2mS in advance of sending data, and reserve the start time;
- When transmitting, set TX_EN pin to high level and RX_EN pin to low level;
- When receiving, set RX_EN pin to high level and TX_EN pin to low level;
- Before turning off, set the TX_EN and RX_EN pins to low level;
- TX_EN and RX_EN cannot be high at the same time;

Chapter 5 Basic Application

5.1 Basic circuit



Chapter 6 Frequently Asked Questions

6.1 Transmission distance is not ideal

- When there is a straight line communication obstacle, the communication distance will be attenuated accordingly;
- Temperature, humidity, and co-frequency interference will increase the communication packet loss rate;
- The ground absorbs and reflects radio waves, and the test effect is poor when it is close to the ground;
- Sea water 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, and the air speed is set too high (the higher the air speed, 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 lower the power output;
- The matching degree between the antenna and the module is poor or the quality of the antenna itself is problematic.

6.2 Module is easily damaged

- Please check the power supply to ensure that it is within the recommended power supply voltage. If it exceeds the maximum value, it will cause permanent damage to the module;

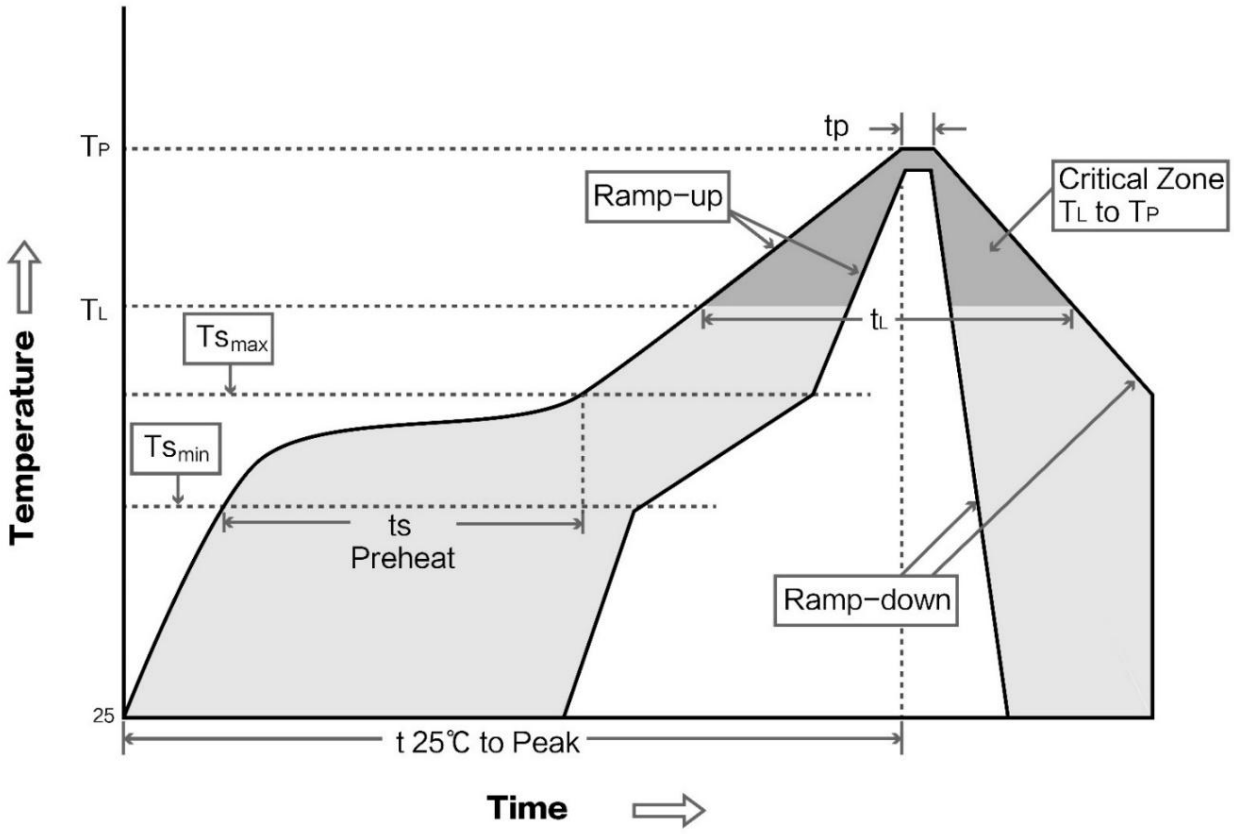
- Please check the stability of the power supply, and the voltage should not fluctuate greatly and frequently;
- Please ensure that the installation and use process is anti-static, and high-frequency components are electrostatically sensitive;
- Please ensure that the humidity should not be too high during installation and use, and some components are humidity sensitive devices;
- If there is no special requirement, it is not recommended to use it at too high or too low temperature.

Chapter 7 Welding Operation Guidance

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)	Preheat time	60-120 sec	60-120 sec
Average ramp-up rate(Tsmax to Tp)	Average ascent rate	3℃/second max	3℃/second max
Liquidous Temperature (TL)	Liquidus temperature	183℃	217℃
Time（tL）Maintained Above（TL）	Time above liquidus	60-90 sec	30-90 sec
Peak temperature（Tp）	Peak temperature	220-235℃	230-250℃
Aveage ramp-down rate（Tp to Tsmax）	Average descent rate	6℃/second max	6℃/second max
Time 25℃ to peak temperature	Time from 25℃ to peak temperature	6 minutes max	8 minutes max

7.2 Reflow soldering curve



Chapter 8 Related Models

Module model	PA + LNA	Frequency range	PA maximum power	LNA gain	Package form	Antenna form
		MHz	dBm	dBm		
E21-400G30S	√	400~470	30	15	Patch	Stamp hole
E21-900G30S	√	850~931	30	12	Patch	Stamp hole

Chapter 9 Antenna Guide

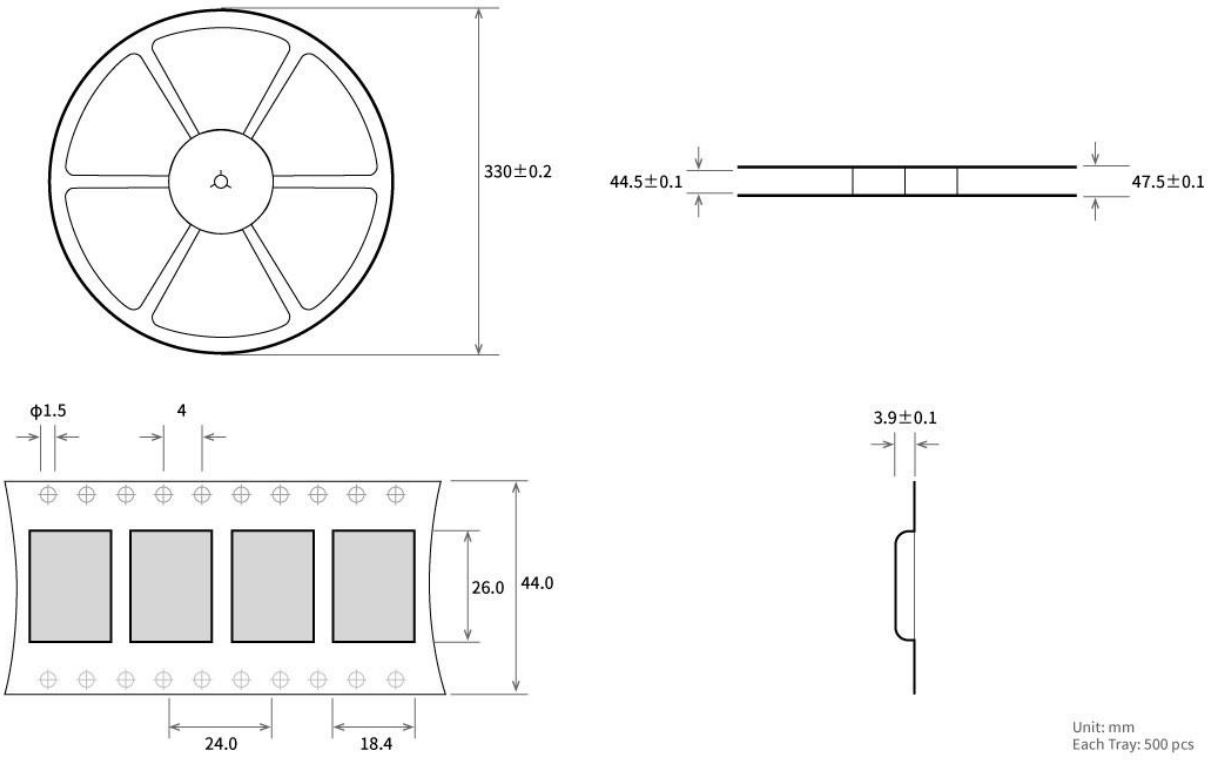
9.1 Antenna recommendation

Antennas are an important role in the communication process, and often inferior antennas will have a great impact

on the communication system. Therefore, our company recommends some antennas as supporting our company ' s wireless modules with excellent performance and reasonable prices.

Product number	type	Frequency band	Gain	Size	Feeder	Interface	Features
		MHz	dBi	cm	cm		
TX433-XP-200	Suction cup antenna	400~470	4	1.9	200	SMA-J	Ultra-short straight, omnidirectional antenna
TX433-JKD-20	Glue stick antenna	400~470	4	2.0	/	SMA-J	Bendable glue stick, omnidirectional antenna
TX868-XPL-100	Suction cup antenna	850~900	3.5	2.9	100	SMA-J	Small suction cup antenna, cost-effective
TX868-JKD-20	Glue stick antenna	850~900	3.0	2.0	/	SMA-J	Bendable glue stick, omnidirectional antenna
TX915-XPL-100	Suction cup antenna	850~900	3.5	2.6	100	SMA-J	Small suction cup antenna, cost-effective
TX868-JKS-20	Glue stick antenna	900~931	3.0	2.1	/	SMA-J	bendable glue stick, omnidirectional antenna

Chapter 10 Bulk Packing Method



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