E32-400M30S Product Specifications

SX1278 433/470MHz SMD SPI Hardware Wireless Module



Chengdu Ebyte Electronic Technology Co.,Ltd.

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

Contents

Disclaimer and Copyright Notice 2
Features 3
1 Introduction 4
1.1 Brief Introduction 4
1.2 Features 4
1.3 Application 4
2 Specification Parameters 5
2.1 Limit parameter 5
2.2 Operating parameter 5
3 Mechanical Dimensions and Pin Definitions 6
4 Basic operation 7
4.1 Hardware design 7
4.2 Programming 8
5 Basic Application 9
5.1 Hardware Design and Circuit Schematic 9
6 FAQ 9
6.1 Unsatisfactory transmission distance 9
6.2 Modules are fragile 10
6.3 BER is too high 10
7 Welding instructions 10
7.1 Reflow temperature 10
7.2 Reflow Profile 11
8 Related Models 11
9 Antenna Guide 12
9.1 Antenna Recommendations 12
Revision history 12
About us 12

Copyright ©2012–2024，Chengdu Ebyte Electronic Technology Co.,Ltd.

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

Disclaimer and Copyright Notice

The information in this document, including the URL addresses for reference, is subject to change without notice. this document is provided “as is” without warranty of any kind, including any warranty of merchantability, fitness for a particular purpose, or non-infringement, and any warranty that any proposal, specification, or sample is referred to elsewhere. this document disclaims all liability, including liability for infringement of any patent, arising out of the use of the information in this document. This document does not grant any license, express or implied, by estoppel or otherwise, to use any intellectual property.

The test data in this document are from tests conducted in the laboratory of EBYTE, and the actual results may vary slightly.

All trade names, trademarks and registered trademarks mentioned herein are the property of their respective owners and are hereby acknowledged.

The final explanation right belongs to Chengdu Ebyte Electronic Technology Co.,Ltd.

Notes:

The contents of this manual are subject to change due to product version upgrade or other reasons. Chengdu Ebyte Electronic Technology Co.,Ltd. reserves the right to make changes to the contents of this manual without notice or prompting. EBYTE makes every effort to provide accurate information in this manual, however, EBYTE does not warrant that the contents of this manual are error-free, and all statements, information and recommendations in this manual do not constitute any warranty, express or implied.

Copyright ©2012–2024，Chengdu Ebyte Electronic Technology Co.,Ltd.

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

Features

- Communication range up to 10km under ideal conditions;
- Maximum transmit power 1W, software multi-level adjustable;
- Support 433/470MHz frequency band;
- Supports data transmission rates from 0.018k to 37.5kbps in LoRaTM mode;
- Support data transmission rate up to 300kbps in FSK mode;
- Supports multiple modulation modes, LoRaTM/FSK/GFSK/MSK/GMSK/OOK;
- Large FIFO capacity, supporting 256Byte data cache;
- Supports 3.3~5.5V power supply, any power supply greater than 5V can ensure the best performance;
- Industrial-grade standard design, support -40 ~ +85 ℃ long time use;
- IPEX interface, stamp holes optional, easy for users to secondary development, conducive to integration.

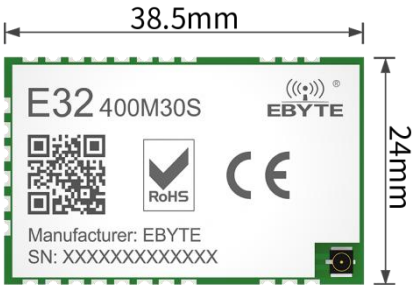
Copyright ©2012–2024，Chengdu Ebyte Electronic Technology Co.,Ltd.

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

1 Introduction

1.1 Brief Introduction

E32-400M30S is a 433/470MHz chip LoRaTM wireless module with 1W maximum transmit power developed independently based on the SX1278 core manufactured by Semtech.



Due to the use of the original imported SX1278 as the core of the module on the basis of the original built-in power amplifier (PA) and low-noise amplifier (LNA), so that the maximum transmit power of 1W at the same time the reception sensitivity has been further improved, in the overall stability of the communication is greatly improved compared with the product without power amplifier and low-noise amplifier. Due to the use of advanced LoRaTM modulation technology, the anti-interference performance and communication distance are far beyond the current FSK and GFSK modulation products. The module is mainly targeted at smart home, wireless meter reading, scientific research and medical treatment as well as medium and long distance wireless communication equipment. As the RF performance and component selection are in accordance with industrial grade standards.

Since the module is a pure RF transceiver module, it needs to be driven by MCU or use a special SPI debugging tool.

1.2 Features

- Communication distance up to 10km under ideal conditions;
- Maximum transmit power 1000mW, software multi-level adjustable;
- Support global license-free ISM 410~493MHz frequency band;
- Supports multiple modulation modes, LoRaTM/FSK/GFSK/MSK/GMSK/OOK;
- LoRa^{TM} mode supports data transfer rate from 0.018k to 37.5kbps;
- Supports data transfer rate up to 300kbps in FSK mode;
- Large FIFO capacity, supporting 256Byte data cache;
- Supports 3.3~5.5V power supply, and any power supply greater than 3.3V can ensure the best performance;
- Industrial-grade standard design, support -40 ~ +85 ℃ long time use;
- Stamp hole, easy for users to secondary development, conducive to integration.

1.3 Application

- Home security alarms and remote keyless entry;
- Smart home as well as industrial sensors, etc;
- Wireless alarm security systems;
- Building automation solutions;
- Wireless industrial grade remote controls;

Copyright ©2012–2024，Chengdu Ebyte Electronic Technology Co.,Ltd.

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

- Healthcare products;
- Advanced Meter Reading Architecture (AMI);

2 Specification Parameters

2.1 Limit parameter

Main Parameter	Performance		Remark
	Minimum Value	Maximum Value	
Supply Voltage (V)	0	5.5	Above 5.5V permanently burns out the module
Blocking power (dBm)	-	10	Less likely to burn out in close proximity
Operating temperature (°C)	-40	+85	Industrial grade

2.2 Operating parameter

Main Parameter		Performance			Remark
		Minimum Value	Typical value	Maximum Value	
Operating voltage (V)		3.3	5	5.5	>5.5V can cause permanent damage to the module;
Communication level (V)		-	3.3	-	-
Operating temperature (°C)		-40	-	+85	Industrial-grade design
Operating frequency band (MHz)		410	-	493	-
Power consumption	Emission current (mA)	-	650	-	-
	Receiving current (mA)	-	19	-	-
	Sleep Current (μA)	-	2	-	-
Maximum transmit power (dBm)		-	30	-	-
Receiving sensitivity (dBm)		-123	-124	-125	Air rate of 1.2kbps

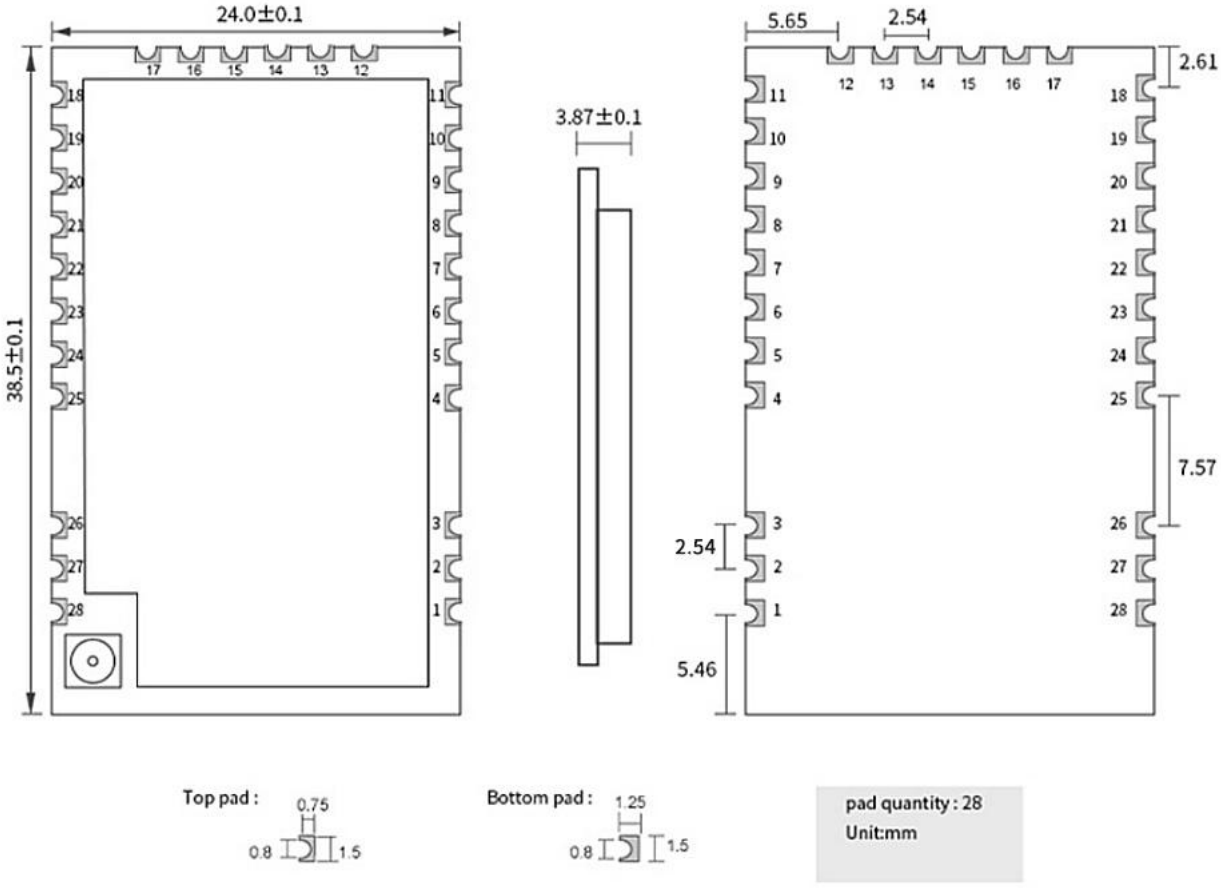
Main Parameter	Description	Remark
Reference distance	10Km	Clear and open environment, antenna gain 5dBi, antenna height 2 meters, air rate 2.4kbps
FIFO	256Byte	Maximum length of a single transmission
Crystal frequency	32MHz	Passive crystal oscillator
Modulation method	LoRa™(Recommendation)	FSK/GFSK/MSK/GMSK/OOK
Package Type	SMD	Pitch 2.54mm

Copyright ©2012–2024，Chengdu Ebyte Electronic Technology Co.,Ltd.

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

Interface method	2.54mm	Stamp hole
Communications interface	SPI	0～10Mbps
External Dimension	24*38.5mm	-
Antenna Interface	Stamp Holes/IPEX	Equivalent impedance approx. 50Ω

3 Mechanical Dimensions and Pin Definitions



Pin No.	Pin Name	Pin orientation	Pin Usage
1	GND	-	Ground, connected to power reference ground
2	GND	-	Ground, connected to power reference ground
3	GND	-	Ground, connected to power reference ground
4	GND	-	Ground, connected to power reference ground
5	GND	-	Ground, connected to power reference ground
6	RXEN	Input	RF switch receive control pin, connected to external microcontroller IO, active high.
7	TXEN	Input	RF switch transmitter control pin, connected to external

Copyright ©2012–2024，Chengdu Ebyte Electronic Technology Co.,Ltd.

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

			microcontroller IO, high level active
8	DIO2	Input/Output	Configurable general-purpose IO ports (see SX1278 manual for details)
9	VCC	-	Power supply, range 3.3 to 5.5V (external ceramic filter capacitors recommended)
10	VCC	-	Power supply, range 3.3 to 5.5V (external ceramic filter capacitors recommended)
11	GND	-	Ground, connected to power reference ground
12	GND	-	Ground, connected to power reference ground
13	NC	-	Floating
14	DIO3	Input/Output	Configurable general-purpose IO ports (see SX1278 manual for details)
15	DIO4	Input/Output	Configurable general-purpose IO ports (see SX1278 manual for details)
16	DIO5	Input/Output	Configurable general-purpose IO ports (see SX1278 manual for details)
17	GND	-	Ground, connected to power reference ground
18	GND	-	Ground, connected to power reference ground
19	DIO1	Input/Output	Configurable general-purpose IO ports (see SX1278 manual for details)
20	DIO0	Input/Output	Configurable general-purpose IO ports (see SX1278 manual for details)
21	NRST	Input	Chip reset trigger input pin
22	MISO	Output	SPI Data Output Pins
23	MOSI	Input	SPI Data Input Pins
24	SCLK	Input	SPI Clock Input Pins
25	NSS	Input	Module chip select pin to start an SPI communication.
26	GND	-	Ground, connect to power reference ground.
27	ANT	-	Antenna connector, stamp hole (50Ω characteristic impedance)
28	GND	-	Ground, connected to power reference ground

4 Basic operation

4.1 Hardware design

- It is recommended to use a DC regulated power supply to power the module, the power supply ripple coefficient should be as small as possible, and the module should be reliably grounded;
- Please pay attention to the correct connection of the positive and negative terminals of the power supply, if reversed it may cause permanent damage to the module;

Copyright ©2012–2024，Chengdu Ebyte Electronic Technology Co.,Ltd.

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

- Please check the power supply to ensure that it is between the recommended supply voltages, if it exceeds the maximum value, it may cause permanent damage to the module;
- Please check the stability of the power supply to ensure that the voltage does not fluctuate significantly and frequently;
- When designing the power supply circuit for the module, it is often recommended to keep more than 30% of the residual capacity, and have the whole machine is conducive to long-term stable operation;
- Module should be as far away as possible from the power supply, transformers, high-frequency alignments and other electromagnetic interference in the larger part;
- High-frequency digital alignment, high-frequency analog alignment, power supply alignment must be avoided below the module, if really have no choice but to go through the module below, assuming that the module is welded in the Top Layer, the Top Layer in the contact part of the module to pave the ground copper (all paved with copper and a good ground), must be close to the module digital part and the alignment of the line in the Bottom Layer;
- Assuming that the module is soldered or placed in the Top Layer, it is also wrong to randomly route the wires in the Bottom Layer or other layers, which will affect the spuriousness of the module as well as the reception sensitivity in different degrees;
- Assuming that the module is surrounded by a large electromagnetic interference devices will also greatly affect the performance of the module, according to the intensity of the interference is recommended to stay away from the module, if the situation permits you can do appropriate isolation and shielding;
- Assuming that there is a large electromagnetic interference around the module alignment (high-frequency digital, high-frequency analog, power supply alignment) will also greatly affect the performance of the module, according to the intensity of the interference is recommended to stay away from the module, if the situation permits you can do appropriate isolation and shielding;
- Try to stay away from some of the physical layer is also 2.4GHz TTL protocol, such as: USB3.0;
- The antenna installation structure has a greater impact on the module performance, be sure to ensure that the antenna is exposed, preferably vertically upward. When the module is installed inside the chassis, a good quality antenna extension cable can be used to extend the antenna to the outside of the chassis;
- The antenna must not be installed inside the metal casing, which will result in a great weakening of the transmission distance.

4.2 Programming

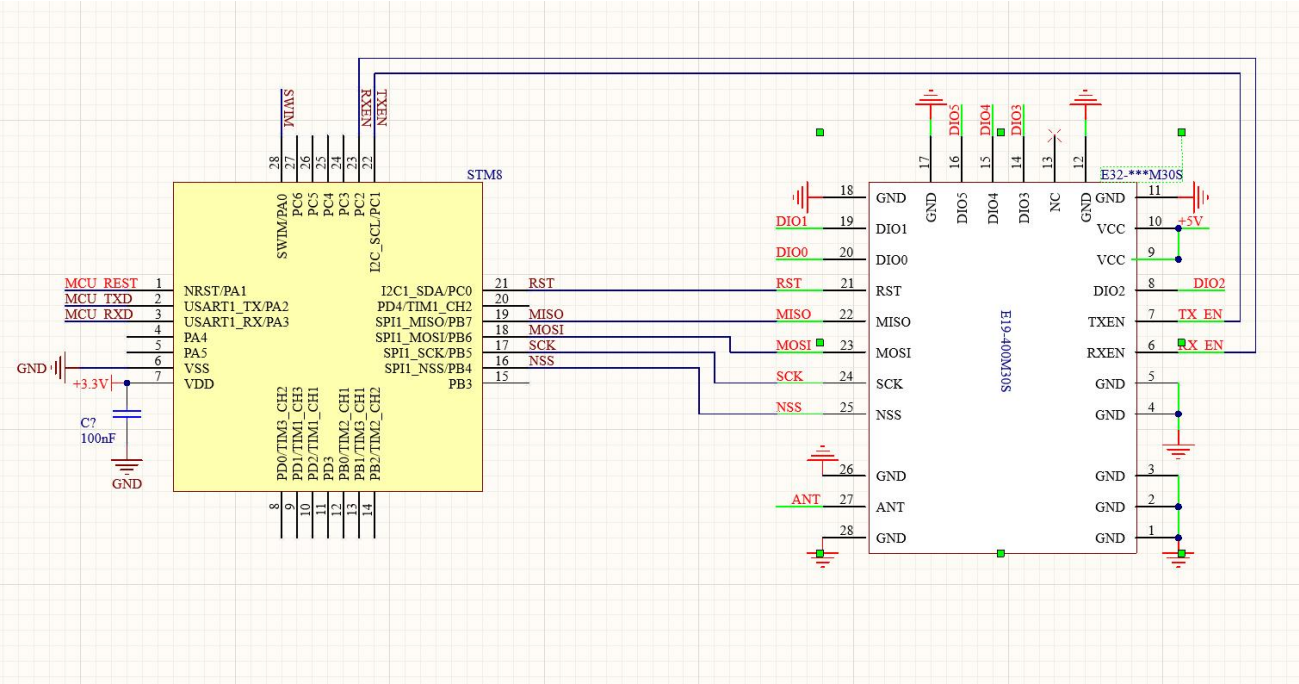
- This module is SX1278/SX1278+PA+LNA, its driving method is completely equivalent to SX1278/SX1278, users can follow the SX1278/SX1278 chip book exactly;
- DIO0, DIO1, DIO2, DIO3, DIO4, DIO5 are general-purpose I/O ports, which can be configured for various functions, see SX1278 manual for details. They can be left blank if not used;
- NRST, TXEN, RXEN pins must be connected, where NRST controls the reset of the chip, and TXEN, RXEN pins control the RF switch;
- Pay attention to good grounding, have a large paved area, small power ripple, should increase the filter capacitor and try to close to the module VCC and GND pins;
- SPI communication rate should not be set too high, usually 1Mbps is recommended;
- When transmitting, set TXEN pin high and RXEN pin low; when receiving, set RXEN pin high and TXEN pin low; before shutting down, set TXEN and RXEN pins low;
- The register configuration can be re-initialized when the chip is idle for higher stability.

Copyright ©2012–2024，Chengdu Ebyte Electronic Technology Co.,Ltd.

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

5 Basic Application

5.1 Hardware Design and Circuit Schematic



6 FAQ

6.1 Unsatisfactory transmission distance

- When there are linear communication barriers, the communication distance will be attenuated accordingly;
- Temperature, humidity, co-channel interference, will lead to communication packet loss rate increase;
- The ground absorbs and reflects radio waves, and the test effect is poor near the ground;
- Seawater has a strong ability to absorb radio waves, so the effect of the seaside test is poor;
- There are metal objects near the antenna, or placed in a metal shell, the signal attenuation will be very serious;
- Incorrect power register setting, air rate setting is too high (the higher the air rate, the closer the distance);
- Low voltage of the power supply at room temperature is lower than the recommended value, the lower the voltage the lower the hair power;
- The antenna is poorly matched with the module or the quality of the antenna itself.

Copyright ©2012–2024，Chengdu Ebyte Electronic Technology Co.,Ltd.

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

6.2 Modules are fragile

- Please check the power supply to ensure that it is between the recommended supply voltages, exceeding the maximum value can cause permanent damage to the module;
- Please check the stability of the power supply, the voltage can not be large and frequent fluctuations;
- Please ensure that the installation and use of the process of anti-static operation, high-frequency devices electrostatic sensitivity;
- Please ensure that the installation and use of the process of humidity should not be too high, part of the components for humidity-sensitive devices;
- If there is no special demand is not recommended in too high, too low temperature use.

6.3 BER is too high

- There is interference with the same frequency signal nearby, stay away from the interference source or modify the frequency and channel to avoid interference;
- SPI clock waveform is not standard, check whether there is interference on the SPI line, SPI bus line should not be too long;
- Unsatisfactory power supply may also cause garbled code, be sure to ensure the reliability of the power supply;
- Extension cables, feeder cables of poor quality or too long, will also cause high BER.

7 Welding instructions

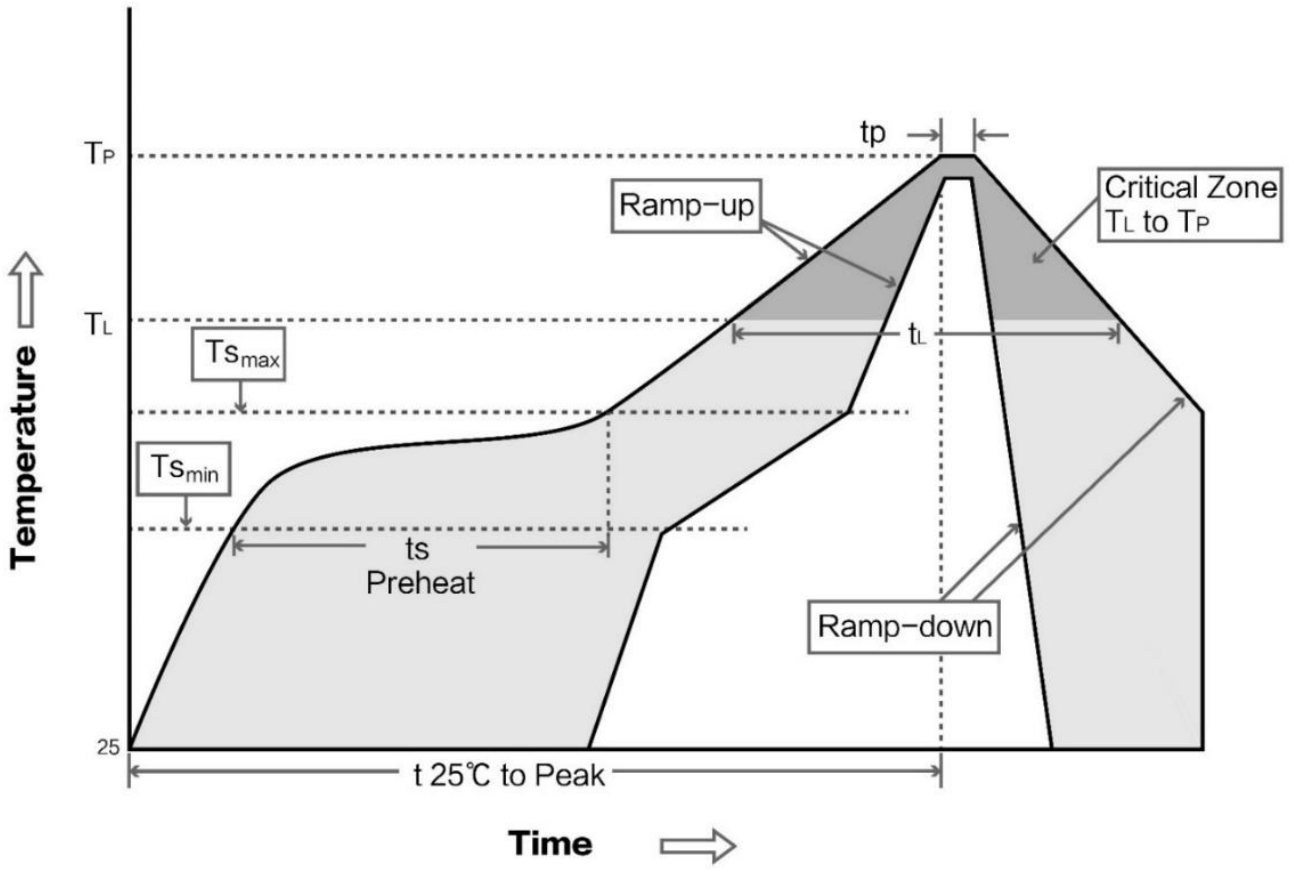
7.1 Reflow temperature

Profile Feature	Curve characteristic	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)	Preheating time	60-120 sec	60-120 sec
Average ramp-up rate(Tsmax to Tp)	Average rate of increase	3℃/second max	3℃/second max
Liquidous Temperature (TL)	liquid-phase temperature	183℃	217℃
Time（tL）Maintained Above（TL）	Time above the liquid phase line	60-90 sec	30-90 sec
Peak temperature（Tp）	Peak temperature	220-235℃	230-250℃
Aveage ramp-down rate（Tp to Tsmax）	Average rate of decline	6℃/second max	6℃/second max
Time 25℃ to peak temperature	Time from 25℃ to peak temperature	6 minutes max	8 minutes max

Copyright ©2012–2024，Chengdu Ebyte Electronic Technology Co.,Ltd.

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

7.2 Reflow Profile



8 Related Models

Module Model	Chip	Carrier frequency	Rransmitter power	Communication distance	Package form	Antenna form
		Hz	dBm	km		
E32-400T20S	SX1278	433M	20	5	SMD	IPEX/Stamp Hole
E32-400T20D	SX1278	433/470MHz	20	5.5	DIP	SMA-K
E32-433T30D	SX1278	433M	30	8	DIP	SMA-K
E32-433T20DC	SX1278	433M	20	5	DIP	SMA-K

Copyright ©2012–2024，Chengdu Ebyte Electronic Technology Co.,Ltd.

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

9 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 of the antennas as a supporting our wireless module and the performance is more excellent and reasonably priced antennas.

Model	Type	Frequency	Gain	Size	Feeders	Interface	Characteristic
		Hz	dBi	mm	cm		
TX470-JZ-5	rubber-stick antenna	470M	2.0	50	-	SMA-J	Ultra Short Straight, Omni-Directional Antenna
TX470-JK-11	rubber-stick antenna	470M	2.5	110	-	SMA-J	Bendable Rubber Stick, Omnidirectional Antenna
TX470-JK-20	rubber-stick antenna	470M	3.0	200	-	SMA-J	Bendable Rubber Stick, Omnidirectional Antenna
TX470-XPL-100	suction cup antenna	470M	3.5	290	100	SMA-J	Small suction cup antenna, cost-effective

Revision history

Version	Revision date	Revised description	Maintainer
1.0	2021-9-07	initial version	Linson
1.2	2022-12-6	Content amendments	Yan
1.3	2023-3-6	Content amendments	Yan
1.4	2024-12-26	Delete Certificate Description	Lei

About us

Technical support: service@cdebyte.com

Copyright ©2012–2024，Chengdu Ebyte Electronic Technology Co.,Ltd.

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

Documents and RF Setting download link: www.cdebyte.com

Thank you for using Ebyte products! Please contact us with any questions or suggestions: info@cdebyte.com

---

Web: www.cdebyte.com

Address: B5 Mould Park, 199# Xiqu Ave, High-tech District, Sichuan, China

Chengdu Ebyte Electronic Technology Co.,Ltd.

Copyright ©2012–2024，Chengdu Ebyte Electronic Technology Co.,Ltd.

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