



HJ-68LR(xx)_Hardware Design Manual

Based on SEMTECH SX1262、SX1268 or LLCC68

Chip-level high-performance LoRa wireless module

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Preface

Thank you for using the LoRa module provided by HJSIP. The HJ-68LR(xx) series standard LoRa module is a high-performance chip-level LoRa module, and the module supports external antennas. The product also features low power consumption, small size and strong anti-interference ability, and is suitable for a variety of application scenarios.

This module is mainly used for data communication, and the company does not assume responsibility for property losses or personal injuries caused by improper operations of users. Please develop the product according to the technical specifications and reference design in the manual. At the same time, pay attention to the general safety matters that should be concerned about when using mobile products.

Before the announcement, the company has the right to modify the content of this manual according to the needs of technological development.

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Version History

Version	Date	Change Description	Reviser	Reviewer
V1.0	2022/01/05	Initial Version	LMY	LJH
V1.1	2022/01/20	Add the description of radio frequency parameters	LMY	LJH
V1.2	2022/03/02	Update the recommended circuit design drawing and add the package size drawing	LMY	ZYP
V1.3	2022/03/10	Update the size, height and maximum power	LMY	ZYP
V1.5	2022/05/11	The updated model is HJ-68LR (12), and the thickness dimension has changed	LMY	ZYP
V1.6	2022/05/18	Update the specification and model.	LMY	ZYP
V1.7	2022/11/28	Update the specification and model of the module.	FJW	LMY
V1.8	2023/08/14	Format change, change the maximum storage temperature.	FJW	LMY
V1.9	2025/01/21	1) Unify the document format; 2) Add 3 description of working characteristics; Add 4 application interface descriptions; Adjust the content of "9 Surface Mount Technology Production"; 3) Adjust the "10.2 Tag Information"; 4) Table 2-2: The reset time of the module has been changed from 100us to 1 second.	WYW	LMY
V2.0	2025/07/29	Merge the three manuals of HJ-68LR(12), HJ-68LR(18), and HJ-68LR(68).	WYW	LJH
V2.1	2025/10/27	7.1: Add note and component values.	WYW	LJH
V2.2	2026/06/29	Added contact information.	WYW	LJH

Applicable module selection

No.	Module type	Type	Description
1	HJ-68LR(12)-A800	800MHz-950MHz, active TCXO temperature-compensated oscillator 32MHz	Based on SX1262, the RF matching is within the frequency range of 800-950 MHz, and it is an active TCXO temperature-compensated oscillator
2	HJ-68LR(18)-A400	410MHz-525MHz, active TCXO temperature-compensated oscillator 32MHz	Based on SX1268, the RF matching is within the frequency range of 410-525 MHz, and it is an active TCXO temperature-compensated oscillator
3	HJ-68LR(68)-P400	410MHz-525MHz, passive 32MHz crystal oscillator	Based on LLCC68,a reduced cost version of SX1262, has a RF matching frequency range of 410-525 MHz and a passive crystal oscillator
4	HJ-68LR(68)-P800	800MHz-950MHz, passive 32MHz crystal oscillator	Based on LLCC68,a reduced cost version of SX1262, has a RF matching frequency range of 800-950 MHz and a passive crystal oscillator

1 Introduction

The HJ-68LR(xx) series modules are high-performance wireless transceiver modules based on LLCC68 or SX1262, SX1268 chips, with operating frequencies supporting 410MHz - 525MHz (recommended 434MHz) or 800MHz - 950MHz (recommended 868MHz). When using SX1262 and SX1268, the TCXO temperature-compensated crystal oscillator solution is adopted. The module using TCXO is more stable in the low-rate and long-distance miniaturization design scheme. The maximum transmission power is +22dBm, and the external interface is SPI. Users can achieve wireless data transmission and reception by making an IO connection with the MCU.

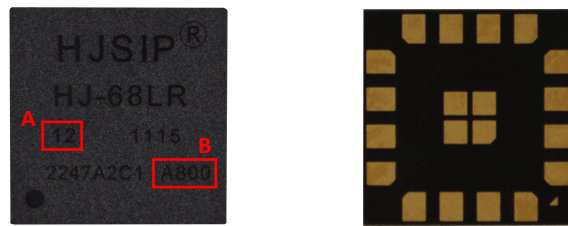


Figure 1.1: HJ-68LR (xx) front and bottom views

Table 1-1: HJ-68LR(xx) the front silk-screened chip type classification

Model \ Sign	A (Core Chip Sign)	B (Frequency Sign)	Instruction
HJ-68LR(12)-A800	12	A800	Based on SX1262 , Active TCXO temperature-compensated oscillator, frequency range 800-950MHz
HJ-68LR(18)-A400	18	A400	Based on SX1268 , Active TCXO temperature-compensated oscillator, frequency range 410-525 MHz
HJ-68LR(68)-P400	68	P400	Based on LLCC68 , Frequency range: 410-525MHz, passive crystal oscillator
HJ-68LR(68)-P800	68	P800	Based on LLCC68 , Frequency range: 800-950MHz, passive crystal oscillator

Note

A (Core chip identification) : 12 indicates that the core chip is SX1262, 18 indicates that the core chip is SX1268, and 68 indicates that the core chip is LLCC68.

B (Frequency Identifier) : The initial letter A represents the TCXO oscillator used, the initial letter P represents a passive ordinary crystal oscillator, and the number following the letter represents the frequency band.

2 Product overview

2.1 Key features

Table 2-1: HJ-68LR (xx) key characteristics

Characteristic	Description
frequency range	Free frequency bands 800MHZ-950MHZ are available without application
transmitting power	Max. +22dBm

Receiving sensitivity	TYP.-129dBm(Passive crystal oscillator version); -148dBm(TCXO version).
Size	7.5mm * 7.5mm * 1.35mm (L*W*H)
Supply voltage	1.8V-3.7VDC
RX peak current (DCDC)	<4.6mA @ LoRa® 125kHz
TX peak current (20dBm)	TYP. 102mA @ 868/915MHz TYP. 90mA @ 434/490MHz
Ultra-low power consumption	<1uA
Working temperature	-40 ~ +85°C
Storage temperature	-40 ~ +85°C

2.2 Application scenarios

- Smart electricity meter
- Supply Chain and logistics
- Building automation, street lighting, smart cities
- Agricultural sensors, parking sensors, environmental sensors, security sensors
- Medical care
- Remote control application

2.3 functional block diagram

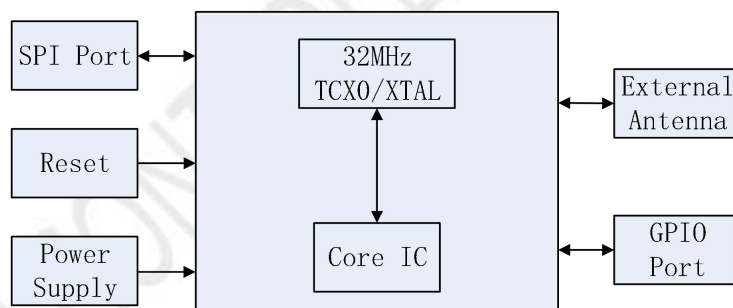


Figure 2.1: HJ-68LR(xx) functional block diagram

2.4 Pins distribution diagram

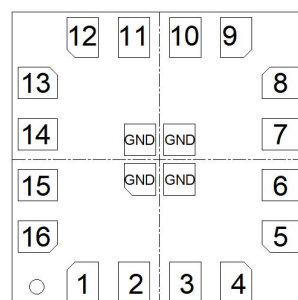


Figure 2.2: HJ-68LR(xx) Pins distribution diagram

2.5 Pins description table

Table 2-2: HJ-68LR(xx) Pins definition table

PIN	Name	Type	Description	Remarks
1	GND	POWER	Power GND	/
2	VCC	POWER	Power Supply	1.8-3.7V
3	GND	POWER	Power GND	Power GND Pin
4	GND	POWER	Power GND	Power GND Pin
5	VCC	POWER	Power Supply	1.8-3.7V
6	DIO3	IO	User-defined functions	For the passive crystal oscillator version, the response function of this pin can be configured through the register. <i><u>(When using TCXO, this pin is the power supply pin for TCXO and cannot be used for any other purposes.)</u></i>
7	DIO2	IO	User-defined functions	The corresponding functions can be achieved by programming the internal registers of the module
8	DIO1	Output	Interruption flag	When the IRQ corresponding function is enabled, when the corresponding function is triggered, the IRQ will output the corresponding interrupt level.
9	BUSY	Output	BUSY flag	Note: In the low-power sleep mode, this pin will be pulled up.
10	RST	Reset	Reset Pin	The low level is valid and the duration of the low level should be more than 1 second.
11	MISO	Output	MOSI, for the chip, refers to serial data output DOUT	Connect to the MISO of the MCU
12	SCK	Input	SPI interface synchronous clock input port	/
13	ANT	RF out	/	External antenna access
14	MOSI	Input	MOSI, for the chip, refers to serial data input DIN	Connect to the MOSI of the MCU
15	NSS	Input	SPI chip selection interface	When the NSS is pulled low, the module is locked and SPI data transmission can be carried out. During the low-power sleep phase, the NSS pulls down wake-up the module.
16	GND	POWER	Power GND	Power GND Pin

3 Work characteristics

3.1 Power Supply

The HJ-68LR (xx) series modules are connected to the external power supply via VCC and GND.

The power supply interface is described as follows:

Table 3-1: HJ-68LR (xx) power supply interface

Pin	Pin definition	Function description
2,5	VCC	Power supply, recommend 3.3V
1,3,4,16	GND	Power GND

The power supply circuit design of the HJ-68LR (xx) series modules should pay attention to the following points:

It is recommended to supply power to this module with a DC regulated power. The ripple of the power supply should be as small as possible, usually less than 1% VCC. Excessive ripple can lead to connection abnormalities such as poor sensitivity. At the same time, the transmitted signal of LoRa will be coupled with interference signals, causing the radio frequency index to exceed the specification. In severe cases, it may result in the inability to connect and communicate. Try to use LDO to supply power to the module. Meanwhile, LDO should be kept away from DC-DC power supplies and inductors to prevent DC-DC radiation from contaminating the power supply of LDO. The module must be reliably grounded. Please pay attention to the correct connection of the positive and negative terminals of the power supply. If they are connected in reverse, it may cause permanent damage to the module.

It is recommended to use 10uF and 0.1uF decoupling capacitors for the power pins of the HJ-68LR (xx) module. The capacitors should be as close as possible to the power pins.

The recommended power supply circuit is as follows:

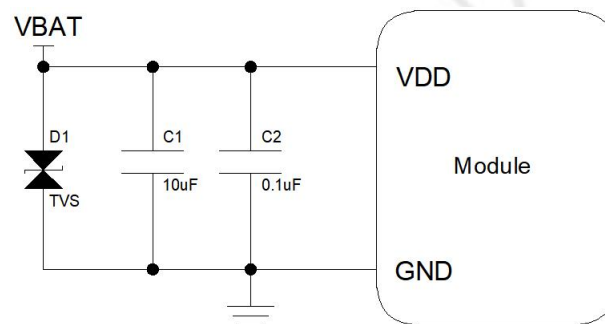


Figure 3.1: Power supply recommendation circuit

Note: D1 is used for electrostatic protection. Users should pay attention to the electrostatic requirements of the product when designing. It is recommended to place TVS diodes on the outside of the module for electrostatic protection.

3.2 Reset

Table 3-2: Module reset pin description

Pin	Pin definition	Function description
10	RST	Reset Pin, low level is valid and the duration of the low level should be more than 1 second.

Note:

- During the reset process, VCC needs to be in a stable state;
- The RESET pin should be pulled down for at least 100 microseconds.

- For some industrial environments or complex electromagnetic environments, it is recommended that the hardware reset pin be connected to the main control MCU. When powering on, the power-on reset operation must be performed.

4 Application interface

The HJ-68LR (xx) module provides the following application interfaces:

- One control signal pin
- One status indicator pin
- One SPI communication interface

4.1 Control signal

Table 4-1: control signal pin definition

PIN	Pin definition	Direction	Function description
15	SPI chip selection interface	input	When the NSS is pulled low, the module is locked and SPI data transmission can be carried out. During the low-power sleep phase, the NSS pulls down wake-up the module.

4.2 Status indication signal

Table 4-1: Status indication signal pin definition

PIN	Pin definition	Direction	Function description
9	BUSY sign	Output	Note: In the low-power sleep mode, this pin will be pulled up

4.3 SPI Communication

The HJ-68LR (xx) module provides one SPI data communication interface.

Table 4-2: Pin description

PIN	Pin definition	Function description
11	MISO, for the chip, refers to serial data output DOUT	Connect to the MISO of the MCU
14	MOSI, for the chip, refers to serial data input DIN	Connect to the MOSI of the MCU

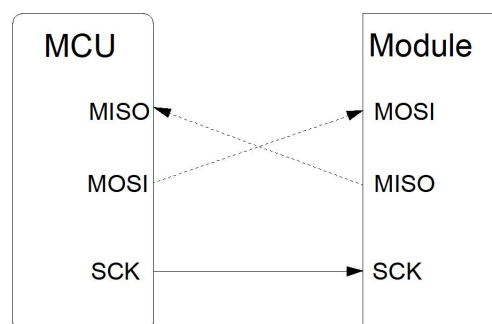


Table 4.1: Diagram of SPI port connection

5 Electrical Parameters

5.1 Absolute Maximum Ratings

Table 5-1: Absolute Maximum Ratings

Parameter	MIN	MAX	Unit
supply voltage VCC	1.8	3.9	V
IO Supply Voltage	0	VCC	V
Operating Temperature	-40	+85	°C
Storage Temperature	-40	+85	°C

5.2 DC Characteristics

Table 5-2: Recommended Operating Conditions

Parameter	MIN	TYP	MAX	Unit
Supply voltage VCC	1.8	3.3	3.7	V
IO Supply Voltage	0	3.3	VCC	V
Dormant working current	/	<1	/	uA
Maximum Operating Current@+20dBm	/	102	/	mA
Operating Temperature	-40	+25	+85	°C

5.3 RF Features

Table 5-3: RF features

Attribute	Value	Remarks
Wireless modulation mode	(G)FSK、LoRa®	/
Frequency range	410-525MHz or 800-950MHz	/
Air speed	- (G)FSK: 0.6-300 kb/s - LoRa®: 0.018-62.5 kb/s, SF5-SF12, BW = 7.8 - 500 kHz	/
Transmit Power	MAX : +22dBm	/
Receive sensitivity	TYP.-129dBm(Passive crystal oscillator version); -148dBm(TCXO version).	/
RX peak current(DC-DC)	<4.6mA @ LoRa® 125kHz	/
TX peak current(20dBm)	TYP. 102mA @ 868/915MHz TYP. 90mA @ 434/490MHz	/
Antenna	External antenna	/

6 Parameter description of RF

Table 6-1: Parameter description of RF

Model	Instruction
HJ-68LR(12)	The module based on SX1262 provides more comprehensive support for RF parameters SF5-SF12. BW10 - BW500. The HJ-68LR(12) uses a TCXO temperature-compensated crystal oscillator internally. Modules using TCXO are more stable in low-rate and long-distance miniaturized design schemes.
HJ-68LR(18)	The module based on SX1268 provides more comprehensive support for RF parameters SF5-SF12. BW10 - BW500. The HJ-68LR(18) uses a TCXO temperature-compensated crystal oscillator internally.

	Modules using TCXO are more stable in low-rate and long-distance miniaturized design schemes.
HJ-68LR(68)	LLCC68 is a reduced cost version of SX1262, so it should be noted that the RF parameter Settings of LLCC68 only support <u>SF5-SF11; BW125, BW250 and BW500</u> , The other functions are basically same.

7 Reference hardware design

7.1 Reference schematic diagram

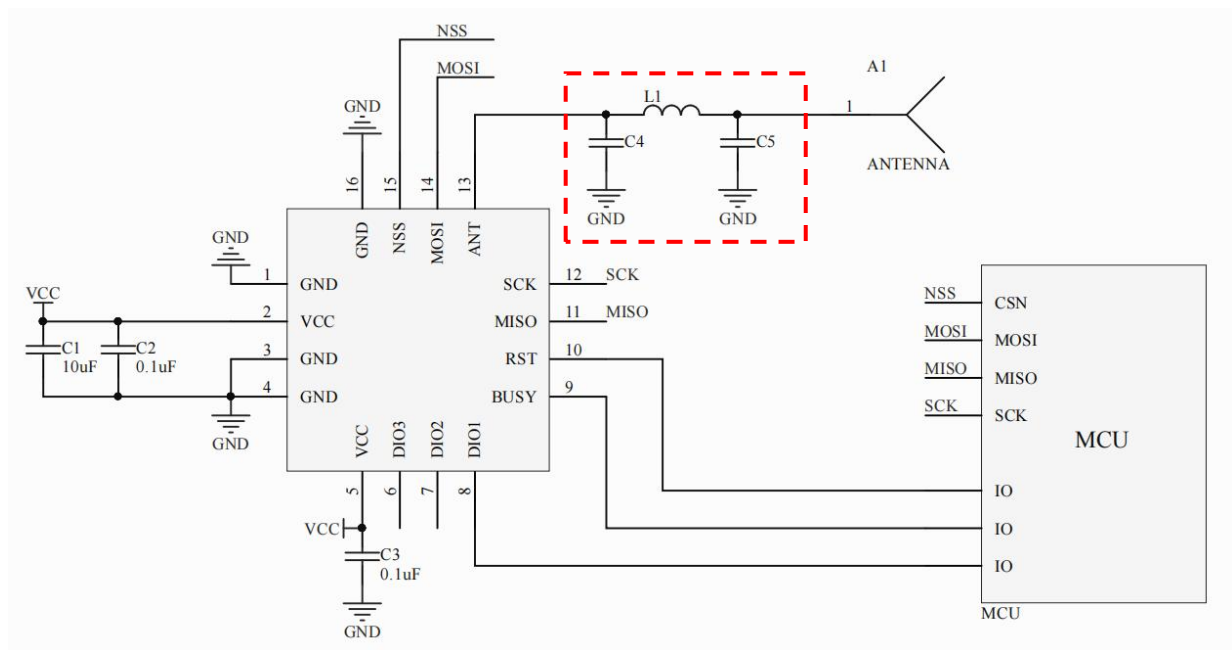


Figure 7.1: High-voltage power supply mode

Note: The RF port must be connected to the external antenna through a PI circuit!!

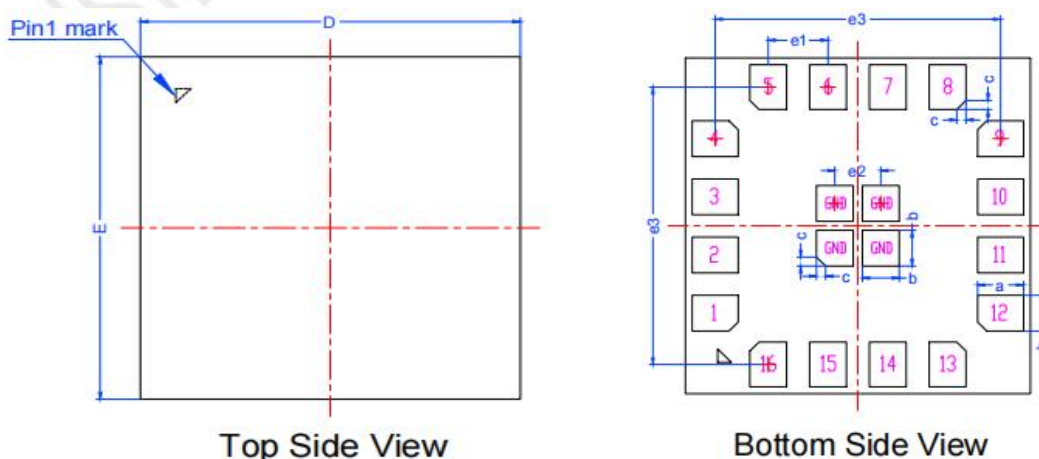
Designator and Value	L1	C4	C5
Model			
HJ-68LR(12)-A800 HJ-68LR(68)-P800	9.1nH	3pF	3pF
HJ-68LR(18)-A400 HJ-68LR(68)-P400	16nH	6.8pF	6.8pF

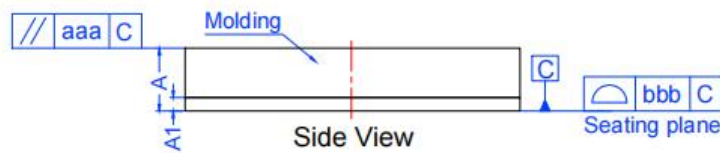
7.2 Notices for Hardware Design

- Antennas are recommended to use dedicated antennas that match the specifications of the wireless frequency band, such as spring antennas, etc.
- Module antenna should be placed at the four edges of the circuit board. The antenna part should be close to the edge or corner of the main board. It is best to place the module in the corner of the circuit board.
- Do not place any other components near or on the back of the antenna of the wireless module, and do not trace wires. If devices or traces are placed, it will affect the wireless performance.

- Each layer of the circuit board is fully copper-clad and connected to GND, and it is necessary to ensure that the copper-clad area is large enough (except for the antenna part) and is well grounded.
- Vias need to be drilled throughout the copper-clad area of the entire circuit board, especially near the modules and antennas. As many vias as possible should be drilled.
- If space permits, it is best to reserve a π -type filter circuit between the module and the antenna.
- If there are high-power devices or high-voltage conversion circuits on the circuit board, the GND copper clad of the module should be isolated from the GND copper clad of other parts, connected in a single-point grounding manner, and as many vias as possible should be drilled to reduce interference to the RF signal.
- The module should not be placed in a metal housing. If a metal housing must be used, the antenna must be led out.
- In products that require the installation of this wireless module, some metal components such as screws, inductors, etc. should be kept as far away as possible from the radio frequency antenna part of the wireless module.
- The filter capacitor at the power supply should be placed as close as possible to the power input pin of the module. If it is powered by a capacitor or space is limited, the filter capacitor at the power input can be removed. The module already has filter capacitors inside.
- For non-battery-powered and mains power supply with reduced voltage, it is recommended to filter the input power with magnetic beads or inductors.
- Please pay attention to the pin diagram for all pins. Please pay attention to the IO mode and status of the IO connected to them. When the SPI port is connected to the MCU, it is best to add a 100-ohm resistor if there is sufficient space.
- The pins that are not needed can be left in the air.

8 Dimension figure





DIMENSIONAL REFERENCES Units: mm

SYMBOL	DIMENSIONAL REQMTS			SYMBOL	Tolerance of Form & Position
	MIN	NOM	MAX		
A	1.31	1.35	1.39	aaa	0.10
A1	0.27	0.30	0.33	bbb	0.10
D	7.40	7.50	7.60		
E	7.40	7.50	7.60		
a	0.95	1.00	1.05		
b	0.75	0.80	0.85		
c	0.15	0.20	0.25		
e1	1.30REF.				
e2	1.00REF.				
e3	6.20REF.				

Note:

1. All dimensions are in mm

Figure 8.1: HJ-68LR(xx) mechanical dimensions

9 Surface mount production

9.1 Production Guide

The module is recommended to be soldered using reflow soldering, and the surface mount should be completed within 24 hours after opening the package. Otherwise, it needs to be re-vacuum-packed to prevent moisture from causing poor surface mount.

The packaging tape of this module can withstand a maximum temperature of 50°C. Please do not high-temperature baking with the tape.

If the product has been unpacked for more than three months, special attention should be paid to whether it has become damp. This is because the PCB gold plating process may cause the solder pads to oxidize after more than three months, which may lead to problems such as false soldering and missed soldering during the surface mount process.

To ensure the pass rate of reflow soldering, it is recommended to randomly select 10% of the products for visual inspection and AOI testing during the first surface mount to guarantee the furnace temperature, the rationality of control, device adsorption methods and placement methods; During the entire production process, operators at each workstation must wear anti-static gloves or bracelets.

9.2 Precautions for ultrasonic welding

Please carefully consider using ultrasonic welding technology. If it is necessary to use ultrasonic welding technology, please use 40KHz high frequency ultrasound welding technology. Keep the

module away from the ultrasonic soldering line and the fixing column during the design method to prevent damage to the module!

For specific ultrasonic welding matters, please contact our company for technical consultation.

9.3 Reflow soldering operation instructions

HJ-68LR(xx) module use high temperature resistant materials, manufacturing by Lead-free Process. The maximum temperature resistance is 265°C. Ten continuous reflow soldering has no effect on properties and strength. Specific parameters as shown in Table 9-1.

Table 9-1: Reflow soldering parameters

Parameter	Value
Features	Lead-free process
Average ramp up rate(T_{Smax} to T_p)	max3°C/sec. max
Temperature Min(T_{Smin})	150°C
Temperature Max(T_{Smax})	200°C
Preheat time (Min to Max) (t_S)	80~100sec
Peak Temperature (T_p)	250±5°C
Ramp-down Rate	6°C/sec. max
Time 25°C to Peak Temp (T_p)	8 min. max

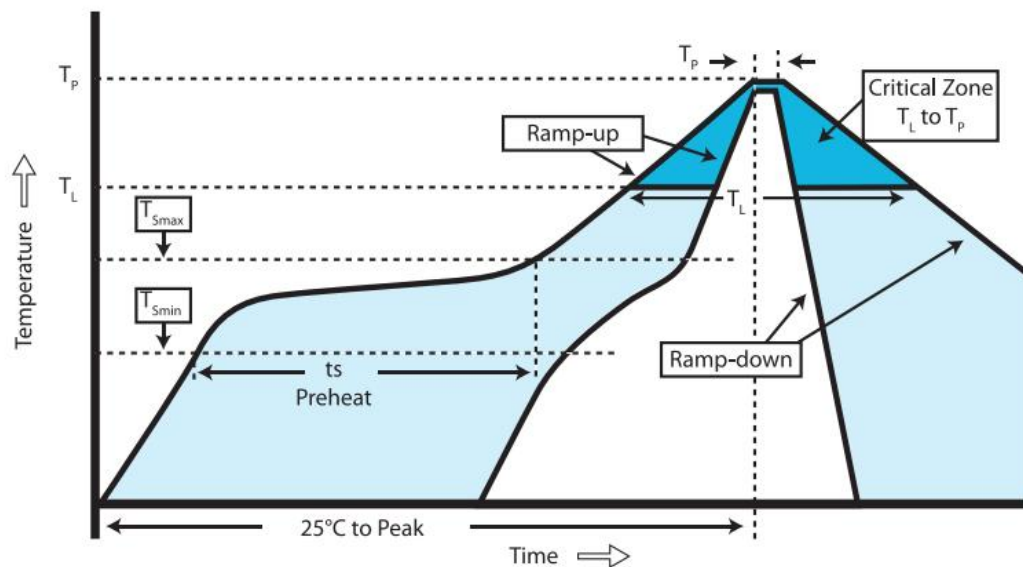


Figure 9.1: Temperature Curve of Reflow Welding

9.4 Humidity sensing properties

The HJ-68LR(xx) module has a humidity sensitivity of level 3.

If any of the following two conditions are met, the HJ-380IMH module should be fully baked prior before reflow soldering, otherwise the module may cause permanent damage during reflow soldering.

- After unpacking or vacuum packaging is damaged and air leaks, the module needs to be SMT

within 168 hours when the temperature is less than 30 degrees and the relative humidity is less than 60%. If the above conditions are not met, bake.

- Vacuum packaging is not opened, but beyond the shelf life, also need to be baked.

10 Packaging

10.1 Packaging method

Table 10-1: Packaging method

Type	Packaging method	Minimum packaging quantity(PCS)
HJ-68LR(xx) _xxxx	Roll tape	3000

Use chip-grade anti-static aluminum foil bags to seal and pack with braid. Each bag is put in desiccant. Industrial grade vacuum pump ensures no air leakage, moisture, water and dust (IP65). The actual packaging effect is shown in Figure 10.1.



Figure 10.1: package figure

10.2 Label information

All packages are labeled with cargo information, ROHS label, anti-static label, etc.

【A】 Tangshan Hongjia electronic Technology Co., LTD
【B】 HJ-XXX-XXX
【C】 Pb Free Reflow(260°C)
【D】 Date Code:2508 HJ0218
【E】 Note: Must be stored in a vacuum Seal
【F】 Warning: Humidity sensitivity level MSL:XX
【G】 QTY:1500PCS SEAL DATE:20250218

Figure 10.2: Product label drawing

Table 10-2: Module information description

No.	Description
A	company name
B	product model
C	Lead-free reflow mark and reflow temperature setting value
D	Production date Example: 2508 HJ0218 represents the product produced in the 8th week of 2025, on February 18
E	Storage precautions
F	Humidity sensitivity level
G	Quantity of product + date of sale