

**UL-68LR based on SX1262 ultra-small
(7.5mm*7.5mm*1.35mm) chip-level
high-performance LORA wireless module user
manual**

Module model: UL-68LR(12)

Revision history

serial number	Version	date	describe
1	V1.0	2022.01.05	first edition
2	V1.1	2022.01.20	Add RF parameter description
3	V1.2	2022.03.02	Updated recommended circuit design diagram and added package size diagram
4	V1.3	2022.03.10	Updated dimensions, height and maximum power
5	V1.5	20220511	Updated model to UL-68LR, thickness and size changed
6	V1.6	20220518	Update specification model selection
7	V1.7	20221128	Change specification model selection

Table of contents

Overview	1
1. Module features	2
(1) Functional features	2
(2) Application fields	2
2. Electrical characteristics	3
2.1. Maximum tolerance value	3
2.2. Recommended work value	3
2.3. Radio frequency characteristics	3
3. Mechanical dimensions	4
4. Pin definition	6
5. Hardware design considerations	8
5.1 Reference schematic diagram	8
5.2 Hardware design description	8
6. Radio frequency parameter description	10
7. Reflow soldering reference	10
8. Supply information	12
8.1. Model definition	12
8.2. Packaging method	12
9. Warning	14

Overview

UL-68LR(12) is a chip-level LORA module based on the SX1262 (chip supports 150MHZ-960MHZ, frequency customization is accepted) solution. The module specifications support the TCXO temperature-compensated crystal oscillator version; the operating frequency supports two specifications: 800MHZ - 950MHZ, The maximum transmit power is +22dBm, and the external interface is SPI interface. Users can send and receive wireless data through IO or SPI connection with MCU.

1、Module features

(1) Functional features

- support 800MHZ - 950MHZ Free frequency band, no need to apply for use
- Maximum transmit power +22dBm
- Single power supply with wide voltage supply 1.8V-3.7V
- RX peak current (DCDC) < 5mA; TX peak current (20dBm) < 92.0mA;
- Extra small size: 7.5mm * 7.5mm * 1.35mm
- < 1uA in ultra-low power mode

(2) Application fields

- Smart home wireless remote control, data transmission
- Wireless POS machine
- Industrial control, three-meter wireless communication
- Other wireless, low-power applications

2. Electrical characteristics

2.1. Maximum tolerance value

surface2-1 maximum tolerance

parameter	minimum value	maximum value	unit
Supply voltage VCC	1.8	3.9	V
IOport voltage	0	VCC	V
working temperature	-40	+105	°C
storage temperature	-55	+125	°C

2.2. Recommended work value

surface2-2 Recommended working value

parameter	minimum value	Typical value	maximum value	unit
Supply voltage VCC	1.8	3.3	3.7	V
IOport voltage	0	3.3	VCC	V
Sleep working current		<1		uA
Maximum working current @+20dBm		~92(TCXO版)		mA
working temperature	-40	+25	+85	°C

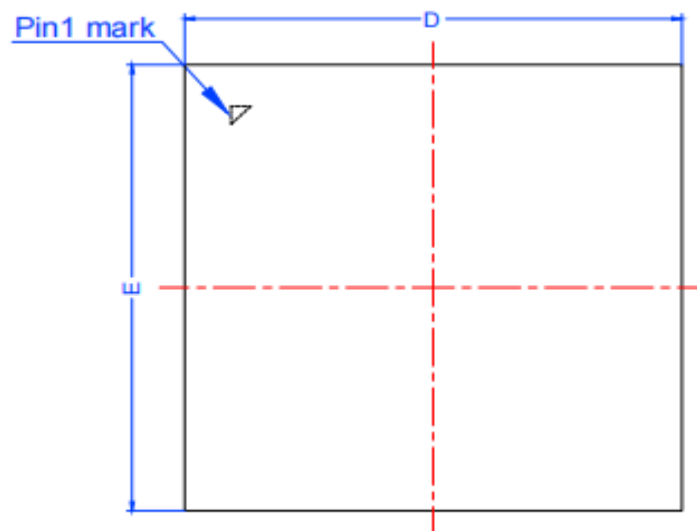
2.3. Radio frequency characteristics

surface2-3 RF characteristics

property	value	Remark
Wireless	GFSK、FSK、LORA	

modulation method		
frequency range	800-950Mhz	
Air speed	0.6Kbps - 300Kbps	
Transmit power	MAX. +22dbm	
Receive sensitivity	MAX.-148dbm	
antenna	external antenna	

3. Mechanical dimensions



Top Side View

Figure 3-1 Top view

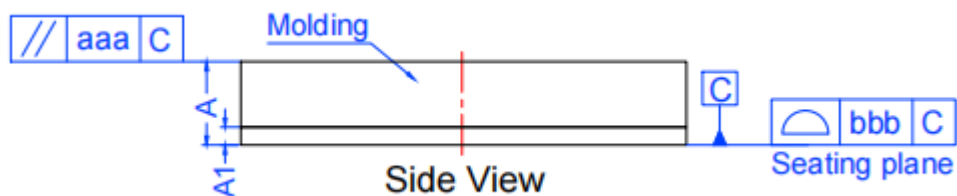


Figure 3-2 Side view



Figure 3-3 Bottom view

DIMENSIONAL REFERENCES *Units: mm*

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

Note:

1. All dimensions are in mm

Figure 3-4 Dimensional drawing

4. Pin definition

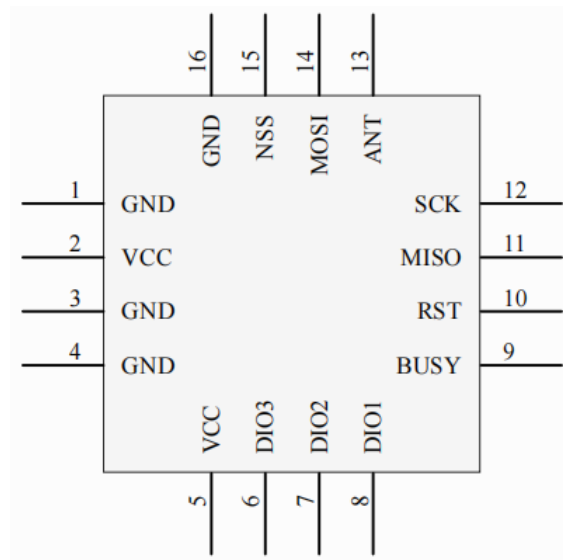


Figure 4-1 Pin diagram

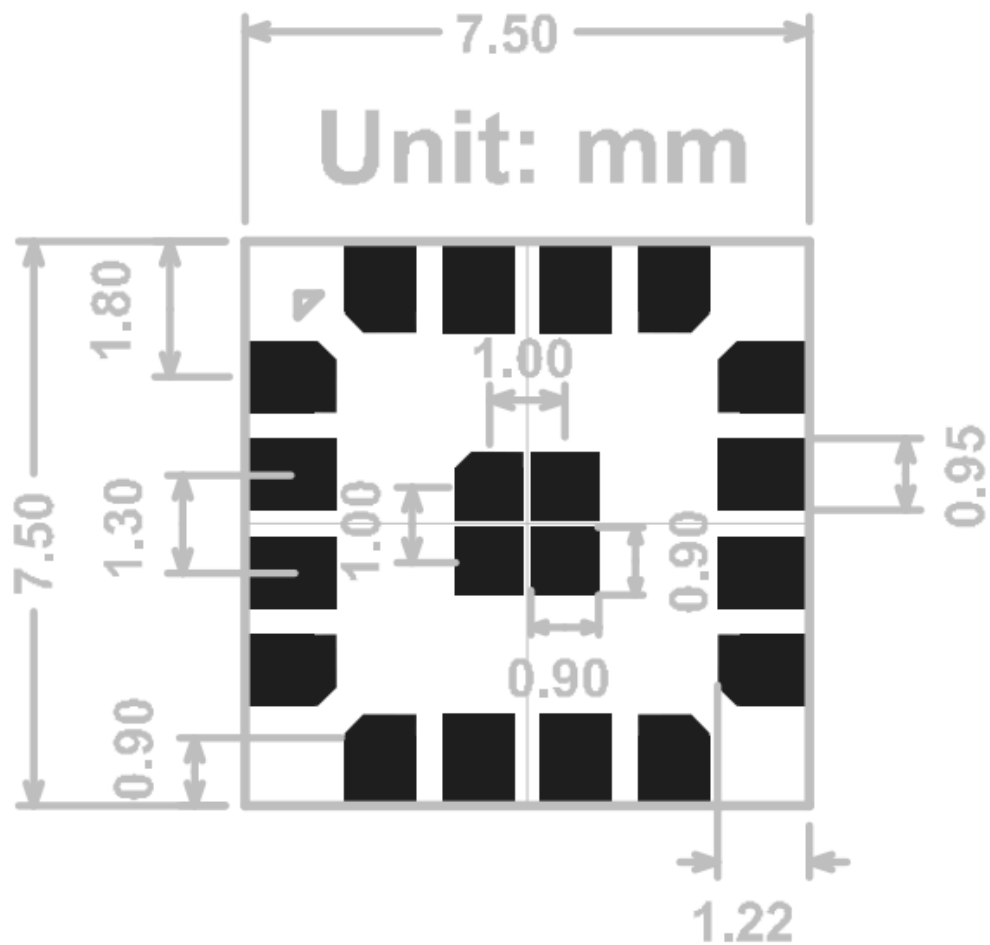


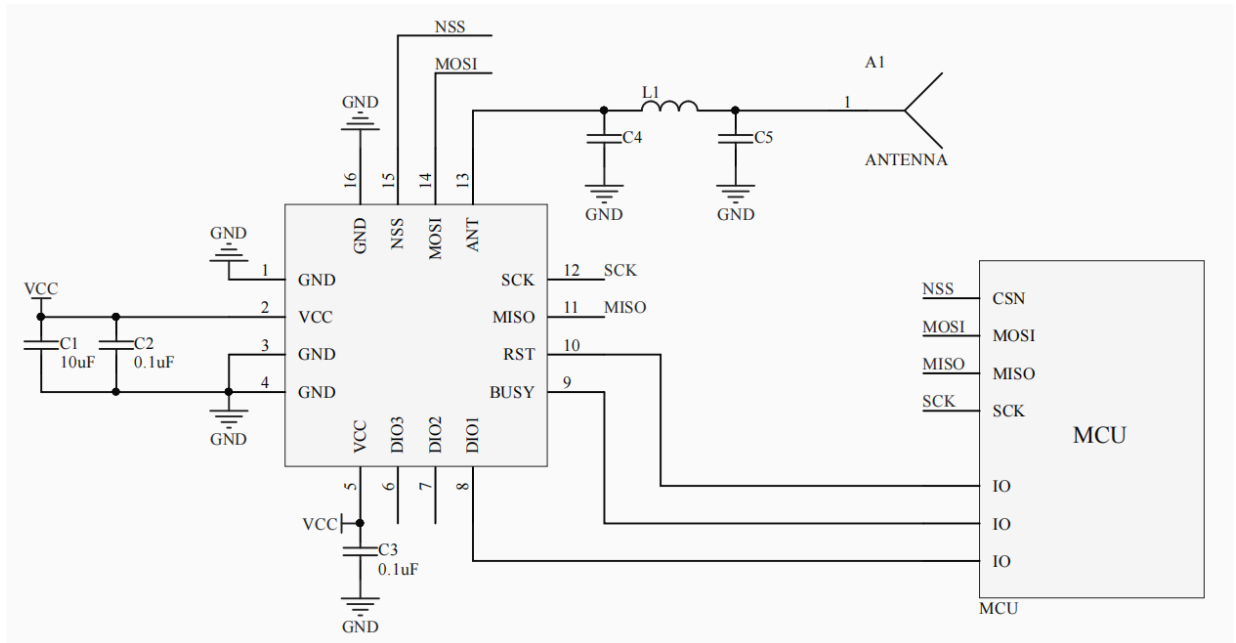
Figure 4-2 Recommended package size diagram

Pin #	name	type	describe	Remark
1	GND	POWER	power ground	Power GND pin.
2	VCC	POWER	Power input	1.8-3.7V
3	GND	POWER	power ground	Power GND pin.
4	GND	POWER	power ground	Power GND pin.
5	VCC	POWER	Power input	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; (When TCXO is currently used, this pin is the TCXO power supply pin and cannot be used for other purposes)
7	DIO2	IO	User-defined functions	Corresponding functions can be realized by programming the internal registers of the module
8	DIO1	Output	interrupt flag	When the IRQ corresponding function is enabled and the corresponding function is triggered, the IRQ will output the corresponding interrupt level.
9	BUSY	Output	BUSY logo	Note: In low power sleep mode, this pin will be pulled high
10	RST	Reset	reset pin	When the low level is connected for more than 100us, the module will reset;
11	MISO	Output	For the chip, it is the serial data output DOUT!	Corresponds to MISO connected to MCU
12	SCK	Input	SPI interface synchronous clock input port	
13	ON	RF out	External antenna output	External antenna access
14	SMOKE	Input	For the chip, enter DIN for serial data!	Corresponds to the MOSI connected to the MCU
15	NSS	Input	SPI interface chip select interface	When SEL is pulled low, the module is locked and SPI data transmission can be performed;

				in the low-power sleep stage, pulling SEL low will wake up the module.
16	GND	POWER	power ground	Power GND pin.

5. Hardware design considerations

5.1 Reference schematic diagram



5.2 Hardware design description

1、 It is recommended to use a special antenna that matches the wireless frequency band specifications, such as a spring antenna.

2、 The module antenna should be placed around the edges of the circuit board. The antenna part should be close to the edge or corner of the motherboard. It is best to place the module on the corner of the circuit board.

3、 Try not to place other components near the antenna and on the back of the wireless module, and no wiring is allowed. Placement of components or traces will affect wireless performance.

4、 Cover each layer of the circuit board with copper and connect it to GND. Make sure that the copper area of the module, especially the antenna part, is large enough and well grounded.

5、 Vias need to be drilled in the copper area of the entire circuit board, especially in the copper area near the module and antenna. As many vias as possible should be drilled.

6、 If space permits, it is best to reserve a π -type filter circuit between the module and the antenna.

7、 If there are high-power devices or high-voltage conversion circuits on the circuit board, the GND copper of the module needs to be isolated from the GND copper of other parts, connected using a single-point

grounding method, and as many vias as possible to reduce the risk of radio frequency signals. interference.

8、 The module should not be placed in a metal case. If a metal case must be used, the antenna must be led out.

9、 In products that need to be installed with this wireless module, some metal parts, such as screws, inductors, etc., should be kept as far away from the RF antenna part of the wireless module as possible.

10、 It is recommended that the input power be filtered by magnetic beads or inductors. The filter capacitors C1, C2, and C3 should be placed as close as possible to the power input pin of the module.

11、 Please check the pin diagram for all pins. Please pay attention to the I/O mode and status of the I/O connected to it. If there is enough space when connecting the serial port to the MCU, it is best to add a 100 ohm resistor.

12、 GND must be well grounded.

13、 Unused pins can be left floating.

6、RF parameter description

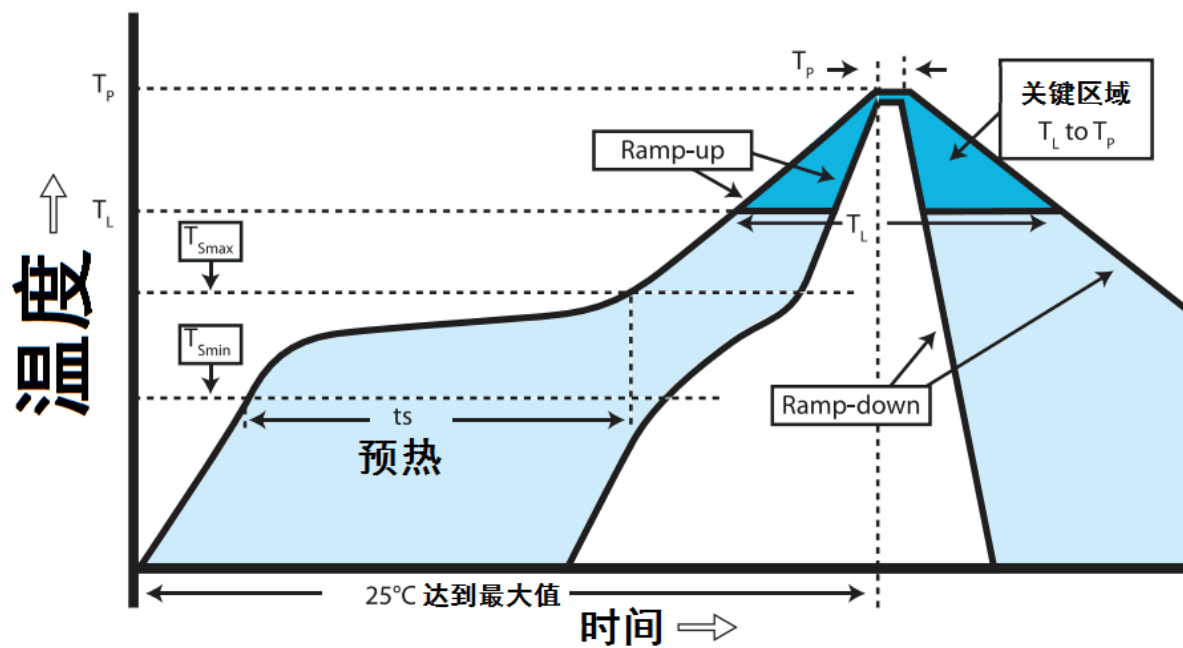
The module performance based on SX1262 is more comprehensive and the RF parameters support SF5 - SF12; BW10 - BW500.

UL-68LR(12) default version: uses TCXO temperature compensated crystal oscillator internally. Modules using TCXO are more stable in miniaturized designs with low speed and long distance.

7. Reflow soldering reference

UL-68LR module boards are all high-temperature-resistant boards, all using lead-free technology. The maximum test temperature resistance is 265° C. 10 consecutive reflow soldering operations will not have any impact on performance and strength. The details are as follows:

Characteristic parameters	Fully lead-free process
average temperature climb rate	3°C/second max
minimum temperature	150°C
maximum temperature	200°C
Reflow soldering time	80-100 seconds
peak temperature	250±5°C
average temperature reduction rate	6°C/second max



8. Supply information

8.1. Model definition

type	model	describe
800MHZ-950MHZ, active TCXO temperature compensated oscillator 32MHZ	UL-68LR(12)-A800	RF matching is 800-950MHZ frequency range, Active TCXO temperature compensated oscillator

8.2. Packaging method

(Pictures related to tape packaging and tape size information)

Use chip-level anti-static aluminum foil bags for sealing and taping packaging, put desiccant into each bag, and use an industrial-grade vacuum machine to ensure airtight, moisture-proof, waterproof and dustproof (IP65). (As shown below)



All packages will be labeled with cargo information, including ROHS and anti-static marks, and the production batch information in the material number is a 15-digit identification.

ULINK Shenzhen RouliTechnology Co., Ltd.
UL-68LR-A800

Pb Free Reflow(260℃)
DATE CODE:P16aI15bS17c001
QTY:1500PCS SEAL DATE:20170504

For example: P16a I15b S17c001 represents PCB production in January 2016, IC production in February 2015, and SMT patch production in the first batch in March 2017.

9. Warning

Please carefully consider the use of ultrasonic welding process. If you must use ultrasonic welding process, please use 40KHZ high-frequency ultrasonic welding technology. During the design process, please keep the module away from the ultrasonic welding line and fixing columns to prevent damage to the module!

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