

Spread spectrum wireless transceiver module

Ultra-low power 160mw

Product Specification



LoRa-CC68 series

CC68-X1

Catalogue

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Note: Revision History

Revision	Date	Comment
V1.0	2021-06	First release
V1.1	2021-10	Added FCC and CE certificate
V2.0	2022-6	Add C1 version, modify pin description

1. Overview

The LoRa-CC68 wireless module uses Semtech's LLCC68 device, ultra-low receive current and sleep current, and sensitivity of -129dBm. Built-in 64KHz crystal oscillator can wake up the microcontroller periodically under low power consumption. The module antenna switch is integrated and controlled by the chip, which saves the resources of the external MCU. The compact size and 22dBm (160mW) output power have great advantages in IoT and battery-powered applications.

The LoRa-CC68 series products are produced and tested strictly using lead-free processes, and all comply with RoHS and Reach standards. At the same time, we have obtained CE certification for 868MHz, and also obtained FCC certification for 915MHz. Customers can quote our certification when doing complete machine certification, greatly saves time and reduces costs.

Module	Frequency Band	Crystal	Certification	Remark
★CC68-C1-433	Center 433MHz customizable 410-810 MHz	10ppm Industrial grade crystal oscillator	NO	Shield
LoRa-CC68-433-TCXO		0.5ppm TCXO crystal oscillator	NO	
★CC68-C1-490	Center 490MHz customizable 410-810 MHz	10ppm Industrial grade crystal oscillator	NO	
LoRa-CC68-490-TCXO		0.5ppm TCXO crystal oscillator	NO	
★CC68-C1-868	Center 868 MHz customizable 150-960 MHz	10ppm Industrial grade crystal oscillator	CE	
LoRa-CC68-868-TCXO		0.5ppm TCXO crystal oscillator	CE	
★CC68-C1-915	Center 915 MHz customizable 150-960 MHz	10ppm Industrial grade crystal oscillator	FCC	
LoRa-CC68-915-TCXO		0.5ppm TCXO crystal oscillator	FCC	
LoRa-CC68-X1	Center 433/490/868/915MHz Customizable 150-960MHz	10ppm Industrial grade crystal oscillator	NO	No shield, small size
Lora-CC68			868-CE, 915-FCC	Shield

2. Features

- Frequency Range: 433/490/868/915 MHz (customizable 150-960 MHz)
- Sensitivity: -129dBm @LoRa
- Maximum output power: 22 dBm (160mW)
- Industrial grade high precision crystal oscillator
- LoRa,(G)FSK
- 255 bytes FiFo
- Data transfer rate:
0.6-300 Kbps @FSK
1.76-62.5 Kbps @Lora

3. Applications

- Industrial meter reading
- Parking lot sensor management
- Industrial automation
- Agricultural sensor
- Smart city
- Remote control
- Street lights
- Logistics management
- Environmental sensor
- Health products
- Security products
- Warehouse management

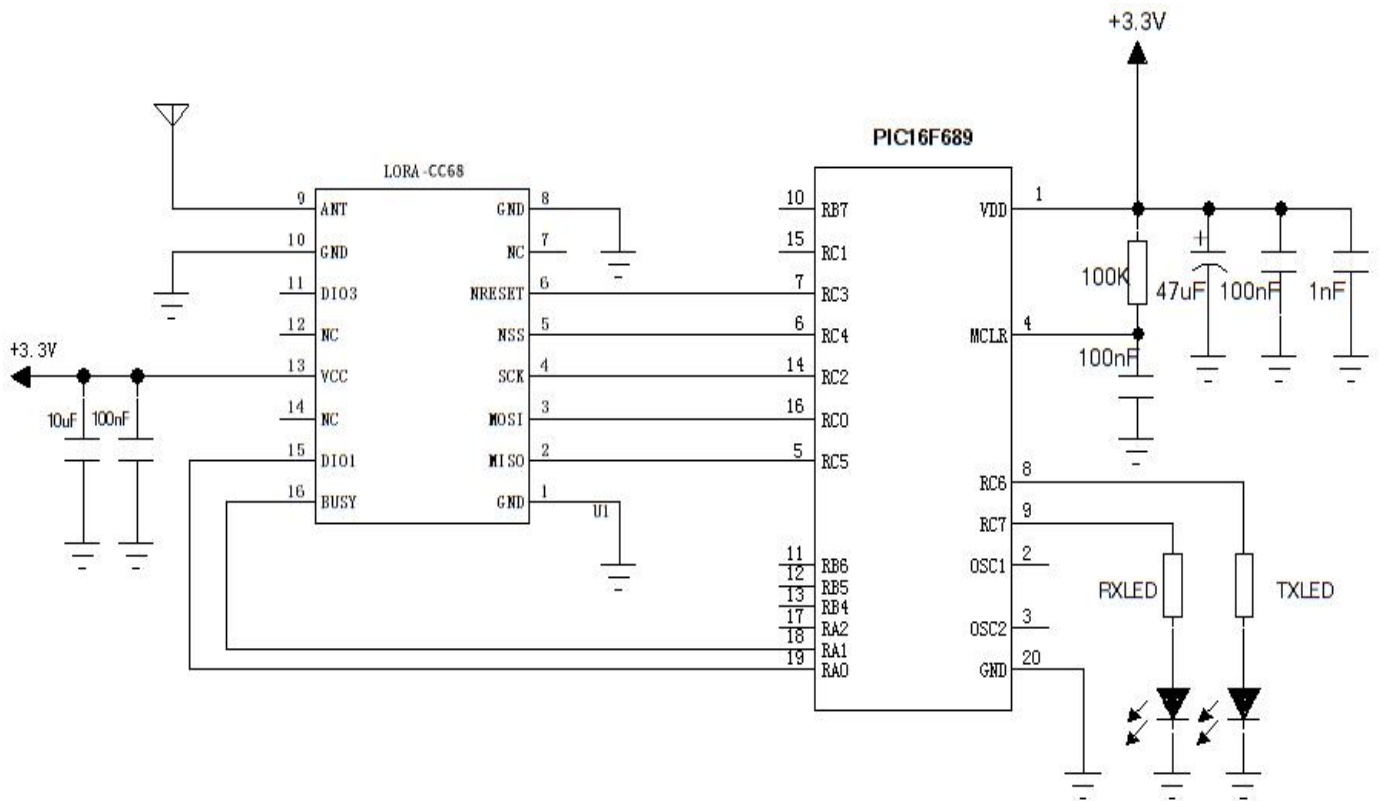
4. Electrical Characteristics (@Vcc=3.3v ANT connected to 50 ohm load)

★Note: The default shipment is ordinary crystal oscillator version. If needs, the TCXO crystal oscillator version can also be customized.

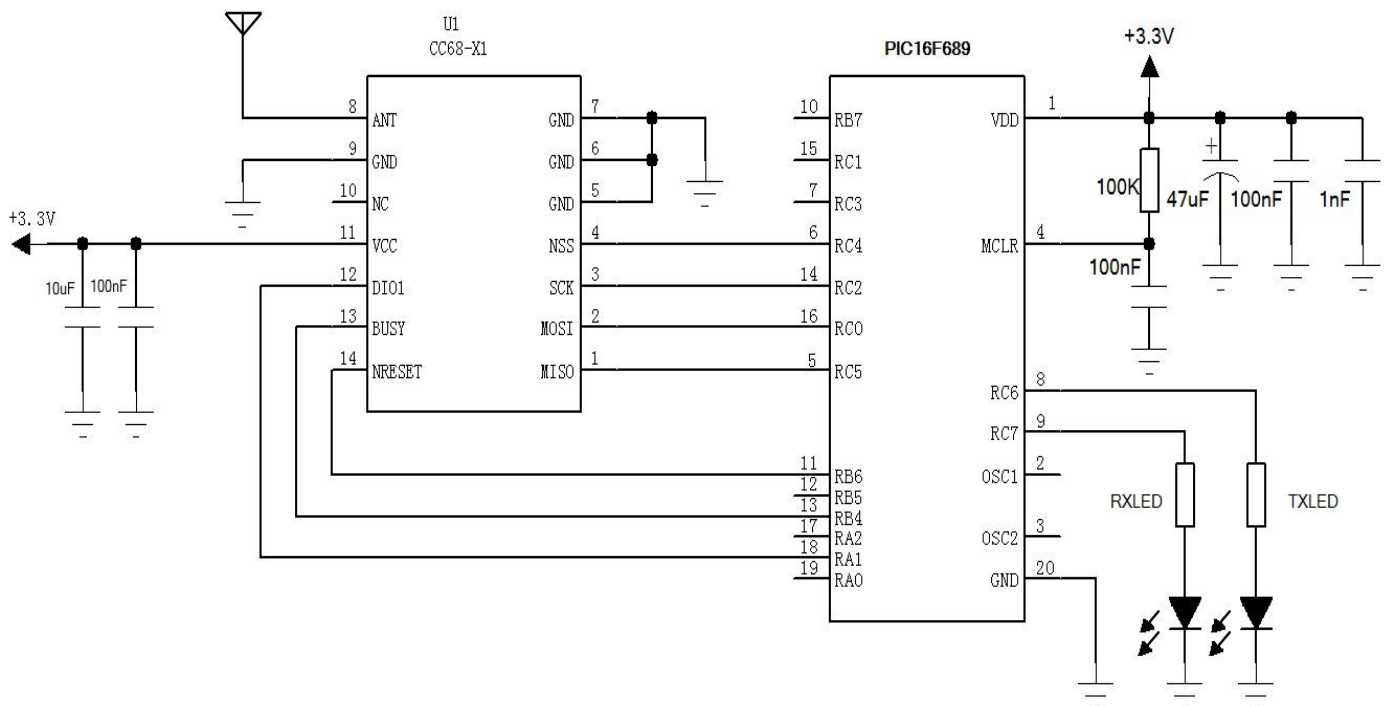
Parameter	Min.	Typ.	Max.	Unit	Condition
Operation Condition					
Working voltage	1.8	3.3	3.7	V	
Temperature range	-40	25	85	°C	
Current Consumption					
RX current		< 5		mA	@ crystal oscillator
		< 6.5		mA	@ TCXO crystal
TX current		< 130		mA	@868MHz @915MHz
		< 110		mA	@433MHz @490MHz
Sleep current		1.9		uA	OFF mode (SLEEP mode with cold start) All blocks off
		2.3		uA	SLEEP mode (SLEEP mode with warm start) Configuration retained
		2.9		uA	SLEEP mode (SLEEP mode with warm start) Configuration retained + RC64k
		0.56		mA	STDBY_RC mode , RC13M, XOSC OFF
		2.35		mA	STDBY_XOSC mode , XOSC ON
RF Parameter					
Frequency range	400	433	450	MHz	@433MHz
	470	490	510	MHz	@490MHz
	848	868	888	MHz	@868MHz
	900	915	940	MHz	@915MHz
Output power	-15	22		dBm	
Receiving sensitivity		-129		dBm	@LoRa BW=250KHz_SF = 10_CR=4/5

5. Typical application circuit

➤ LoRa-CC68 Typical application circuit:

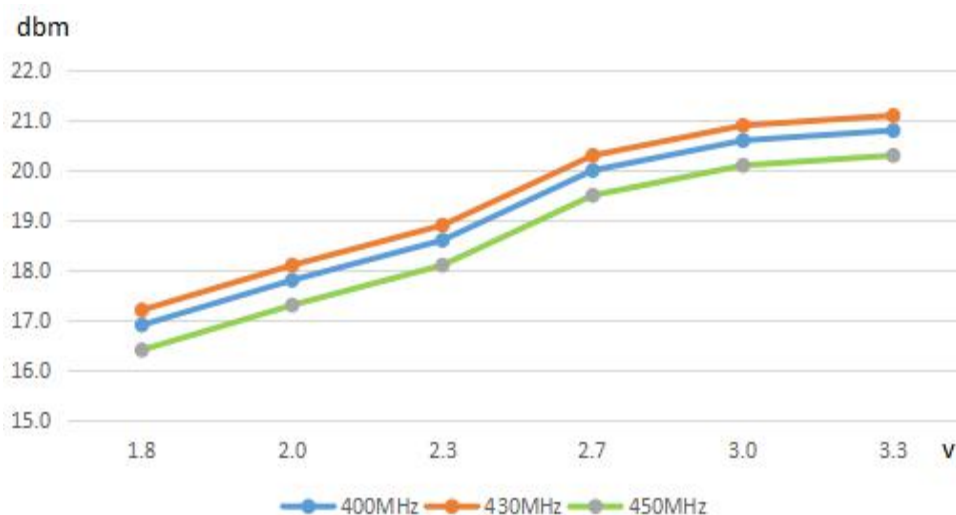


➤ LoRa-CC68-X1 Typical application circuit:

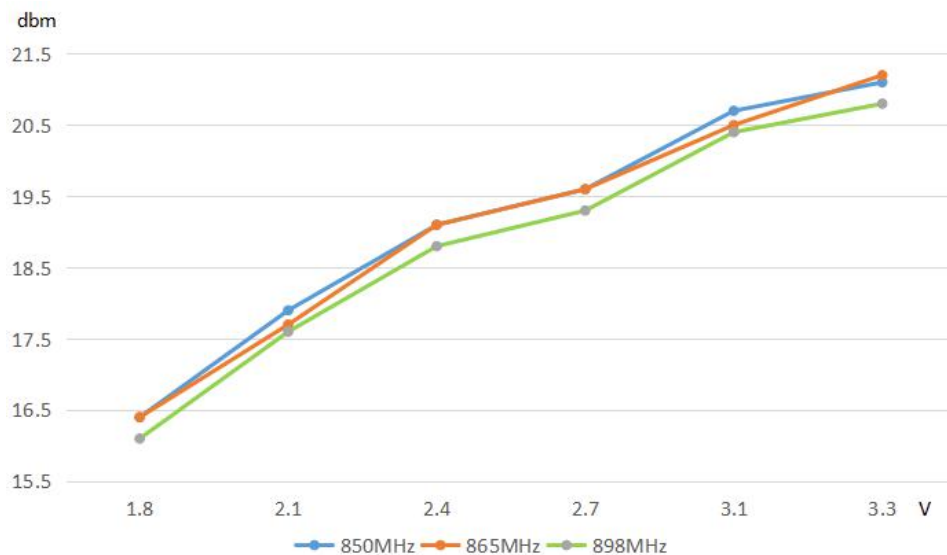


6.Module performance index

Frequency band	Power level	Current (mA)	Power (dBm)	Register value
LoRa-CC68 LoRa-CC68-X1 @ 433MHz @ 490MHz	9	98	21.2	22
	8	80	17.8	19
	7	64	14.2	16
	6	54	11.5	13
	5	44	8.7	10
	4	37	6.0	7
	3	32	3.0	4
	2	26	0	1
	1	22	-2.5	-2
	0	20	-5	-5

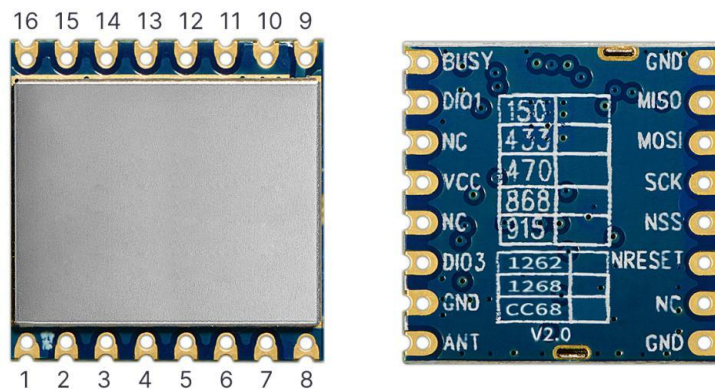


Frequency band	Power level	Current (mA)	Power (dBm)	Register value
LoRa-CC68 LoRa-CC68-X1 @ 868MHz @ 915MHz	9	123.5	21.2	22
	8	110.5	18.03	19
	7	102.2	14.67	16
	6	88.7	11.79	13
	5	74.2	9.15	10
	4	62.9	6.6	7
	3	53.6	3.5	4
	2	44.2	0.53	1
	1	36.8	-2.15	-2
	0	31.7	-4.8	-5



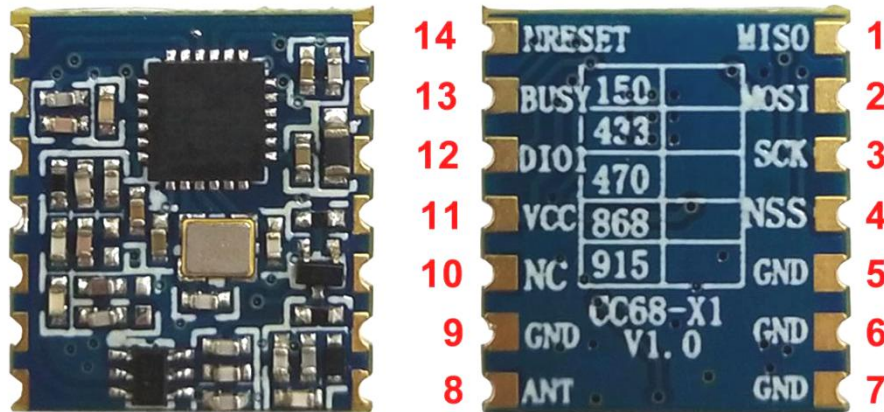
6. Pin definition

➤ LoRa-CC68 Pin definition:



Pin NO.	Pin name	Description
1	GND	Power ground
2	MISO	SPI Output for SPI data
3	MOSI	SPI Input for SPI data
4	SCK	Serial clock for SPI interface
5	NSS	SPI enable
6	NRESET	Reset input
7、12、14	NC	Empty
8	GND	Power ground
9	ANT	Connect with 50 ohm coaxial antenna
10	GND	Power ground
11	DIO3	Can be customized as interrupt signal indication, see chip data for details (Note: TCXO version module is used as TCXO control pin)
13	VCC	Connected power supply (default 3.3V)
15	DIO1	Can be customized as interrupt signal indication, see chip data for details
16	BUSY	Used for status indication, see datasheet for details.

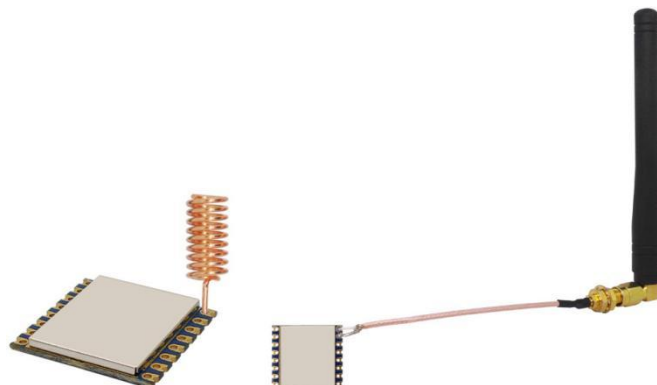
➤ LoRa-CC68-X1 Pin definition:



Pin NO.	Pin name	Description
1	MISO	SPI Output for SPI data
2	MOSI	SPI Input for SPI data
3	SCK	Serial clock for SPI interface
4	NSS	SPI enable
5、6、7、9	GND	Power ground
8	ANT	Connect with 50 ohm coaxial antenna
10	NC	Empty
11	VCC	Connected power supply (default 3.3V)
12	DIO1	Can be customized as interrupt signal indication, see chip data for details
13	BUSY	Used for status indication, see datasheet for details.
14	NRESET	Reset input
1	MISO	SPI Output for SPI data
2	MOSI	SPI Input for SPI data
3	SCK	Serial clock for SPI interface

8. Communication Antenna

Antenna is very important for RF communication, its performance will affect the communication directly. Module needs antenna in 50ohm. SMA can also be used to transfer straight/elbow/folded rod. Users can order accordingly. To ensure module in the best performance, we suggest to use the our antenna.

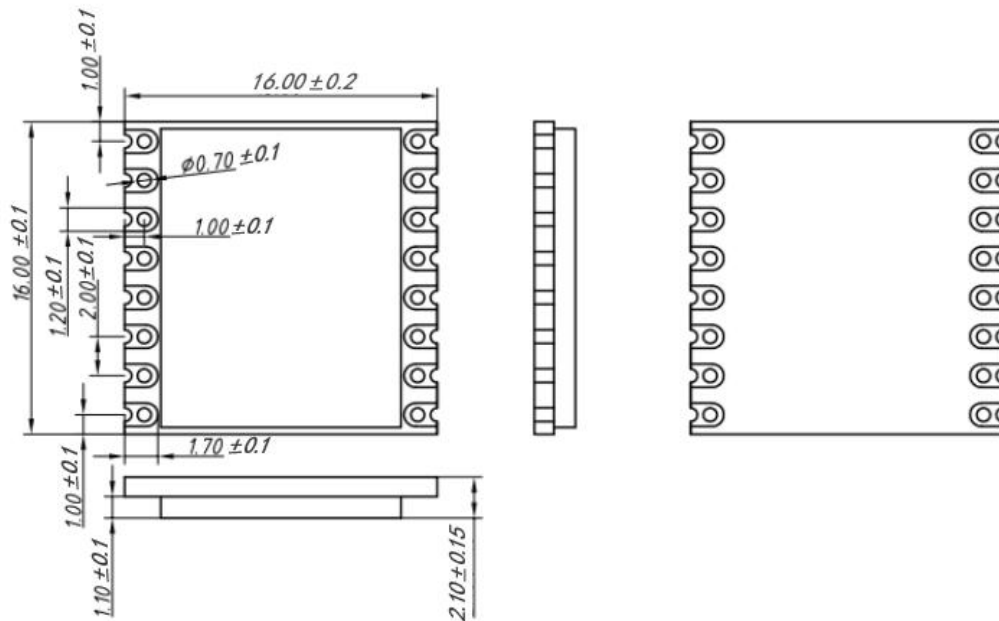


★To ensure modules get the best performance, user must obey the following principles when using the antennas:

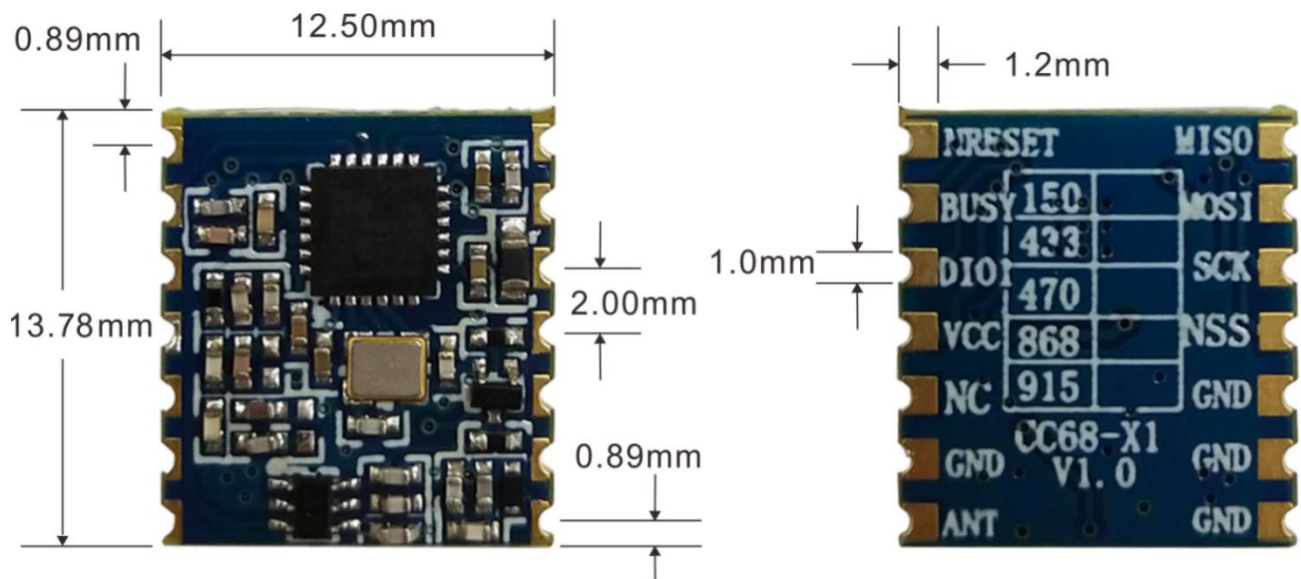
- Put the antenna away from the ground and obstacles as possible as you could;
- If you choose the sucker antenna, pull straight the lead wire as possible as it can be, the sucker under arches should be attached on the metal object.

9. Mechanical Dimensions(Unit:mm)

➤ LoRa-CC68 Mechanical Dimensions:



➤ LoRa-CC68-X1 Mechanical Dimensions(Maximum thickness 1.8mm):



10. Product order information

For example: If the customer needs 868MHz Frequency, with shield, 10ppm Crystal, the order no. shall be LoRa-CC68-868.

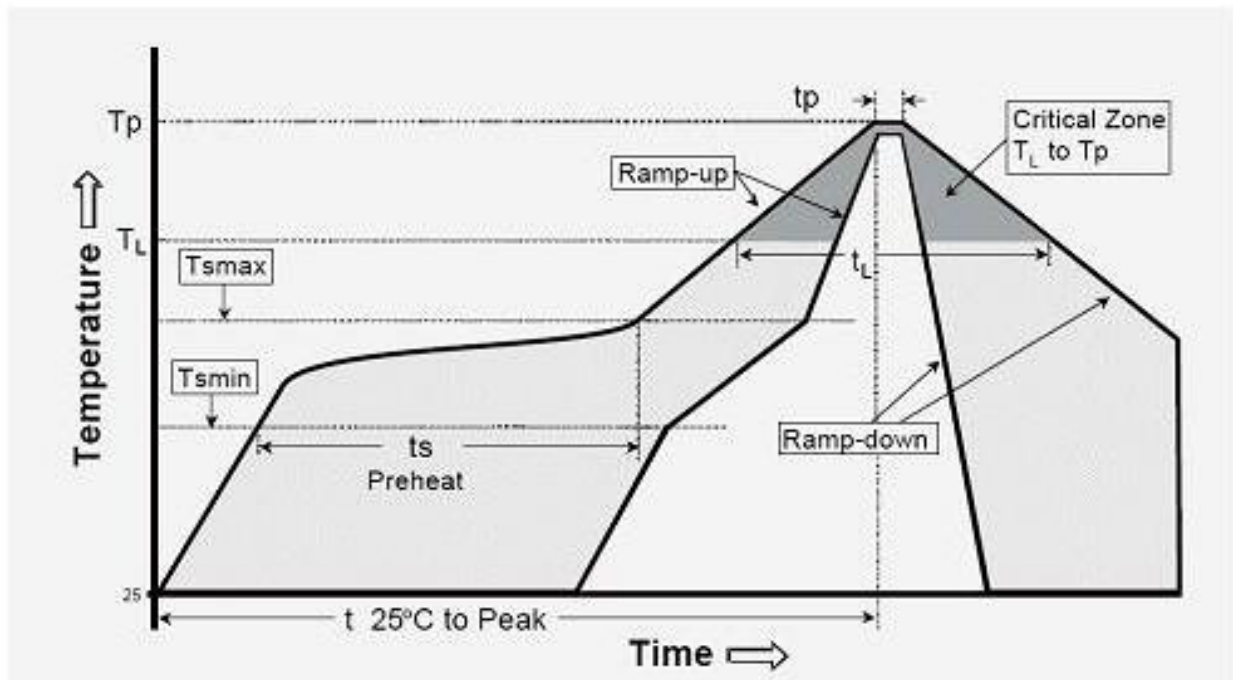
Product Name	Description
CC68-C1-433	With shield, 10ppm Crystal, Center working frequency 433MHz
CC68-C1-490	With shield, 10ppm Crystal, Center working frequency 490MHz
CC68-C1-868	With shield, 10ppm Crystal, Center working frequency 868MHz
CC68-C1-915	With shield, 10ppm Crystal, Center working frequency 915MHz
LoRa-CC68-433-TCXO	With shield, 0.5ppm TCXO Crystal, Center working frequency 433MHz
LoRa-CC68-490-TCXO	With shield, 0.5ppm TCXO Crystal, Center working frequency 490MHz
LoRa-CC68-868-TCXO	With shield, 0.5ppm TCXO Crystal, Center working frequency 868MHz
LoRa-CC68-915-TCXO	With shield, 0.5ppm TCXO Crystal, Center working frequency 915MHz
LoRa-CC68-X1-433	Without shield, 10ppm Crystal, Center working frequency 433MHz
LoRa-CC68-X1-490	Without shield, 10ppm Crystal, Center working frequency 490MHz
LoRa-CC68-X1-868	Without shield, 10ppm Crystal, Center working frequency 868MHz
LoRa-CC68-X1-915	Without shield, 10ppm Crystal, Center working frequency 915MHz
LoRa-CC68-433	With shield, 10ppm Crystal, Center working frequency 433MHz
LoRa-CC68-490	With shield, 10ppm Crystal, Center working frequency 490MHz
LoRa-CC68-868	With shield, 10ppm Crystal, Center working frequency 868MHz
LoRa-CC68-915	With shield, 10ppm Crystal, Center working frequency 915MHz

11. Common problem

- a) Why can't the normal communication between the modules?
 - 1) The power connection is wrong and the module is not working normally;
 - 2) Check whether the frequency bands of each module and other RF parameters are consistent;
 - 3) Whether the module is damaged.
- b) Why is the transmission distance not far?
 - 1) The power supply ripple is too large;
 - 2) The antenna type is not matched or installed incorrectly;
 - 3) Surrounding co-channel interference;
 - 4) The surrounding environment is harsh and there are strong interference sources.

Appendix 1:SMD Reflow Chart

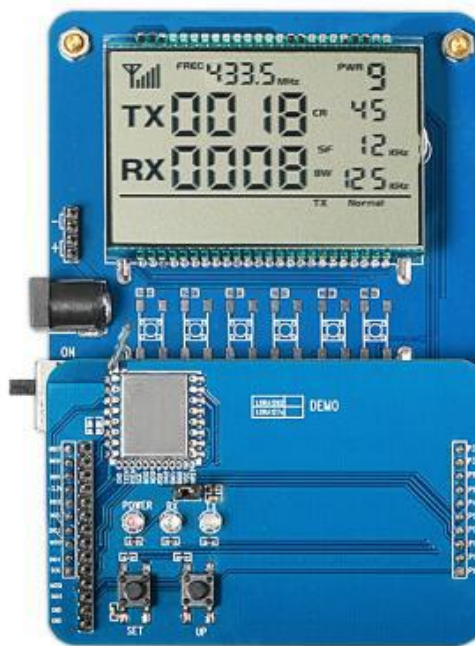
We recommend you should obey the IPC related standards in setting the reflow profile:



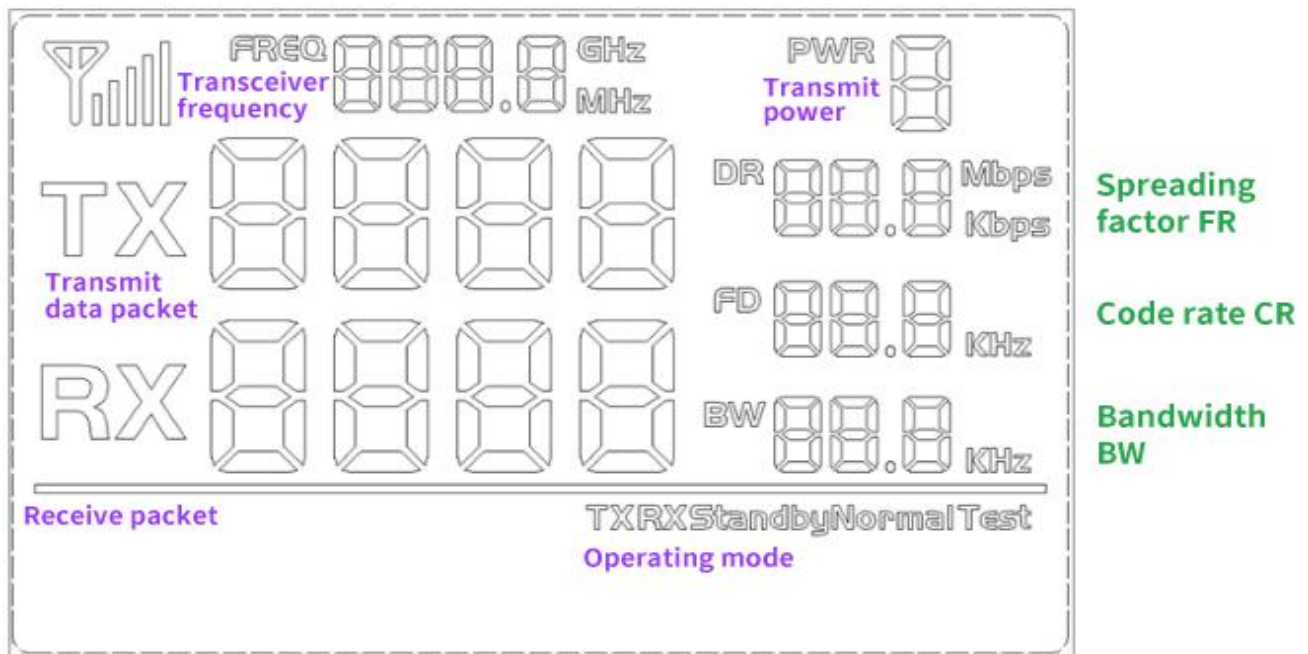
IPC/JEDEC J-STD-020B the condition for lead-free reflow soldering	big size components (thickness $\geq 2.5\text{mm}$)
The ramp-up rate (T _L to T _p)	3°C/s (max.)
preheat temperature	
- Temperature minimum (T _{smin})	150°C
- Temperature maximum (T _{smax})	200°C
- preheat time (t _s)	60~180s
Average ramp-up rate(T _{smax} to T _p)	3°C/s (Max.)
- Liquidous temperature(T _L)	217°C
- Time at liquidous(t _L)	60~150 second
peak temperature(T _p)	245+/-5°C

Appendix 2: Demo Board

The module is equipped with a standard DEMO board for customer to debug the program and test distance. The power supply voltage range: 3.3V~6.0V. It shows as below:



The LCD Full Segment is as below:



The users can set the parameters of the RF module such as frequency /transmitter power / transmission data rate through the buttons.

➤ Working Mode

- 1) Tx normal mode: send data packets regularly (in the setting mode, data packets will not be sent temporarily);
- 2) Rx normal mode: Power on and enter the receiving state, receive data packets, and then send out the correctly received data packets;
- 3) Tx Test Mode: RF module continuously transmit signal;
- 4) Rx Test Mode: RF module is always in Rx mode;
- 5) Standby Mode: RF module is always in standby state.

➤ Button Operation

- 1) [SET] Button

Press the key to enter the setting mode. If the last parameter is set, the key will exit the setting mode.

- 2) UP /Down Button

In setting mode, press to modify the corresponding setting parameters.

Note: The DEMO board has FLASH memory inside, all the setting parameters will behave automatically and keep unchanged even power-off.