

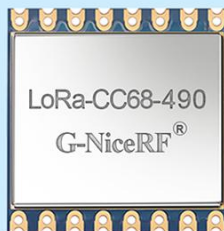
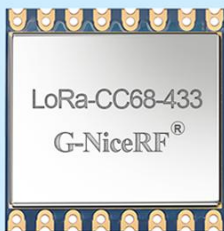
Spread spectrum wireless transceiver module

Ultra-low power 160mw

Product Specification



CC68-C1



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 | Add FCC and CE certificate |
| V2.0 | 2022-5 | Add C1 version, modify pin definition |
| V2.1 | 2022-7 | Add C1 pin definition of LoRaCC68-C1 |
| V3.0 | 2022-11 | Description updated |
| | | |

1. Overview

LoRa-CC68 wireless module adopts Semtech's LLCC68 device and Industrial high-precision crystal oscillator, which make the module having ultra-low receiving current, low sleep current and good sensitivity -129dBm. It can wake up the external micro-controller periodically under low power consumption with built-in 64KHz oscillator. Antenna switch of the module is integrated and controlled by the RF chip, which saves the resources of the external MCU. Moreover, Lora-CC68 has compact size and 22dBm (160mW) output power, which have great advantages in IoT and battery-powered applications.

LoRa-CC68 is produced and tested strictly using lead-free processes, and comply with RoHS and Reach standards. Also,LoRa-CC68 is CE certified @ 868MHz and FCC@915MHz.

The product list of LoRa-CC68 series as below:

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

2. Features

- Frequency Band: 433/490/868/915 MHz (customizable150-960 MHz)
- Sensitivity: -129dBm @LoRa
- Maximum output power: 22 dBm (160mW)
- Industrial grade high precision crystal oscillator
- LoRa,(G)FSK
- 255 bytes FiFo
- Data 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

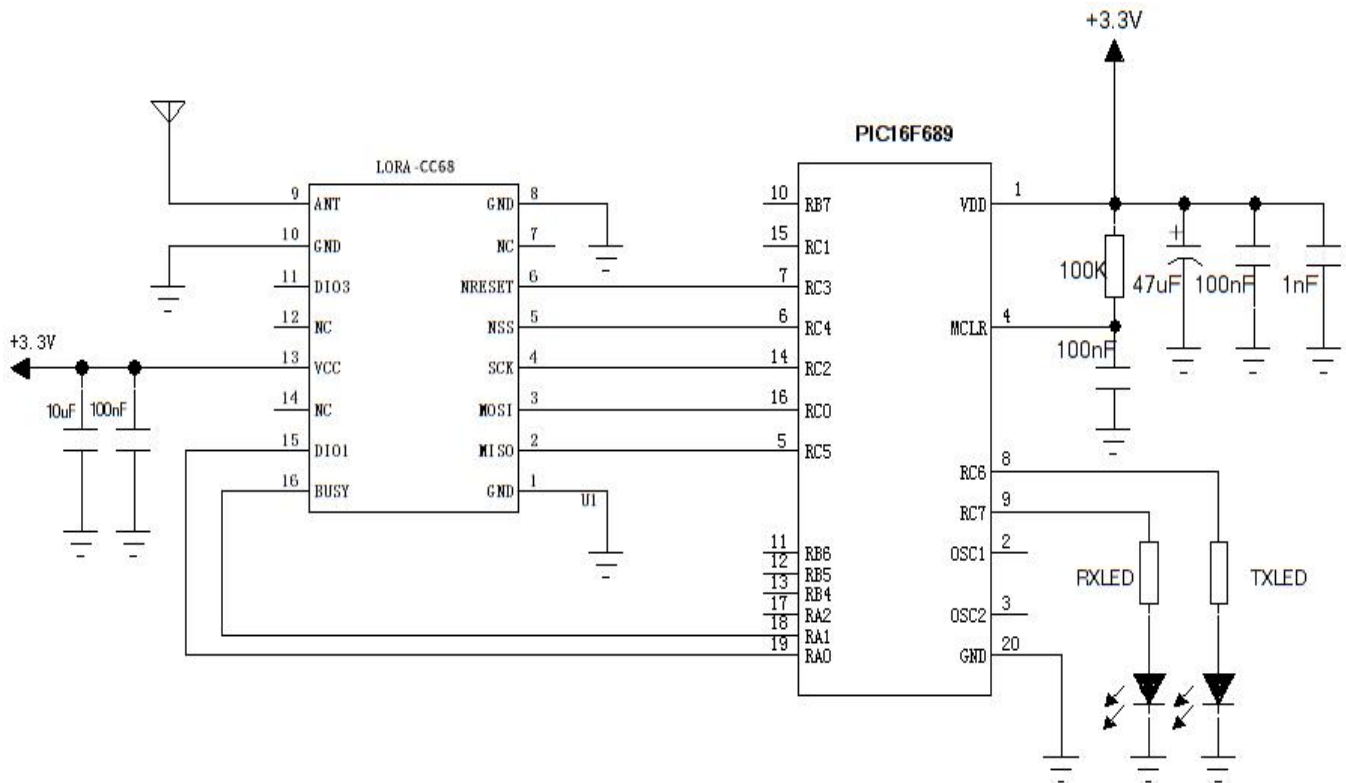
4. Electrical Characteristics

★Note: The default shipping module uses 10ppm Industrial crystal oscillator, the TCXO crystal oscillator is optional for special requirement:

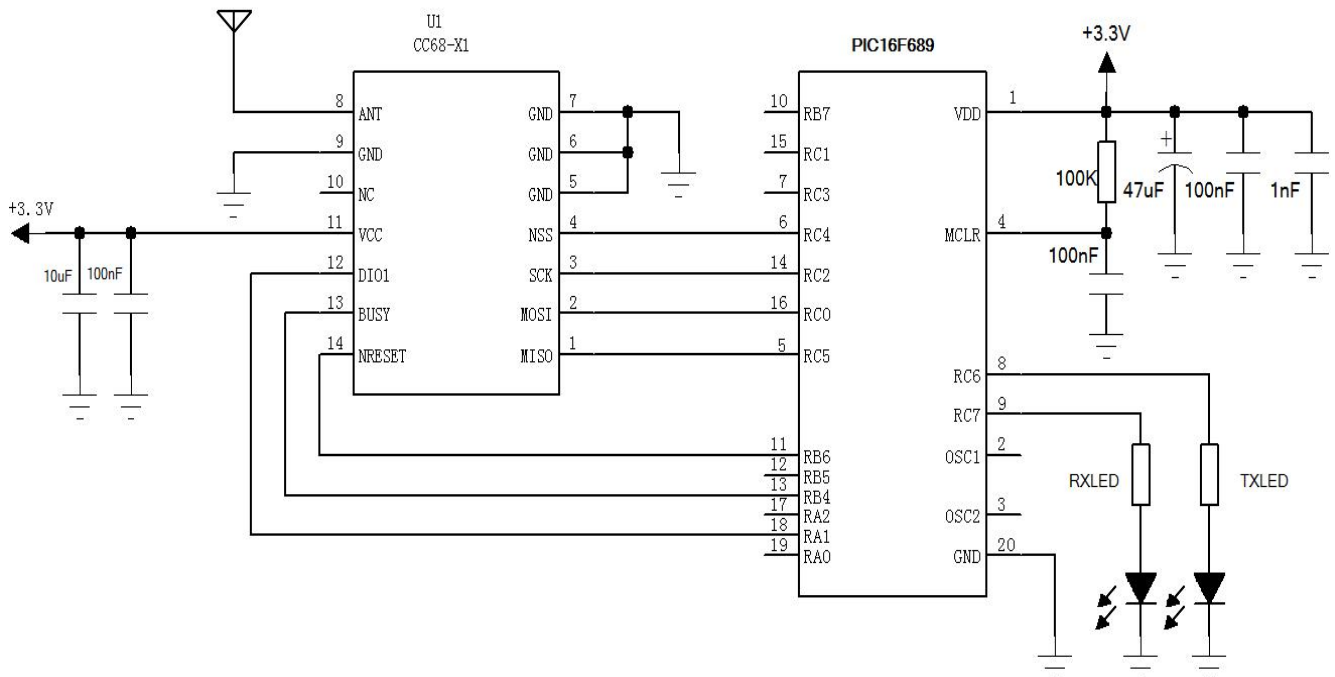
| Parameter | Min. | Typ. | Max. | Unit | Condition |
|---|------|-------|------|------|---|
| Operation Condition (Vcc=3.3V, ANT @ 50 ohm) | | | | | |
| Working voltage | 1.8 | 3.3 | 3.7 | V | |
| Temperature range | -40 | 25 | 85 | °C | |
| Current Consumption | | | | | |
| RX current | | < 5 | | mA | @ 10ppm 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

➤ CC68-C1 & LoRa-CC68 :



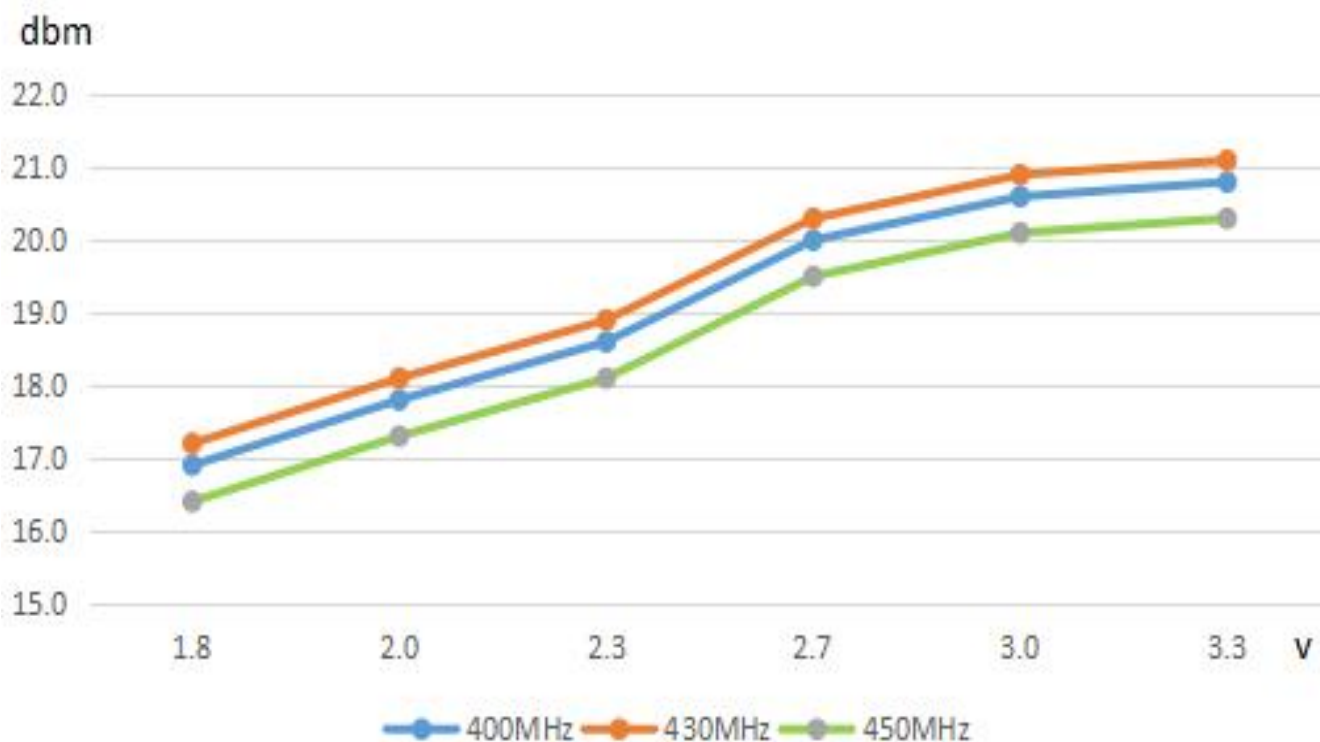
➤ LoRa-CC68-X1:



6. Performance

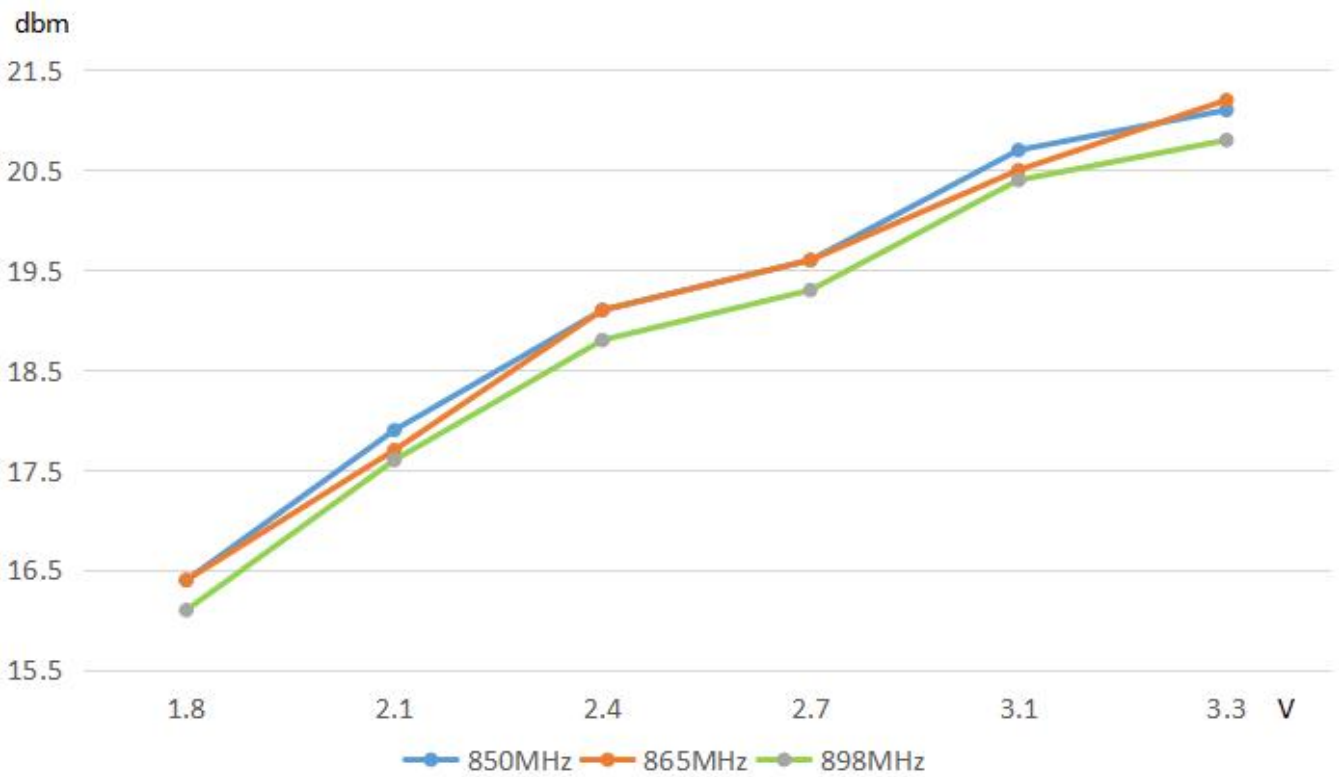
➤ Below table is the output power and current consumption when working in 433MHz or 490MHz

| Frequency band | Power level | Current (mA) | Power (dBm) | Register value |
|--|-------------|--------------|-------------|----------------|
| CC68-C1 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 |



➤ Below table is the output power and current consumption when working in 868MHz or 915MHz

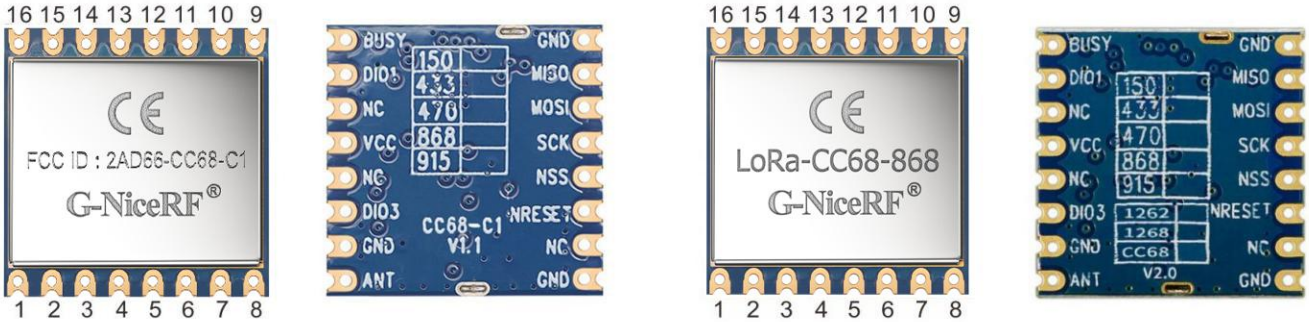
| Frequency band | Power level | Current (mA) | Power (dBm) | Register value |
|--|-------------|--------------|-------------|----------------|
| CC68-C1 LoRa-CC68 LoRa-CC68-X1 @ 868MHz @ 915MHz | 9 | 123.5 | 21.2 | 22 |
| | 8 | 110.5 | 18.03 | 19 |
| | 7 | 102.2 | 14.67 | 16 |
| | 6 | 88.7 | 11.79 | 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 |



7.Pin definition

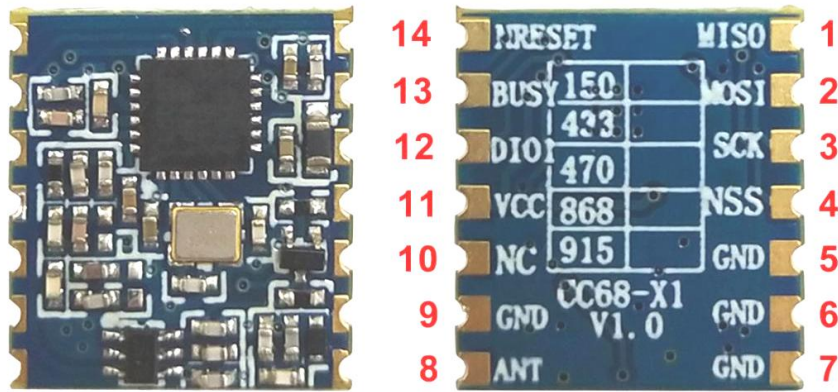
➤ CC68-C1 & LoRa-CC68 Pin definition:

1. Same size
2. Same Pin definition
3. 2 PCB Layers for CC68-C1, 4 PCB Layers for Lora-CC68



| Pin NO. | Pin name | Description |
|---------|----------|--|
| 1 | GND | Power ground |
| 2 | MISO | SPI Output |
| 3 | MOSI | SPI Input |
| 4 | SCK | Serial clock |
| 5 | NSS | SPI enable |
| 6 | NRESET | Reset input |
| 7、12、14 | NC | Empty |
| 8 | GND | Power ground |
| 9 | ANT | Connect with 50 ohm antenna |
| 10 | GND | Power ground |
| 11 | DIO3 | Can be customized as interrupt signal indication, details in chip datasheet (Note: output to control TCXO when TCXO crystal is used) |
| 13 | VCC | Power supply (default 3.3V) |
| 15 | DIO1 | Can be customized as interrupt signal indication, details in chip datasheet |
| 16 | BUSY | Busy status indication, details in chip datasheet. |

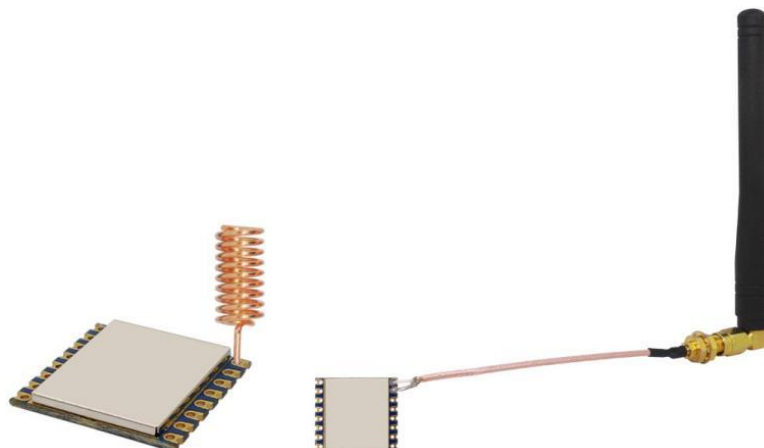
➤ LoRa-CC68-X1 Pin definition:



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

8. Antenna

Antenna is very important for RF communication, its performance has a great impact on RF communication. 50ohm antenna is required for LoRa-CC68, Our spring antenna or antenna with SMA connector is recommended.

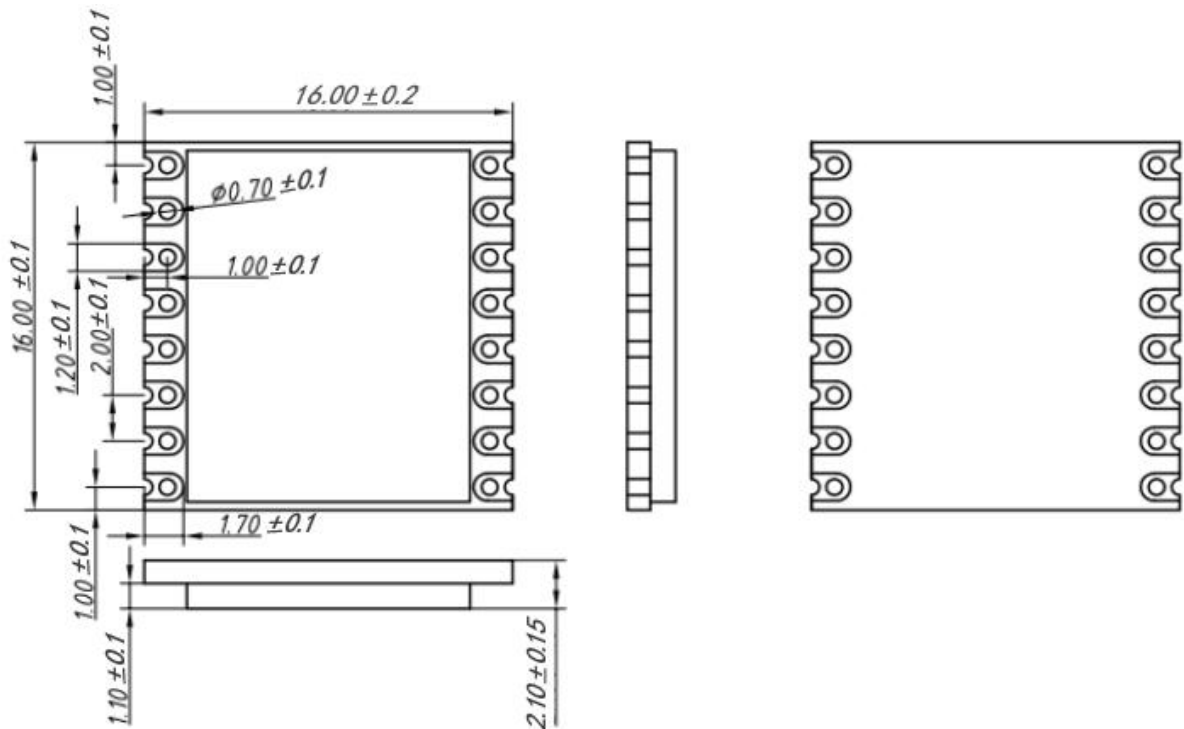


★In order to get better performance, the following principles are recommended.

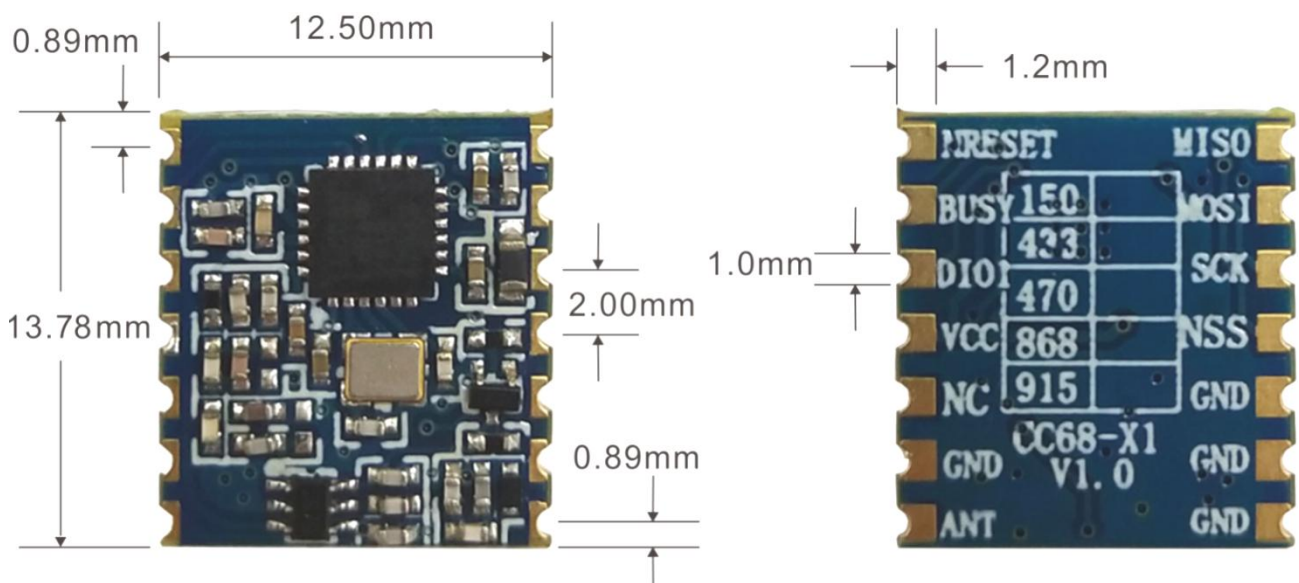
- Put the antenna away from the ground and obstacles;
- When sucker antenna is chosen, pull the lead wire straightly and attach the magnetic base to the metal object.

9. Mechanical Dimensions (Unit:mm)

- CC68-C1 & LoRa-CC68 :



- LoRa-CC68-X1(Maximum thickness 1.8mm):



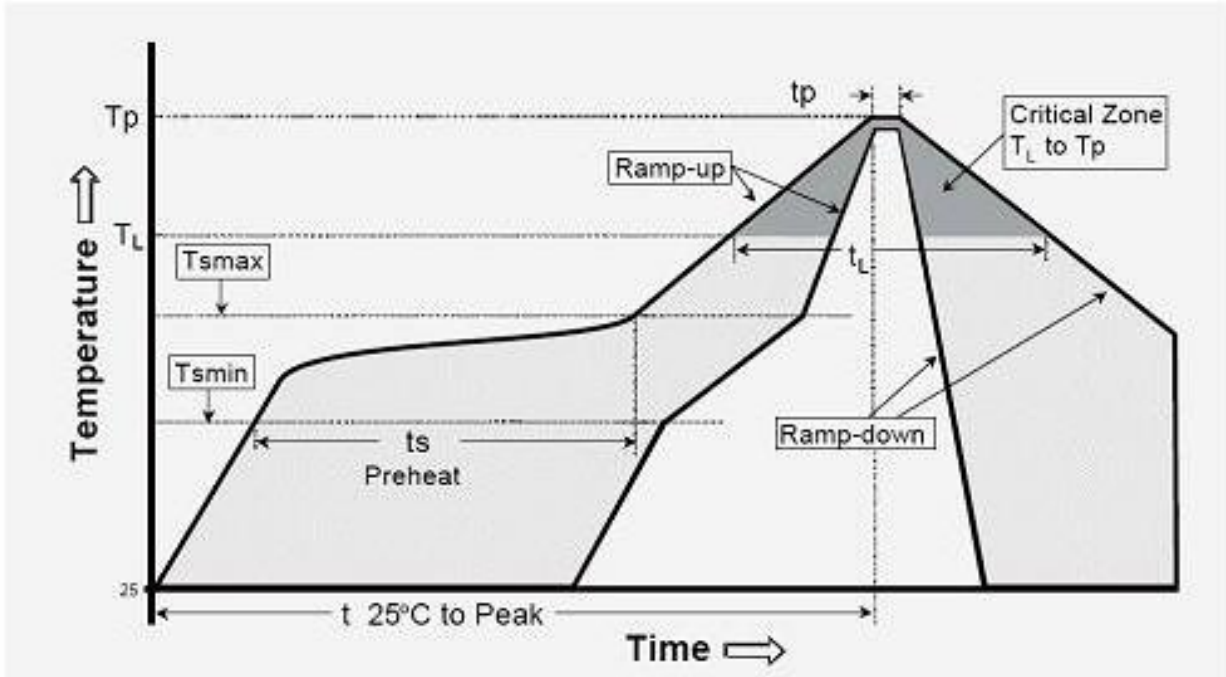
10. Product order information

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

| Product Number | With shield | 10ppm Crystal | 0.5ppm TCXO Crystal | Center working frequency |
|--------------------|-------------|---------------|---------------------|---|
| CC68-C1-433 | √ | √ | × | 433MHz |
| CC68-C1-490 | √ | √ | × | 490MHz |
| CC68-C1-868 | √ | √ | × | Center frequency 868MHz and 915MHz Common |
| LoRa-CC68-433-TCXO | √ | × | √ | 433MHz |
| LoRa-CC68-490-TCXO | √ | × | √ | 490MHz |
| LoRa-CC68-868-TCXO | √ | × | √ | 868MHz |
| LoRa-CC68-915-TCXO | √ | × | √ | 915MHz |
| LoRa-CC68-X1-433 | × | √ | × | 433MHz |
| LoRa-CC68-X1-490 | × | √ | × | 490MHz |
| LoRa-CC68-X1-868 | × | √ | × | 868MHz |
| LoRa-CC68-X1-915 | × | √ | × | 915MHz |
| LoRa-CC68-433 | √ | √ | × | 433MHz |
| LoRa-CC68-490 | √ | √ | × | 490MHz |
| LoRa-CC68-868 | √ | √ | × | 868MHz |
| LoRa-CC68-915 | √ | √ | × | 915MHz |

Appendix 1:SMD Reflow Chart

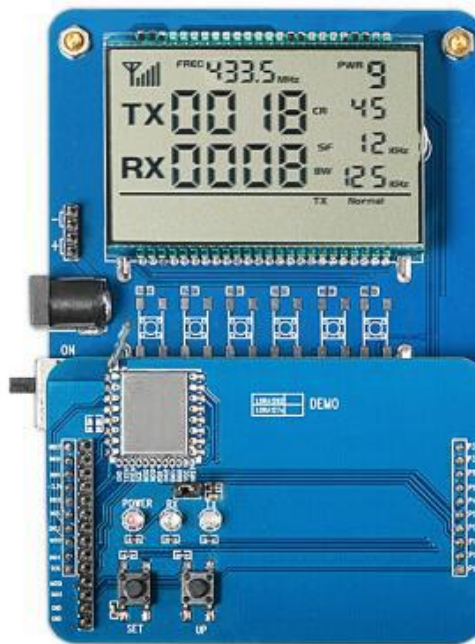
Below reflow profile is recommended for SMT technology:



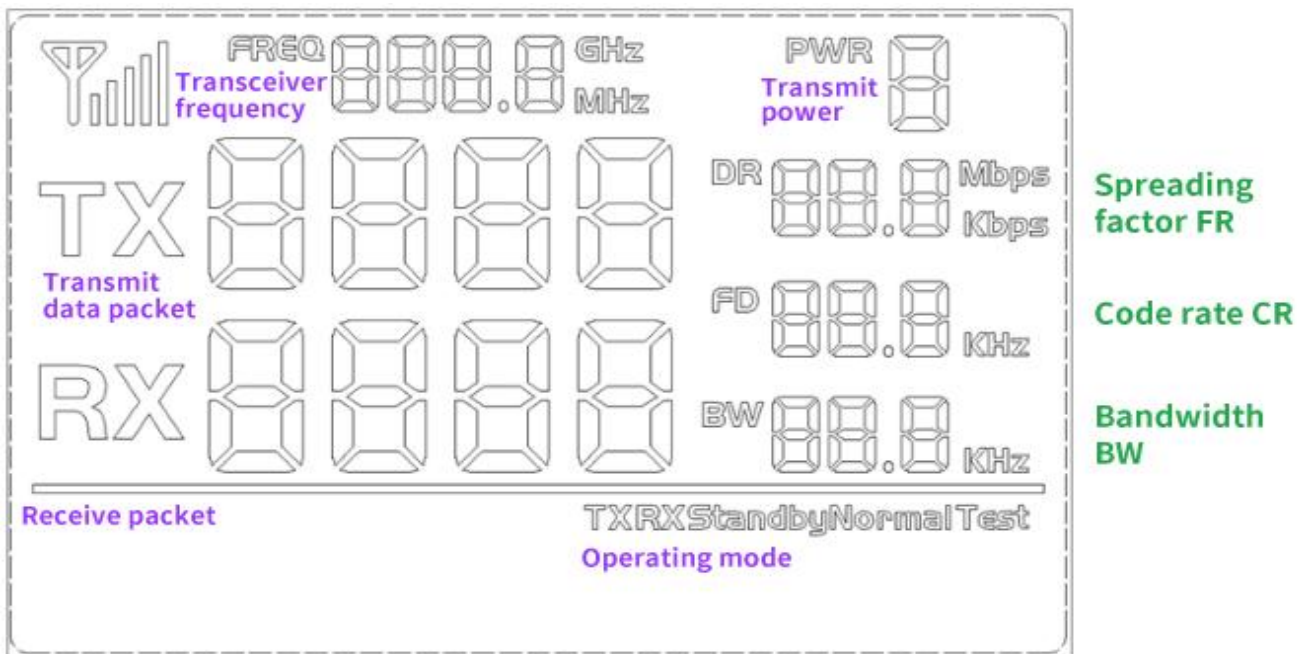
| | |
|---|--|
| IPC/JEDEC J-STD-020B the condition for lead-free reflow soldering | big size components (thickness $\geq 2.5\text{mm}$) |
| The ramp-up rate (Tl to Tp) | 3°C/s (max.) |
| preheat temperature | |
| - Temperature minimum (Tsm) | 150°C |
| - Temperature maximum (Tsmax) | 200°C |
| - preheat time (ts) | 60~180s |
| Average ramp-up rate(Tsmax to Tp) | 3°C/s (Max.) |
| - Liquidous temperature(TL) | 217°C |
| - Time at liquidous(tL) | 60~150 second |
| peak temperature(Tp) | 245+/-5°C |

Appendix 2: Demo Kit

LoRa-CC68 is equipped with a DEMO kit for customer to debug the program and test performance including range measurement. The voltage of power supply is 3.3V~6.0V.:



The LCD Full Segment is as below:



RF parameters of LoRa-CC68 can be set easily by pressing buttons, such as frequency /transmitter power / Spreading factor / Code rate/ Bandwidth.

➤ Working Mode

There are 5 working modes can be chosen as below:

- 1) Tx normal mode: LoRa-CC68 send data packets regularly and receive ACK packets (in the setting mode, data packets will not be sent temporarily);
- 2) Rx normal mode: LoRa-CC68 receive data packets and then send back ACK packets;
- 3) Tx Test Mode: LoRa-CC68 transmit signal continuously ;
- 4) Rx Test Mode: LoRa-CC68 work in Rx Mode;
- 5) Standby Mode: LoRa-CC68 work in Standby state.

➤ Button Operation

- 1) [SET] Button

In normal mode, press the button to enter the setting mode.

In setting mode: 1. Press to select the parameters in setting mode. 2. Press to exit the setting mode after all parameters are set.

- 2) UP /Down Button

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

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