

Product Datasheet V2.0

100mW Long Range Spread Spectrum Modulation
Wireless Transceiver Module

Lora1276



Catalogue

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Note: Revision History

| Revision | Date | Comment |
|----------|-----------|--|
| V1.0 | 2015-4-2 | First release |
| V1.1 | 2016-4-26 | Content Added |
| V2.0 | 2016-5-31 | PCB updated to V2.0, ESD protection added and antenna switch controlled by RF chip |
| | | |
| | | |

1. Overview

LoRa1276 integrates Semtech RF transceiver chip SX1276, which adopts LoRa TM Spread Spectrum modulation frequency hopping technique. The features of long distance and high sensitivity (-139 dBm) make this module perform better than FSK and GFSK module. Multi-signal won't affect each other even in crowd frequency environment; it comes with strong anti-interference performance.

This module is 100mW and ultra small size, widely used in AMR , remote industrial control filed.

Note: Two versions for option, V1.1 and V2.0, please choose the version you need.

| PCB Version | Control of Antenna switch | ESD Protection | Hardware | Firmware |
|-------------|---------------------------------------|----------------|----------------------------|---------------------------|
| V1.1 | TXEN, RXEN controlled by external MCU | None | Pin, dimensions compatible | V2.0 compatible with V1.1 |
| V2.0 | Integrated control by internal chips | Yes | | |

2. Features

- Frequency Range: 868 / 915 MHz
- Sensitivity up to -139dBm @Lora
- Maximum output power: 20 dBm
- 13mA@receiver mode
- Sleep current <200 nA
- Data transfer rate: @FSK, 1.2-300 Kbps
- @Lora TM, 0.018-37.5 Kbps
- Lora TM, FSK, GFSK & OOK Modulation mode
- Built-in ESD Protection
- 127 dB Dynamic Range RSSI
- Packet engine up to 256 bytes with FIFO and CRC
- Hopping frequency
- Built-in temperature sensor and low battery indicator
- Excellent blocking immunity
- Operating Temperature Range: -40 ~ + 85 °C

3. Applications

- Remote meter reading
- Industrial control
- Home automation remote sensing
- Toys control
- Sensor network
- Tire pressure monitoring
- Health monitoring

■ Wireless PC peripherals

4. Electrical Characteristics

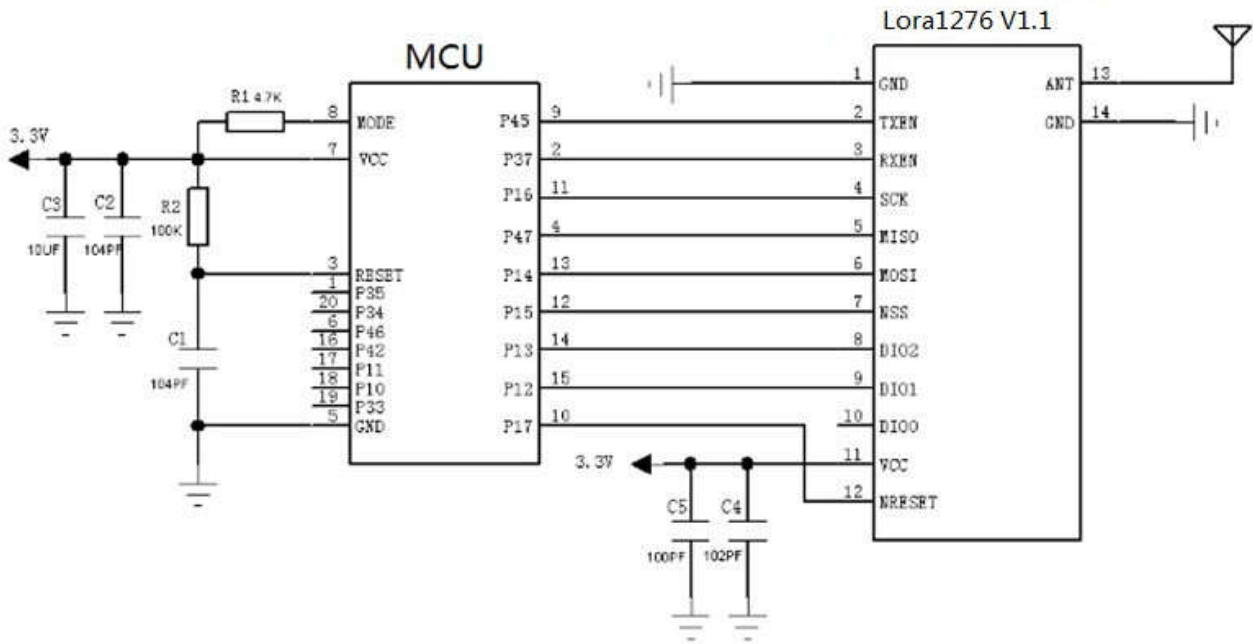
| Parameter | Min | Typ. | Max. | Unit | Condition |
|-----------------------|-------|------|------|------|--------------------------------|
| Operation condition | | | | | |
| Working voltage | 1.8 | 3.3 | 3.7 | V | |
| Temperature range | -40 | | 85 | °C | |
| Current consumption | | | | | |
| RX current | | 10.8 | | mA | |
| TX current | | 120 | | mA | @20dBm |
| Sleep current | | <0.2 | | uA | |
| RF parameter | | | | | |
| Frequency range | 800 | 868 | 900 | MHz | @868MHZ |
| | 900 | 915 | 1000 | MHz | @915MHZ |
| Modulation rate | 1.2 | | 300 | Kbps | FSK |
| | 0.018 | | 37.5 | Kbps | LoraTM |
| Output power range | -1 | | 20 | dBm | |
| Receiving sensitivity | | -123 | | dBm | @FSK data=1.2kbps, Fdev=10kHz |
| | | -139 | | dBm | @Lora BW=125KHz_SF = 12_CR=4/5 |

Note: According to the design of the module, the maximum bit of register 0x09 must be set as 1. PaSelect must be set 1;

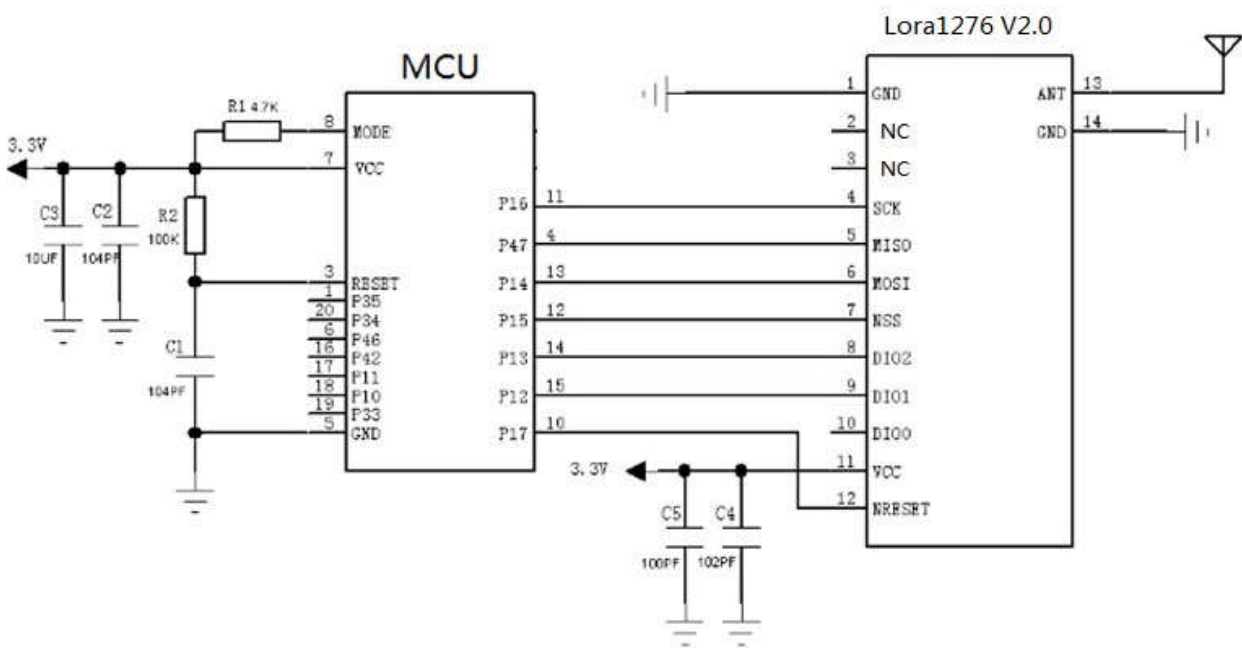
| | | | | | |
|-----------------------|-----|-------------|----|------|---|
| RegPaConfig (0x09) | 7 | PaSelect | rw | 0x00 | Selects PA output pin 0 → RFO pin. Output power is limited to +14 dBm. 1 → PA_BOOST pin. Output power is limited to +20 dBm |
| | 6-4 | MaxPower | rw | 0x04 | Select max output power: Pmax=10.8+0.6*MaxPower [dBm] |
| | 3-0 | OutputPower | rw | 0x0f | Pout=Pmax-(15-OutputPower) if PaSelect = 0 (RFO pin) Pout=17-(15-OutputPower) if PaSelect = 1 (PA_BOOST pin) |

5. Schematic

1) Lora1276 V1.1



2) Lora1276 V2.0

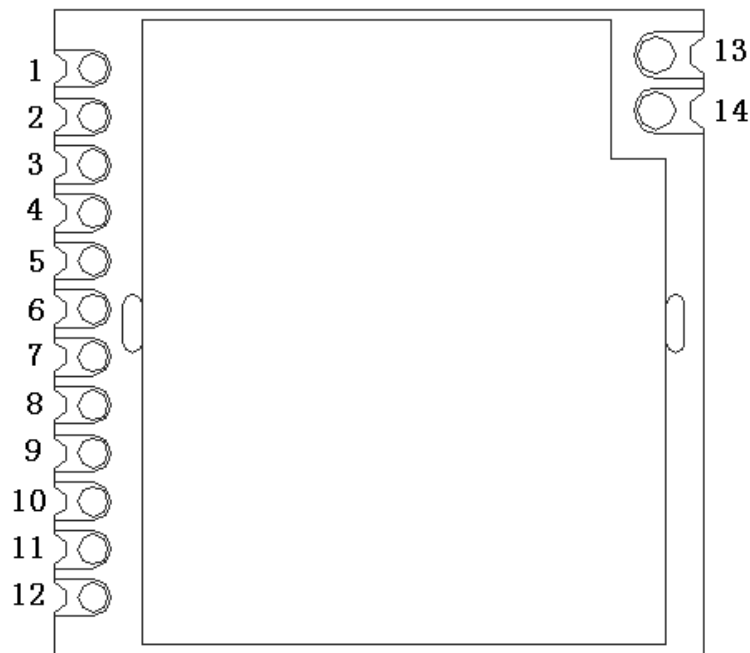


Note: TXEN, RXEN no needed for Version 2.0.

6. Speed rate correlation table

| SingnalBandWidth | SpreadingFactor | Sensitivity(dbm) | ActualBandRate(pbs) |
|------------------|-----------------|------------------|---------------------|
| 62.5kHz | SF=7 | -126 | 2169 |
| 62.5kHz | SF=8 | -129 | 1187 |
| 62.5kHz | SF=9 | -132 | 656 |
| 62.5kHz | SF=10 | -135 | 296 |
| 62.5kHz | SF=11 | -137 | 164 |
| 62.5kHz | SF=12 | -139 | 91 |
| 125kHz | SF=7 | -123 | 4338 |
| 125kHz | SF=8 | -126 | 2375 |
| 125kHz | SF=9 | -129 | 1312 |
| 125kHz | SF=10 | -132 | 733 |
| 125kHz | SF=11 | -133 | 328 |
| 125kHz | SF=12 | -136 | 183 |
| 250kHz | SF=7 | -120 | 8676 |
| 250kHz | SF=8 | -123 | 4750 |
| 250kHz | SF=9 | -125 | 2624 |
| 250kHz | SF=10 | -128 | 1466 |
| 250kHz | SF=11 | -130 | 778 |
| 250kHz | SF=12 | -133 | 366 |
| 500kHz | SF=7 | -118 | 17353 |
| 500kHz | SF=8 | -121 | 9501 |
| 500kHz | SF=9 | -124 | 5249 |
| 500kHz | SF=10 | -127 | 2932 |
| 500kHz | SF=11 | -129 | 1557 |
| 500kHz | SF=12 | -130 | 830 |

7. Pin definition



Lora1276 V2.0 Pin Assignment

| Pin NO. | Pin name | Description |
|---------|----------|--------------------------------------|
| 1 | GND | power ground |
| 2 | NC | Vacant |
| 3 | NC | Vacant |
| 4 | SCK | Serial clock for SPI interface |
| 5 | MISO | SPI Output for SPI data |
| 6 | MOSI | SPI Input for SPI data |
| 7 | NSS | SPI enable |
| 8 | DIO2 | Digital I/O |
| 9 | DIO1 | Digital I/O |
| 10 | DIO0 | Digital I/O |
| 11 | VCC | Connected power supply (default3.3V) |
| 12 | NRESET | Reset input |
| 13 | ANT | Connect with 50 ohm coaxial antenna |
| 14 | GND | power ground |

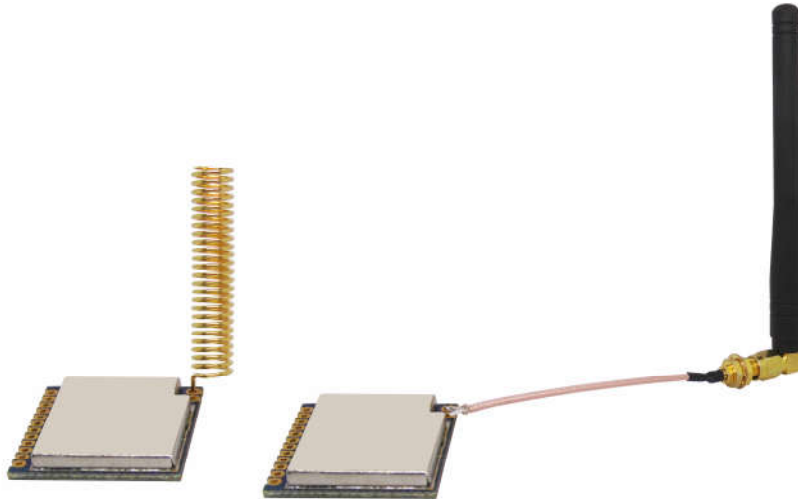
Lora1276 V1.1 Pin Assignment

| Pin NO. | Pin name | Description |
|---------|----------|--|
| 1 | GND | power ground |
| 2 | TXEN | Antenna switch control, Tx: Txen =1, Rxen =0; Rx: Txen = 0, Rxen = 1; Sleep : Txen = Rxen = 0 |
| 3 | RXEN | |
| 4 | SCK | Serial clock for SPI interface |
| 5 | MISO | SPI Output for SPI data |
| 6 | MOSI | SPI Input for SPI data |
| 7 | NSS | SPI enable |
| 8 | DIO2 | Digital I/O |
| 9 | DIO1 | Digital I/O |
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| 11 | VCC | Connected power supply (default3.3V) |
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8. Accessories

1)Antenna

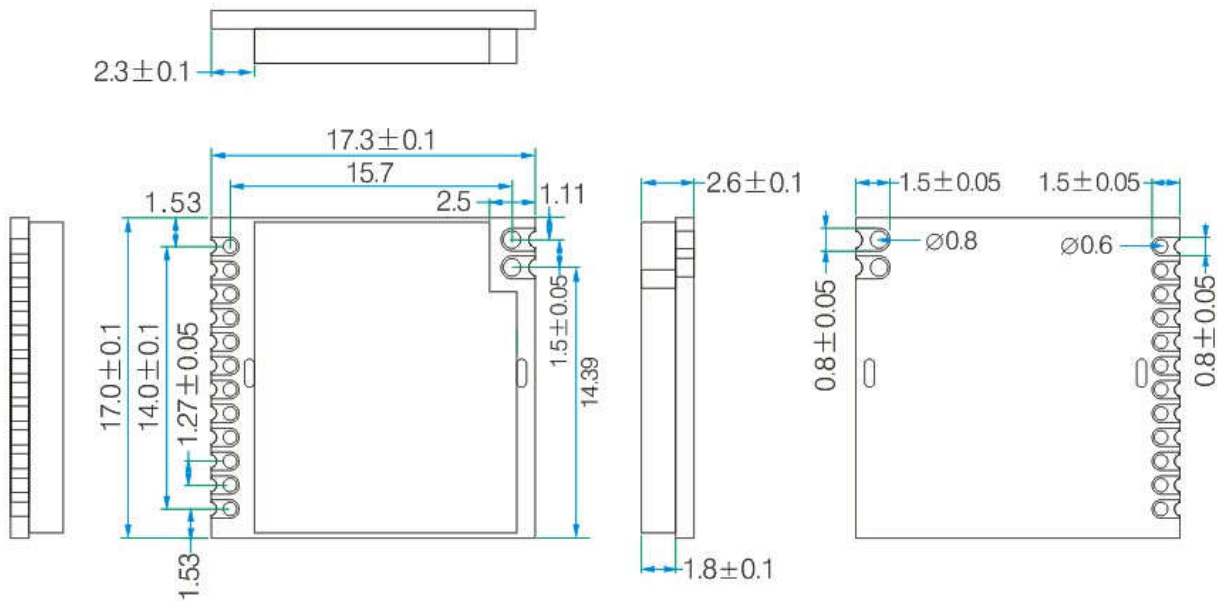
antenna is very important for RF communication, its performance will affect the communication directly. Module needs antenna in 50ohm. Common antenna has rubber straight/ elbow/ foldable rod and sucker antenna and etc. Users can order accordingly. To ensure module in the best performance, we suggest 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(mm)



10. Order information

LoRa1276-868

Product name

Frequency

For example: If the customer needs 868MHz Frequency, the order no. shall be LoRa1276-868.

Here are the product types:

| Product Name | Description |
|--------------|--------------------------|
| LoRa1276-868 | Working frequency 868MHz |
| LoRa1276-915 | Working frequency 915MHz |

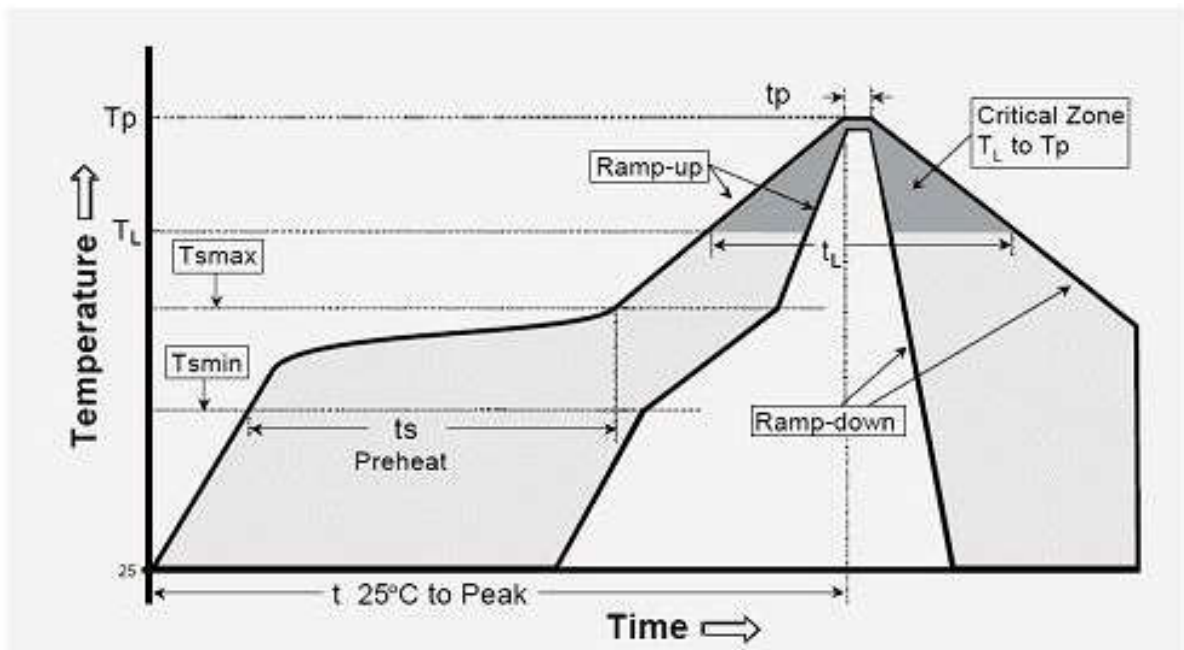
11. FAQ:

- a) Why module can not communicate properly?
 - 1) Check if the band, channel, rate, NET ID has set to the same;
 - 2) Check if there is power connection error;
 - 3) Check if the module is enabled (CS high);
 - 4) Check if the antenna connection is not correct;
 - 5) Check if the module is damaged.
- b) Why transmission distance is not far as it should be?
 - 1) Power supply ripple is too large;

- 2) The antenna types do not match, or not properly installed;
- 3) The surrounding environment is harsh, strong interference sources;
- 4) Surrounding co-channel interference;

Appendix 1: SMD Reflow Chart

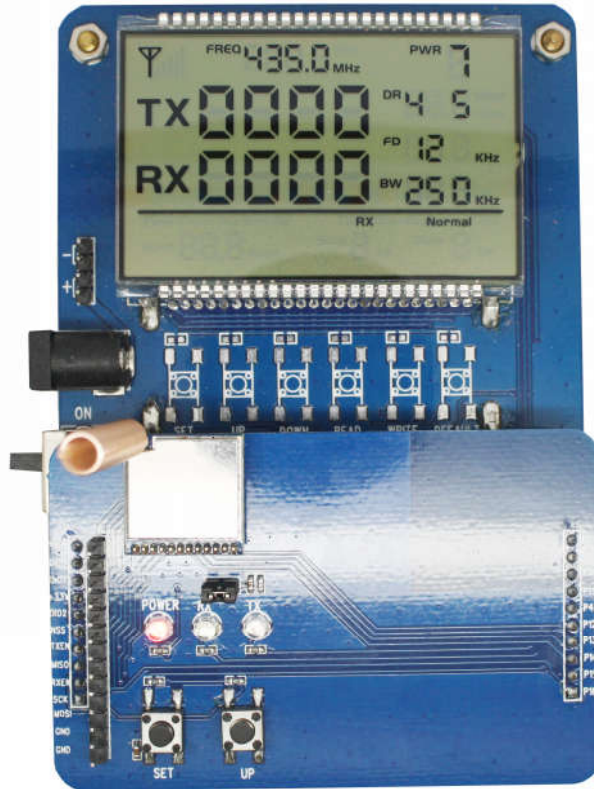
We recommend you should obey the IPC related standards in setting the reflow profile:



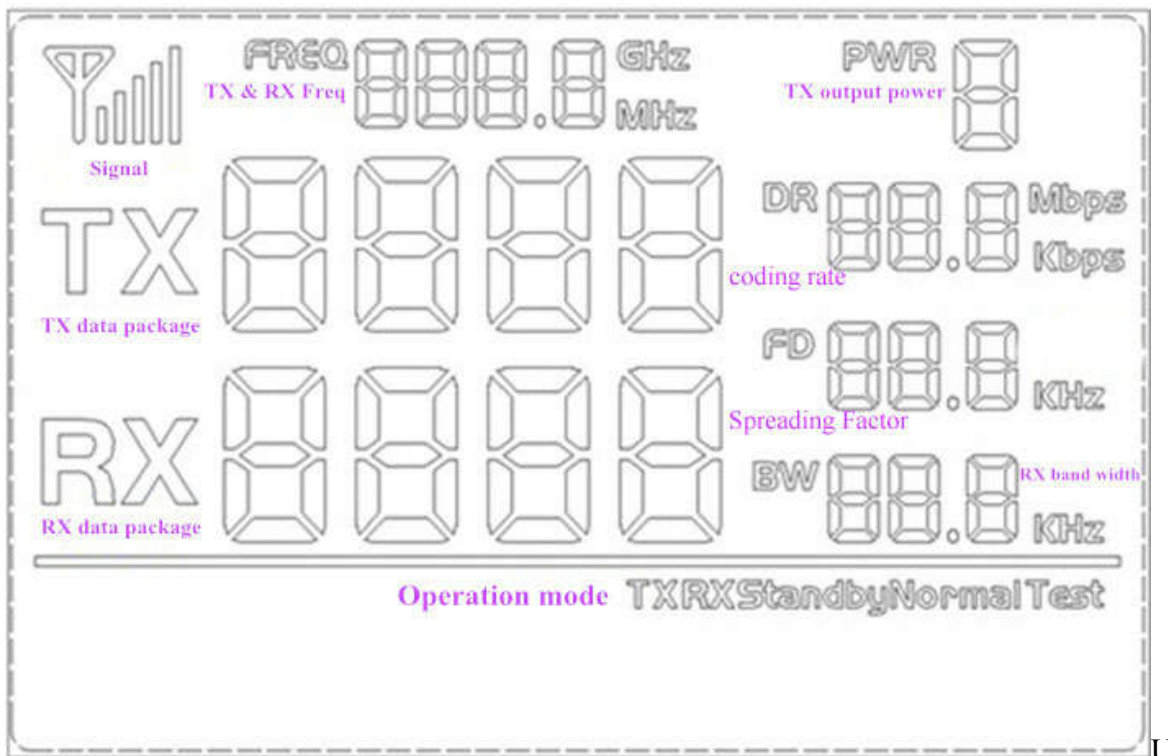
| | |
|---|---|
| IPC/JEDEC J-STD-020B the condition for lead-free reflow soldering | big size components (thickness $\geq 2.5\text{mm}$) |
| The ramp-up rate (Tl to Tp) | 3°C/s (max.) |
| preheat temperature | |
| - Temperature minimum (T _{min}) | 150°C |
| - Temperature maximum (T _{max}) | 200°C |
| - preheat time (t _s) | 60~180s |
| Average ramp-up rate(T _{max} to Tp) | 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~8.0V. It shows as below:



The LCD Full Segment is as below:



Users can set the parameters of the RF module such as working mode /frequency /transmitter power / transmission data rate through the buttons, and measure the wireless communication distance.

➤ Working Mode

- 1) Master Mode: Send 1 packet per second, and waiting for the acknowledge;

- 2) Slave Mode: Stay in Rx mode to wait for the data from the master, it will send back
- 3) The acknowledged signal after received the data from the master.
- 4) Tx Test Mode: RF module continuously transmit signal;
- 5) Rx Test Mode: RF module is always in Rx mode;
- 6) Standby Mode: RF module is always in standby state.

➤ Button Operation

1) [SET] Button

Press the [SET] button to enter setting mode if not in setting mode. In setting mode, press [SET] button to toggle between the set parameters: working mode / frequency / output power / data rate / spreading factor / Bandwidth. The related LCD ICON will flash to indicate.

2) [UP] Button

In setting mode, press the [UP] button to increase the value of flash icon.

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