100mW small size industrial grade wireless transceiver module

Product Specification

RF4432PRO   RF4432X1   RF4432

Catalogue

Note: Revision History

Revision	Date	Comment
V1.0	2013-10-16	First release
V2.0	2016-8-5	Typesetting changes
V2.1	2018-12-13	Pin description correction
V3.0	2020-11	Multi-model integration
V3.1	2022-6	Pin description correction
V3.2	2025-02	Update frequency band and other information

1. Overview

Based on Silicon Lab's si4432 chip, our company has developed three modules with different package sizes: RF4432PRO, RF4432 and RF4432X1 to meet the needs of different customers. We recommend that customers choose the RF4432PRO module with the best anti-interference performance. These modules all have extremely low receiving sensitivity (-121 dBm), coupled with the industry-leading output power of +20 dBm to ensure extended range and improved link performance.

This series of modules use lead-free technology for production and testing strictly, and comply with RoHS and Reach standards. In addition, RF4432PRO also provides customers with different versions of CE certification, which can meet the different needs of customers' products.

Module type	Working frequency	Package	Certification
RF4432PRO	315/433/470/868/915MHz customizable 240-930MHz	With shield; Antenna is designed on one side.	CE versions available
RF4432	315/433/470/868/915MHz customizable 240-930MHz	Without shield; Antenna is designed on one side.	No
RF4432X1	315/433/470/868/915MHz customizable 240-930MHz	Without shield; Symmetrical design with pin on both sides.	No

2. Features

■ Frequency Range：315/433/470/868/915MHz（customizable 240-930MHz）

■ Sensitivity up to -121dBm

■ Maximum output power：20dBm

■ 30mA@+13dBm（Transmit）

■ Data transfer rate：0.123-256Kbps

■ FSK，GFSK&OOK Modulation mode

■ 1.8-3.6 V Power supply

■ Ultra-low consumption shutdown mode

■ Digital received signal strength indicator(RSSI)

■ Timed wake-up function

■ Low power detection

■ Antenna automatic matching and two-way switch control

■ Configurable data packet structure

■ Preamble detection

■ 64 bytes send and receive data register（FiFo）

■ Temperature sensor and 8-bit analog-to-digital converters

■ Operating Temperature Range：-40～+85°C

■ Integrated voltage regulator

■ Frequency hopping

■ Power-on reset function

■ Built-in crystal adjustment function

3. Application

- remote control
- Remote meter reading
- Home security alarm
- Personal data record
- Toys control
- Industrial control

- Sensor network
- Tire pressure monitoring
- Health monitoring
- Wireless PC peripherals
- Tag reading and writing
- Home automation remote sensing

4. Electrical Characteristics

Parameter	Min	Typ.	Max.	Unit	Condition
Operation Condition					
Working voltage range	1.8	3.3	3.6	V	
Temperature voltage	-40		85	℃	
Current Consumption					
RX current		18.5		mA	
TX current		85		mA	@20dBm
Sleep current		< 1		uA	
RF Parameter					
Frequency range	403	433	463	MHz	@433MHz
	470	490	510	MHz	@470MHz
	838	868	898	MHz	@868MHz
	900	915	930	MHz	@915MHz
Modulation rate	0.123		256	Kbps	FSK
Output power range	1		20	dBm	
Receiving sensitivity		-121		dBm	@Data rate=1.2Kbps

5. Typical application circuit
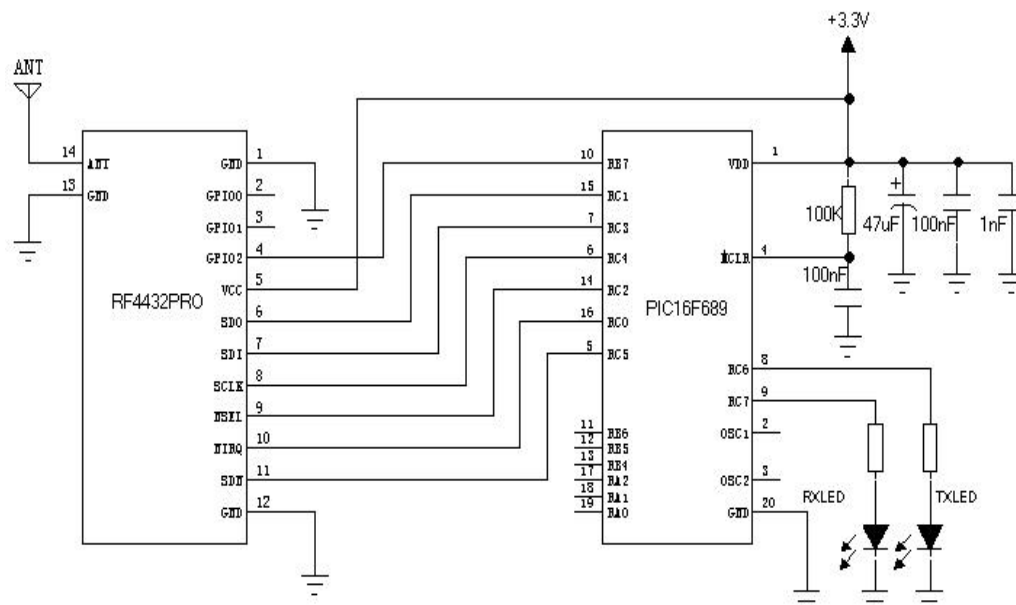
6. Pin definition

➢ The pin definition of RF4432PRO & RF4432 module is as follows：

Pin NO.	Pin Name	Description
1	GND	Power ground
2	GPIO0	The control pin of the transmitter switch is connected inside the module
3	GPIO1	The control pin of the transmitter switch is connected inside the module
4	GPIO2	Connect directly to the GPIO2 pin of the chip
5	VCC	Positive power supply 3.3V
6	SDO	0～VDD V digital output, provides serial readback function to internal control register.
7	SDI	Serial data input. 0～VDD V digital input. This pin is a 4-wire serial data serial data stream bus.
8	SCLK	Serial clock input. 0～VDD V digital input. This pin provides a 4-wire serial data clock function.
9	nSEL	Serial interface select input pin. 0～VDD V digital input. This pin provides select/enable function for 4-wire serial data bus. This signal is also used to indicate burst read/write mode.
10	nIRQ	Interrupt output
11	SDN	Chip enable pin. 0～VDD V digital input. SDN=0 in all modes except shutdown mode. When SDN=1, the chip will be completely shut down and the contents of the register will be lost.
12	GND	Power ground
13	GND	Power ground
14	ANT	Connect with 50 ohm coaxial antenna

➢ The pin definition of RF4432X1 module is as follows:
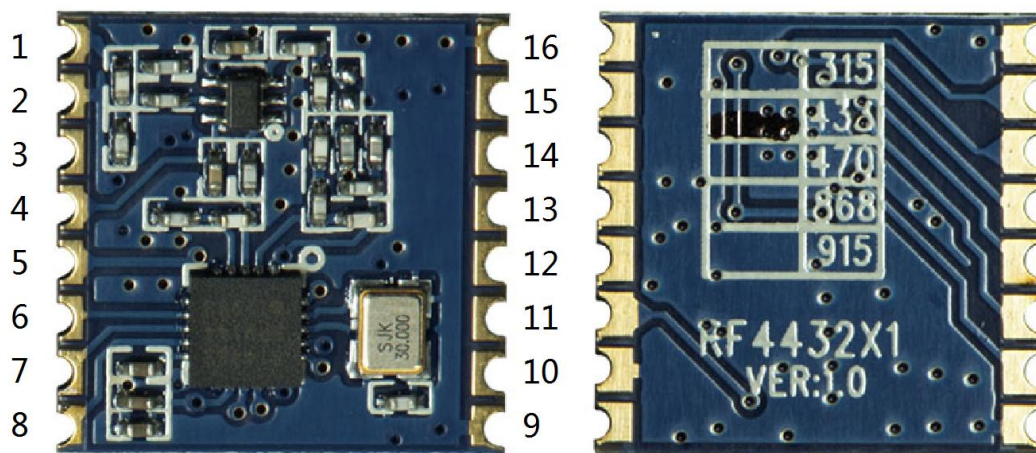
Pin NO.	Pin Name	Description
1	ANT	Connect with 50 ohm coaxial antenna
2	GND	Power ground
3	RX_ANT	Transmit antenna switch control pin
4	TX_ANT	Receiving antenna switch control pin
5	VCC	Connect to the positive power supply 3.3V
6	GPIO0	Connect directly to the GPIO0 pin of the chip
7	GPIO1	Connect directly to the GPIO1 pin of the chi
8	GPIO2	Connect directly to the GPIO 2 pin of the chi
9	GND	Power ground
10	SDO	0～VDD V digital output, provides serial readback function to internal control register
11	SDI	Serial data input. 0～VDD V digital input. This pin is a 4-wire serial data serial data stream bus.
12	SCLK	Serial clock input. 0～VDD V digital input. This pin provides a 4-wire serial data clock function.
13	NSEL	Serial interface select input pin. 0～VDD V digital input. This pin provides select/enable function for 4-wire serial data bus. This signal is also used to indicate burst read/write mode.
14	nIRQ	Interrupt output pin
15	SDN	Chip enable pin. 0～VDD V digital input. SDN=0 in all modes except shutdown mode. When SDN=1, the chip will be completely shut down and the contents of the register will be lost.
16	GND	Power ground

7. 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.
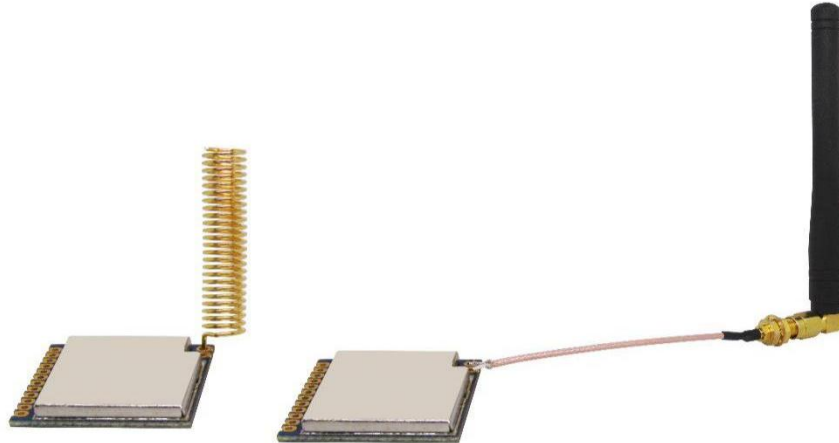

★To ensure modules get the best performance, user must obey the following principles when using the antennas：

➢ 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.
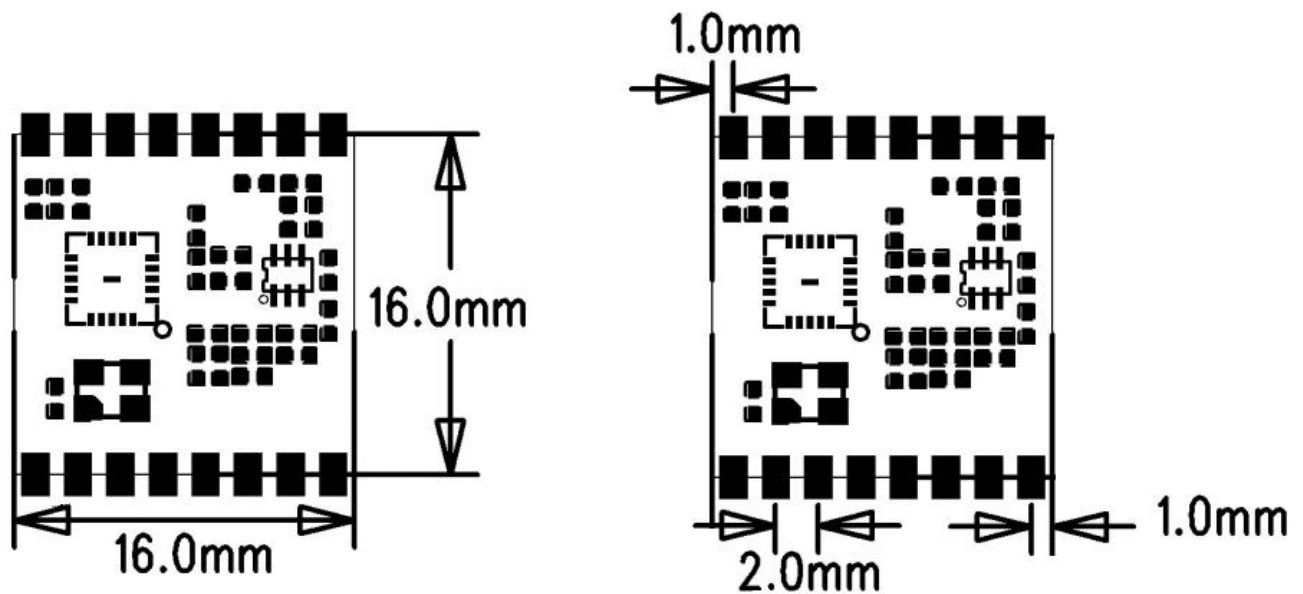
8. Mechanical size (unit：mm)

➢ The dimensions of RF4432Pro are as follows：
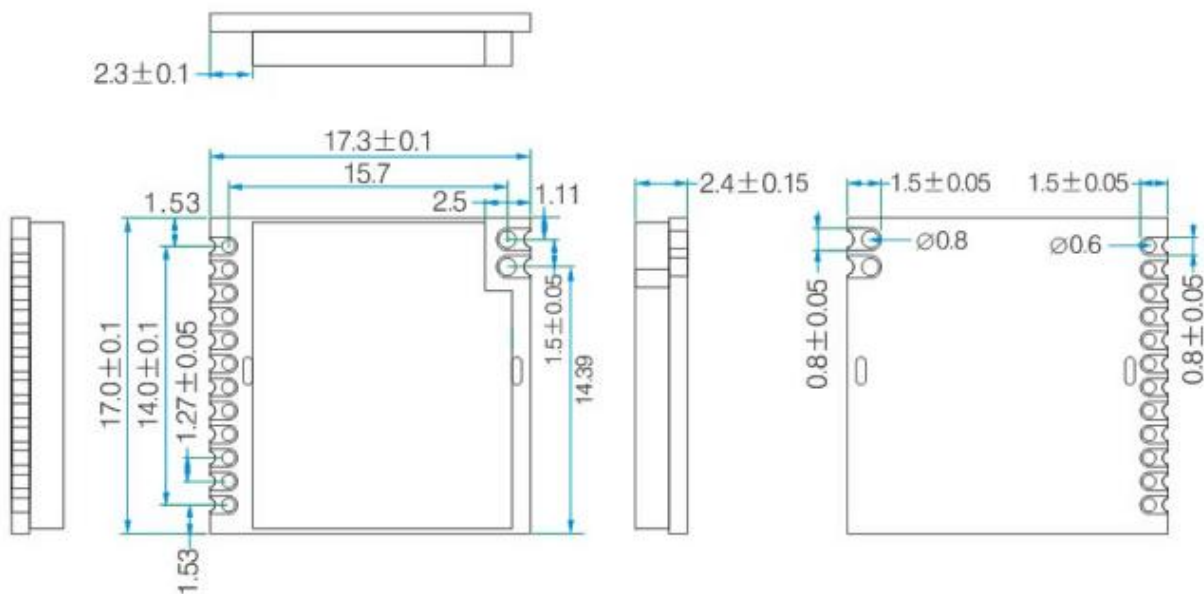
➢ The dimensions of RF4432 are as follows:
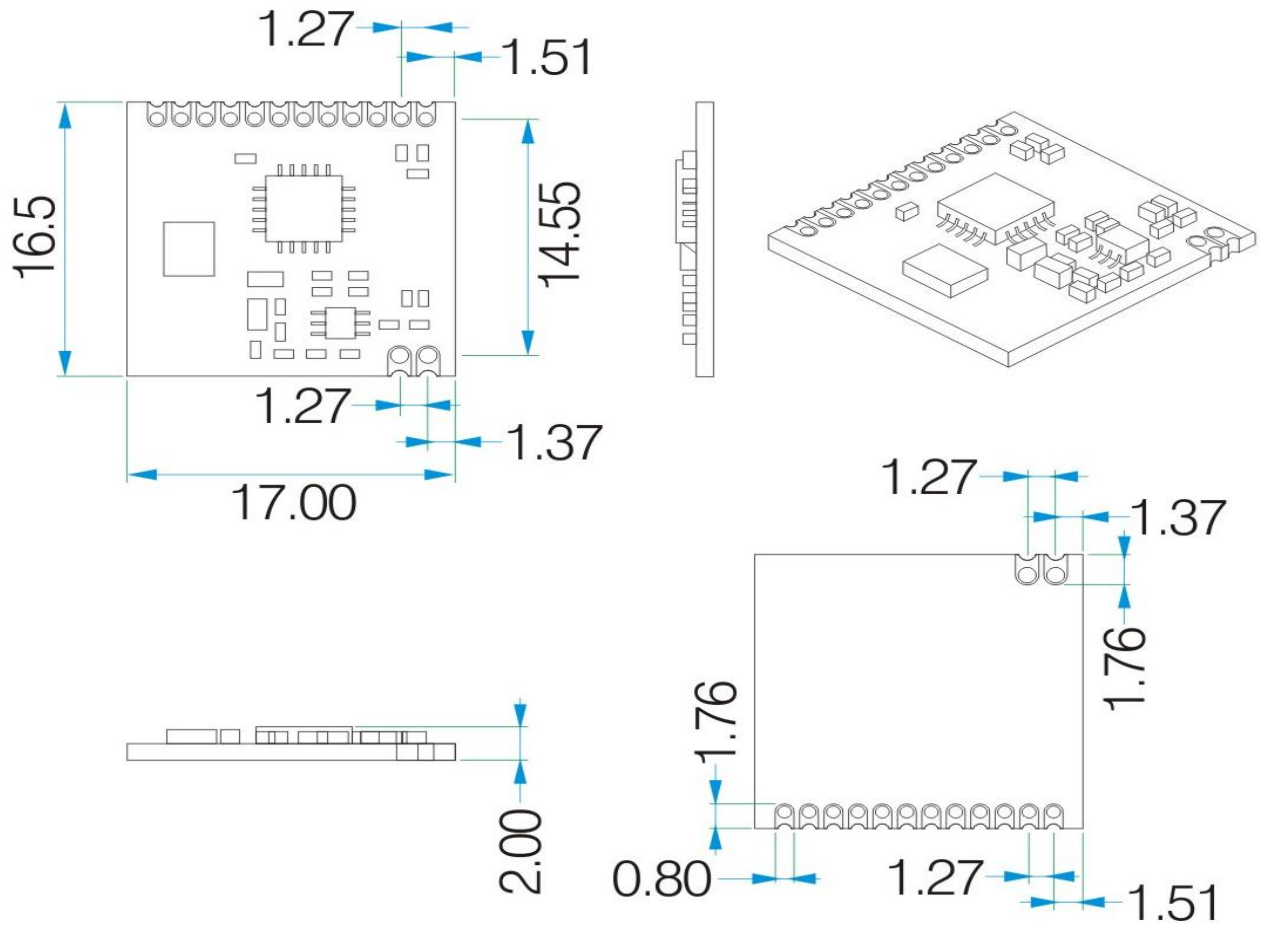
➢ The dimensions of RF4432X1 are as follows:

9. Product order information

For example: If the customer needs 433MHz Frequency,The order model is: RF4432PRO-433.

| Order model	product type
RF4432PRO-433	With shield,the working frequency band of the module is 433MHz
RF4432PRO-433-CE	With shield,the working frequency band of the module is 433MHz,CE certified version
RF4432PRO-470	With shield,the working frequency band of the module is 470MHz
RF4432PRO-868	With shield,the working frequency band of the module is 868MHz
RF4432PRO-868-CE	With shield,the working frequency band of the module is 868MHz,CE certified version
RF4432PRO-915	With shield,the working frequency band of the module is 915MHz
RF4432-433	Without shield,the working frequency band of the module is 433MHz
RF4432-470	Without shield,the working frequency band of the module is 470MHz
RF4432-868	Without shield,the working frequency band of the module is 868MHz
RF4432-915	Without shield,the working frequency band of the module is 915MHz
RF4432X1-433	Symmetrical package on both sides,without shield,the working frequency band of the module is 433MHz
RF4432X1-470	Symmetrical package on both sides,without shield,the working frequency band of the module is 470MHz
RF4432X1-868	Symmetrical package on both sides,without shield,the working frequency band of the module is 868MHz
RF4432X1-915	Symmetrical package on both sides,without shield,the working frequency band of the module is 915MHz

10. 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;

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:
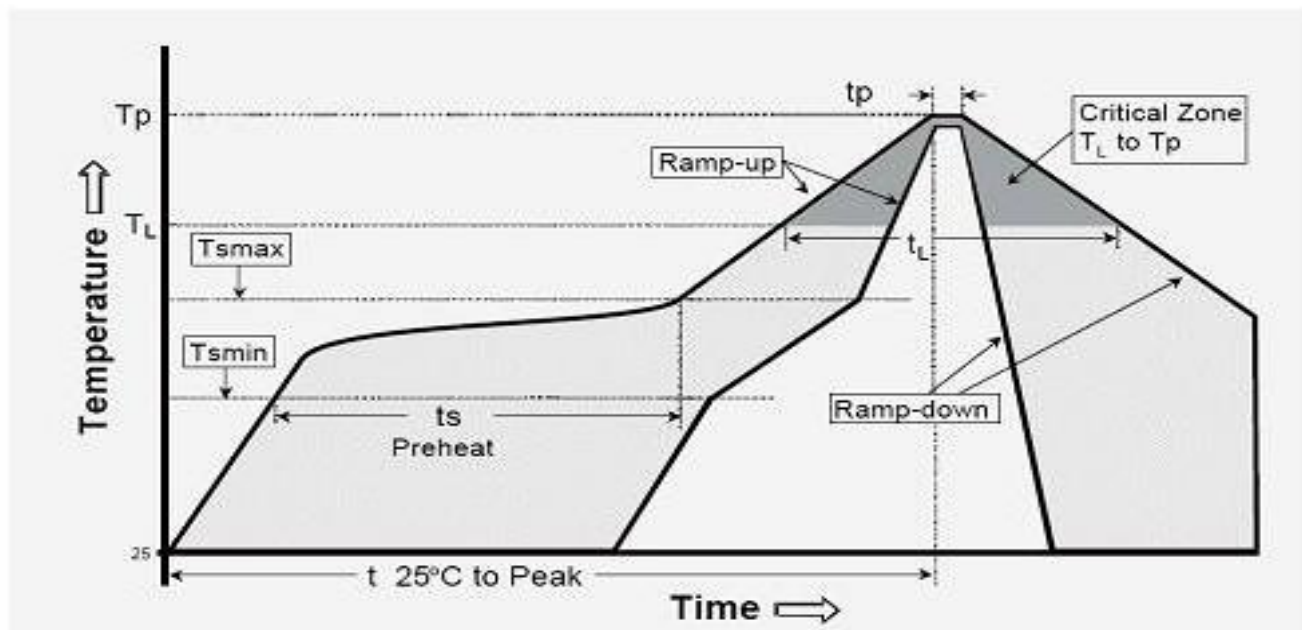

IPC/JEDEC J-STD-020B the condition for lead-free reflow soldering	big size components (thickness >=2.5mm)
The ramp-up rate (Tl to Tp)	3℃/s (max.)
preheat temperature	
— Temperature minimum (Tsmin)	150℃
— Temperature maximum (Tsmax)	200℃
— preheat time (ts)	60~180s
Average ramp-up rate(Tsmax to Tp)	3℃/s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

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:
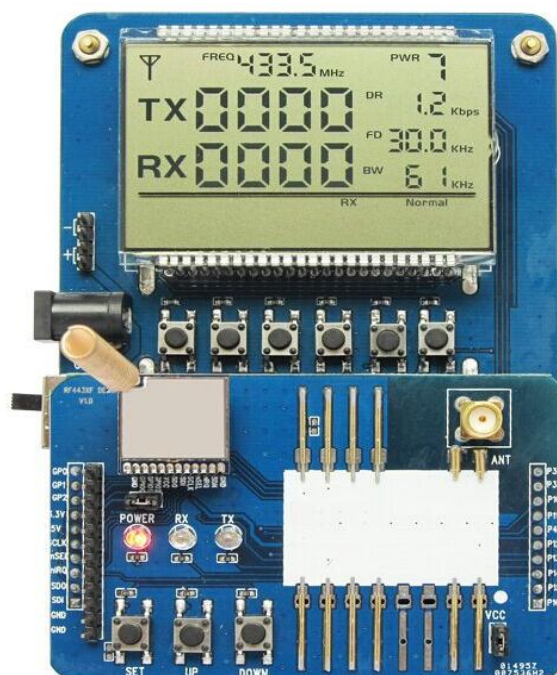
The LCD Full Segment is as below:
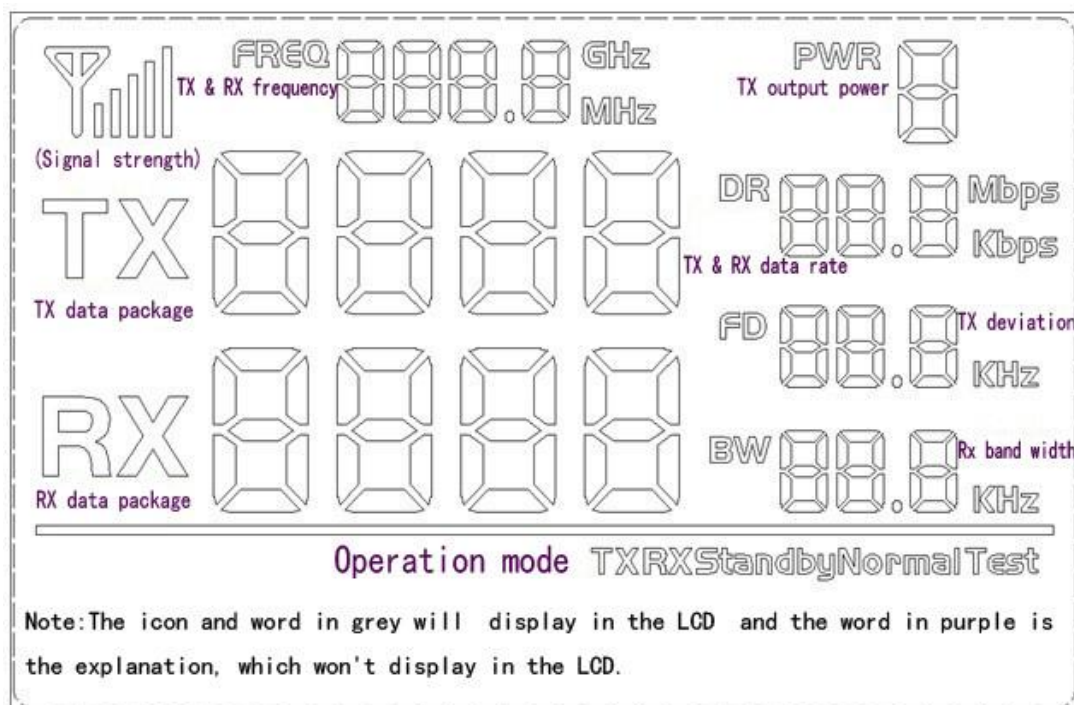
The users can set the parameters of the RF module such as frequency /transmitter power / transmission data rate through the buttons.

➢ **Working Mode:**

1) Tx normal mode: Send data packets regularly (In the setting mode, data packets will not be sent);

2) Rx normal mode: Power on and enter the receive 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.