# 1. General

RF4432 adopts Silicon Lab Si4432 RF chip, which is a highly integrated wireless ISM band transceiver chip. Extremely high receive sensitivity (-121dBm) and +20dBm output power ensure that the covering of the range and improve the data link performance. Built-in antenna diversity and the hopping function can be used to aggressively improve the performance.
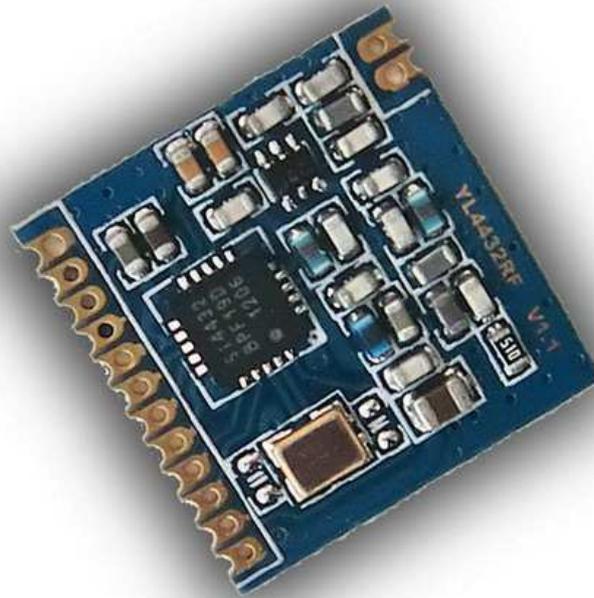
2. Features

- Frequency Range: 433/868
- (Customizable 240-930 MHZ）
- Sensitivity up to -121 dBm
- Data transfer rate：0.123-256 kbps
- FSK，GFSK and OOKModulation mode

- 1.8-3.6 V Power supply

- Ultra-low consumption shutdown mode

- Digital received signal strength indicator (RSSI)

- Timed wake-up function

- The antenna automatically match and two-way switch control

- Configurable packet structure

- Preamble detection

- 64-byte transmit and receive data register（FIFO）

- Low-power detection

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

- Operating Temperature Range：-20 ~ + 70 °C

- Integrated voltage regulator

- Frequency hopping

- Power-on reset function

- Built-in crystal adjustment function

3. Application:

- Automated Meter Reading (AMR)

- Remote control, remote measurement system

- Access control

- Access control

- Data collection

- Identification system

- IT household appliance

- Baby monitoring system

4. Maximum specification

Symbol	Parameter	conditions	Min	Typ	Max	Units
VDD	Supply Voltage Range		1.8	3	3.6	V
Ta	Operating Temperature Range		-40		85	℃
Current consumption						
Irx	current in rx mode			18.5		mA
Itx	Current in tx mode	@20dBm		85		mA
Istandby	Current in standby mode	Register values retained,Oscillator OFF		450	800	nA
Ishutdown	Current in shut down mode	Register value lost, Oscillator off SDN pull high		15	50	nA
RF parameters						
Ftx	Frequency Range	@315MHZ	285	315	335	MHZ
		@433MHZ	403	433	463	MHZ
		@470MHZ	470	490	510	MHZ
		@868MHZ	838	868	898	MHZ
		@915MHZ	895	915	935	MHZ
DRfsk	Data Rate	FSK	0.123		256	Kbps
Ptx	Output power		+1		+20	dBm
Prx	Rx Sensitivity	@data=1.2kbps,Fdev=20kHZ		-121		dBm

5. Pin Out:

FRF4432 module has 12 pins. Refers to the Table 1：

Pin Number	Pin Definitions	Description
1	GND	Connected to power ground
2	GPIO0	Internally by module transmitter control foot
3	GPIO1	Internally by module receives control foot
4	GPIO2	GPIO2 pin chip directly connected
5	VCC	Positive supply 1.8--3.6V
6	SDO	0 ~ VDD V digital output provides a serial readback function of the internal control register
7	SDI	Serial data input. 0 ~ VDD V digital input.The pin is a 4-wire serial data stream of serial data bus.
8	SCLK	Serial clock input. 0 ~ VDD V digital input.This pin provides a 4-wire serial data clock function.

| 9	nSEL	The serial interface input pin. 0 ~ VDD V digital input. This pin to 4-wire serial data bus select / enable function, this signal is also used, said the burst read / write mode.
10	nIRQ	Interrupt output pin
11	SDN	Digital input. When SDN = 0, module not in shut down mode, When SDN = 1 module will be completely closed and the register values will be lost..
12	GND	Connected to power ground
13	ANT	From 50 ohm coaxial antenna
14	GND	Connected to power ground

Table 1: Pin definition

6. Dimension
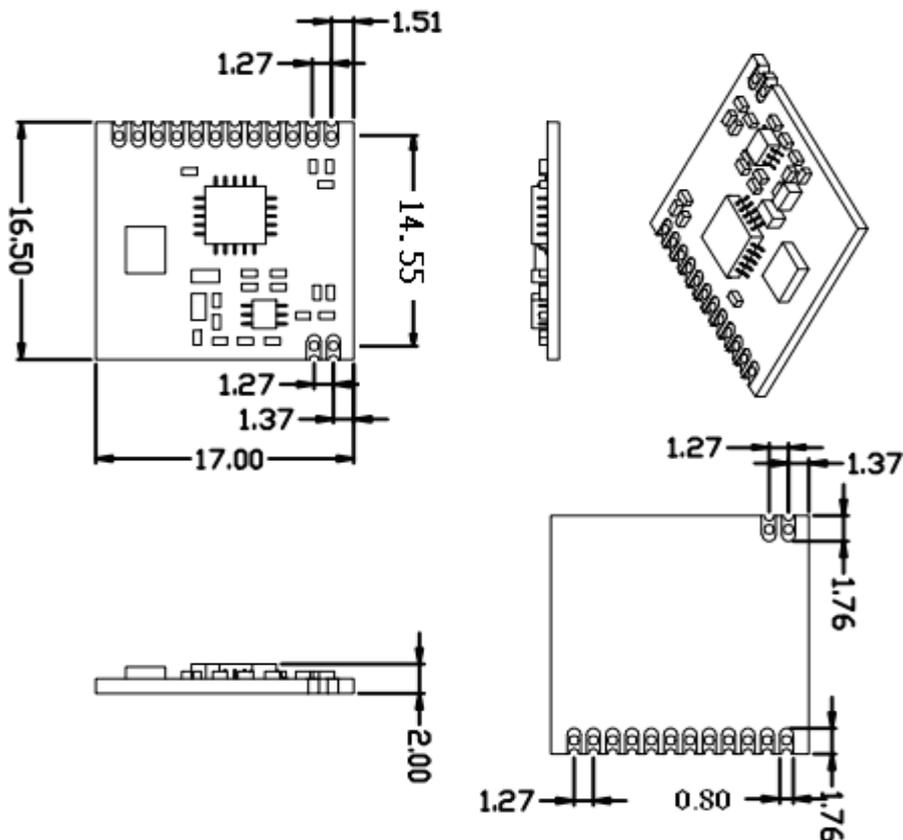
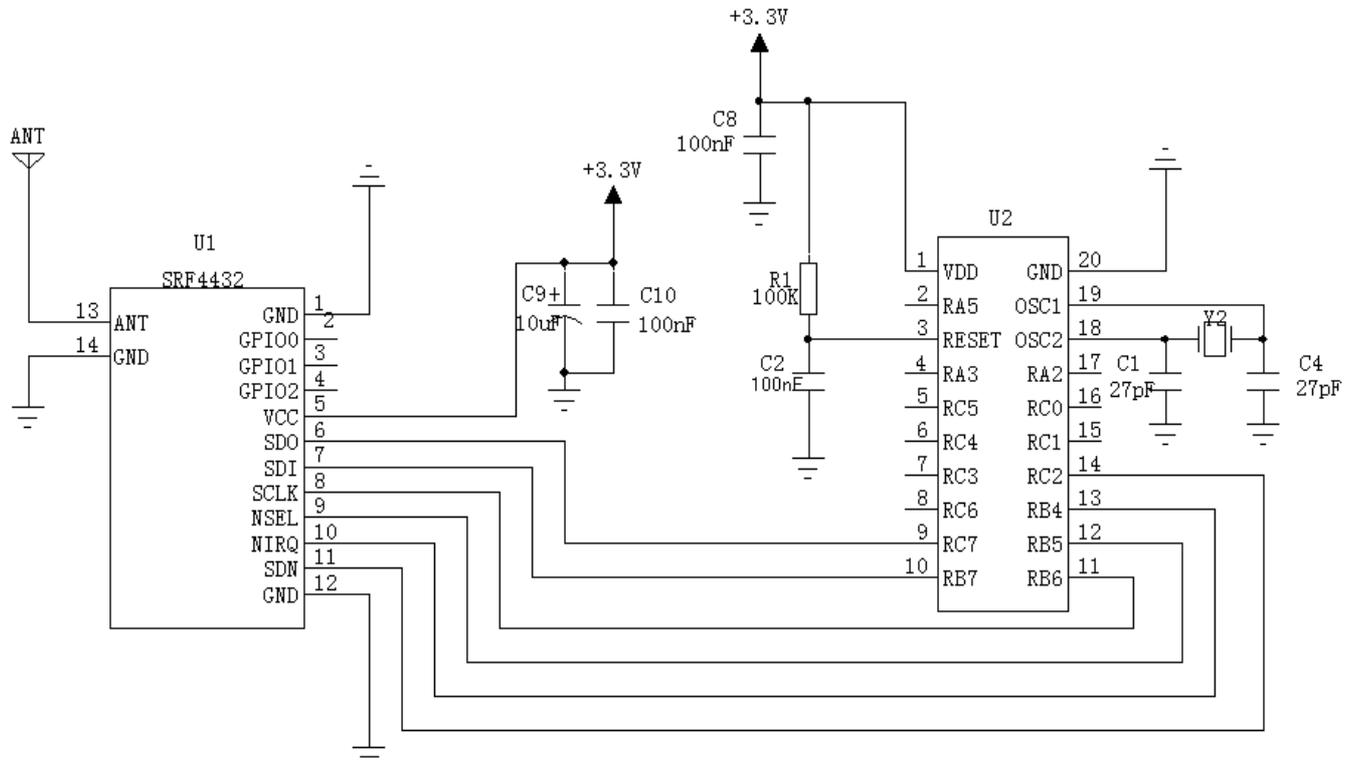**Figure 1: Size of Module**

7. Application Schematic:

Figure 7: The Connection between Module and Device

8. Constructing Network (one point to multi-point):

RF4432 is a semi-duplex module, which can be communicated by point to point or one point to multi-point. In the second mode, user needs to set one master module, while the others are slave modules. Every module must only have one unique ID. The coordination of communication is controlled by the master module, which sends data or commands including ID information. All slave modules can receive the data packets, and compare the ID with itself. If they are matched, the module will deal with the data packets. Otherwise, it will discard them. In order to avoid interfering each other, only one module can be in transmitting state when the network is working. RF4432 can set many different frequencies so that many networks can work in the same place and at the same time.

User should pay attention to the following questions based on the complex transfers in the air and some inherency characteristics of wireless communication:

1）Latency of wireless communication

The wireless terminal keeps receiving data packets after waiting for a while to ensure no data any more. There should be tens to hundreds mil-seconds latency from transfer to receiver (the exact latency depended on UART rate, air rate and the size of data package). In addition, it also need consume some time to transmit from module to terminal, but the delay time is permanent in the same condition.

2）Data flux control

Although there is a buffer zone with 256 bytes in the wireless module, when the UART rate is higher than the air rate, there must be a problem about the data flux. It may cause to lose some data because the data overflow from the buffer. Under this condition, it must be ensured that the average UART rate should NOT higher than 60 percent of the air rate. For instance, the UART rate is 9600bps, the air rate is 4800bps. If UART rate is the same as the air rate, the only way is to interval the transmitting time. If terminal transmits 100bytes to UART every time, it will take 104ms every time. (104ms/0.6)*(9600/4800) =347ms. So if the interval time that terminal transmit 100bytes to UART should NOT less than 347ms every time, those mentioned problems can be avoided.

3）Error control

The wireless network module has strong capability of anti-interference because of the high efficiency checking error correction with interleaving encoding technology. However, when it is in a bad circumstance that has strong electric interference, the data may be lost or receive some error data. User can increase the development of the system link layer protocol. For instance, if user can increase TCP/IP slip window and repeat transmitting functions, it will improve the reliability and ability of wireless network communication.

4) Selection of antenna

Antenna is a very important factor of the communication system. The quality of antenna impacts the capability of communication system. So user should strictly choose the quality of antenna. Generally speaking, it mainly contains two points: the type of antenna (size) and its electric capability. The antenna must be matched with the frequency of communication system.

9. Q&A:

Questions and Answers	
Can not communicate between two devices	1．The communication protocol is different between two modules, for instance: data rate and checkout.
	2．The frequency or RF data rate is different between two communicated modules.
	3．They are not the same kind products.
	4．The connection between module and terminal is wrong.
	5、The module is wrong.
	6．The setting of EN is wrong.
	7．The communication distance exceeds the range, or the connection of antenna is bad.
Short communication distance	1．The supply voltage exceeds range
	2．The ripple of power is too big.
	3．The connection of antenna is bad or it is a wrong kind of antenna
	4．Antenna is too close to the surface of metal or the ground
	5．Receiving circumstance is very bad, for instance buildings and strong interference.
	6．There is interference of the same frequency
Receive wrong data	1．Wrong setting of COM, for example, Baud rate is wrong
	2．The connection of UART is wrong.
	3．The cable to the UART is too long.

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