RF1212

Ultra-low Power ISM Transceiver Module V2.0

Application：

- Home automation
- Security alarm
- Telemetry
- Automatic meter reading
- Contactless access
- Wireless data logger
- Remote motor control
- Wireless sensor network

Features:

- FSK transceiver Module
- 433Mhz ISM frequency band
- 20k bps FSK data rate
- Multiple channels
- 10dBm Max. output power
- Baud rate configurable
- Two 256 bytes data buffers
- Standby current < 1.5uA
- Supply voltage 2.1~3.6V

Description

RF1212 is a low-cost sub-1 GHz transceiver module designed for operations in the unlicensed ISM (Industrial Scientific Medical) and LPRD bands. FSK (Frequency Shift Keying) modulation/demodulation, multi-channel operation, high bandwidth efficiency and anti-blocking performance make RF1212 modules easy to realize the robust and reliable wireless link.

The module can be configured to work in different channels with 200 KHz space. It adopts high efficient looped interleaving EDAC (Error Detection and correction) coding with coding gain up to 3dB which keeps in advance in error correction and coding efficiency over normal FEC (Forward Error Correction)

coding. Because of its high reliability in correction, modules can filter error and fake information automatically and realize truly transparent wireless link, which makes RF1212 very suitable in the rigid communication environment.

RF1212 integrates two 256 bytes buffer. When the buffer is empty, users can transfer 256 bytes data per time and even limitless data transfer can be achieved as long as RF data rate (RF module to RF module) is configured to be faster than UART data rate (MCU to RF module). RF1212 provides standard UART/TTL interface for selection. Users can choose seven data rates and three parity checks which make RF1212 possibly tailor-made for different applications. RF1212 operates at 2.1~3.6V with extra low power consumption. The current in polling mode can be minimized to 20uA and the current in receive mode no more than 4mA makes modules very suitable for battery powered-up applications.

Pin Out

RF1212 Pin definition			
PIN	**Name**	**Function**	**Description**
1	GND	Ground	Ground (0V)
2	VCC	Power	Power supply: 2.1V-3.6V
3	SET_A	Input	Parameter setting A; pull-up resistor:47K Ohm
4	RXD	Input	UART input, TTL level; pull-up resistor:47K Ohm
5	TXD	Output	UART output, TTL level
6	AUX	Output	Data in/out indication
7	SET_B	Input	Parameter setting B; pull-up resistor:47K Ohm
8	NC	-	No connection
9	NC	-	No connection

Table 1 RF1212 Pin definition

Dimension

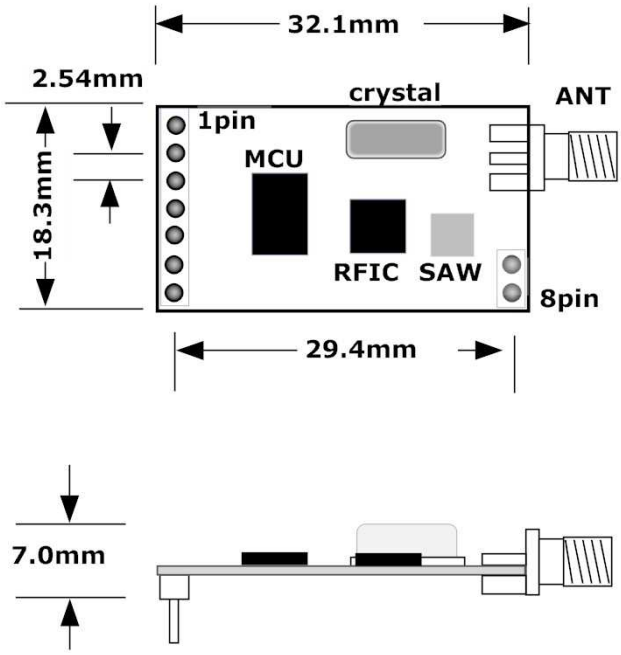

Figure 1 Dimension of RF1212

ELECTRICAL SPECIFICATIONS

Symbol	Parameter(condition)	Min.	Typ.	Max.	Units
VCC	Supply Voltage	2.1		3.6	V
Temp	Operating temperature range	-20	25	70	°C
RH	Operating relative humidity	10		90	%
Freq	Frequency range	430		437	MHz
FDEV	Modulation deviation		67		KHz
Mod	Modulation type		FSK		
IDD	Receive mode@ 1K bps		2.7		mA

(TYP)	Receive mode@ 10K bps		3		mA
	Receive mode@ 40K bps		4		mA
	Transmit mode @ 0dBm		20		mA
	Transmit mode @ 10dBm		35		mA
	Sleep mode		1.5		uA
Pout	Output power			10	dBm
Sen	Reception sensitivity@ 1Kbps		-113		dBm
	Reception sensitivity@ 10Kbps		-107		dBm
DRFSK	FSK data rate	1		40	Kbps
DRIN	UART data rate	1.2		57.6	Kbps
Tw	Wake-up&Search preamble time.@ 1K bps		20		ms
	@ 2K bps		12		ms
	@ 5K bps		6.2		ms
	@ 10K bps		4.2		ms
	@ 20K bps		3.3		ms
	@ 40K bps		2.8		ms
Ts	Switching time		20		us
CHBW	Channel spacing		200		KHz
ZANT	Antenna Impedance		50		Ohm

Table 2 RF1212 Electrical Specifications

APPLICATION INFORMATION

Symbol	Parameter	Min	Max	Units
VCC	Supply Voltage	-0.3	3.7	V
VI	Input Voltage	-0.3	VCC+0.3	V
Vo	Output Voltage	-0.3	VCC+0.3	V
TST	Storage Temperature	-55	125	°C

Table 3 RF1212 Maximum Ratings

1. Data Packet Pattern

PREAMBLE	SYNCWORD	ID (Optional)	DATA + FEC +CRC

Table 4 RF1212 Packet Pattern

The preamble is alternative “1010” codes which is used to make the clock of receiver synchronous with transmitter. In normal conditions, 32 bits preamble is enough for use. When RF1212 works in power-saving mode, the preamble also can be functioned to wake up the receiver and it must be long enough in order to obtain such a function.

If the receiver is configured to wake up at the interval of one second, it wakes up and searches the preamble (TW) every other second and lasting 16 bits. The transmitter must transmit preamble longer than 1 second and then send synchronous word, which means the receiver can detect the preamble and wake up receiver successfully.

2. Working Mode

RF1212 can work in 4 different modes which can be configured through SETA and

SETB pins.

SET_A	SET_B	Work mode	Description
0	0	Normal (Mode 1)	Serial port enabled. Module works in continuous receive conditions. When data comes from MCU, AUX pin is set to low and module is switched to transmit status; then 32bits preamble and synchronous word will be sent. After data is transferred, AUX pin will be sent to high and the module will enter into continuous receiver status again. In this mode the preamble in transmitted data package is not long so the receiver module must work in Mode 1 or 2. When receiver module detects data in the present wireless channel, It will verify the data and set AUX pin to low and then output data to serial port after data is confirmed correctly.
0	1	Wake-up (Mode 2)	Serial port enabled. Module works in continuous receive conditions. When data comes from MCU, AUX pin is set to low and module is switched to transmit status; then preamble [1 wake-up period (E.g. 1second)+ 32bits] and synchronous will be sent. After data is transferred, AUX pin will be sent to high and the module will enter into continuous receiver status again. Because the longer preamble is introduced, the receiver module can work in Mode1, 2 or 3. When receiver module detects data in the present wireless channel, it will verify the data and set AUX pin to low and then output data to serial port after data is confirmed correctly.
1	0	PWR-saving (Mode 3)	Serial port disabled. The receiver module wakes up at a preset period and search if there is any data coming in present channel. It will enter into sleep status when no signal is detected. As soon as the preamble is sniffed out, the receiver module will keep in receive status and wait for the synchronous word; then it will verify the data and set AUX pin to low. After 5ms delay, the receiver module outputs data to serial port.

			After data is transferred, the serial port is disabled and AUX pin is set to high. The module will enter into sleep status again and wait for the next wake-up when mode setting isn't changed
1	1	Sleep (Mode 4)	Serial port disabled. The module stays in sleep status. In this mode. The RF circuit, the main clock circuit and peripherals are closed. The power consumption is extra low (about 1.5uA).

Table 5 RF1212 Working Mode

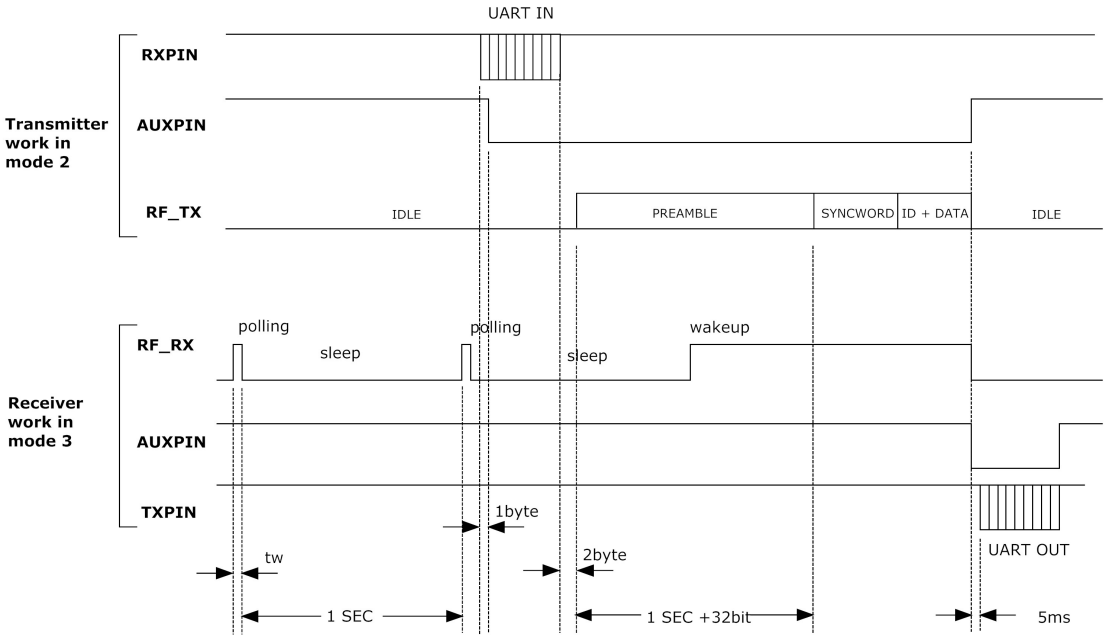

Figure 2 Timing Diagram of working in Mode 2&3

RF1212 module enters into sleep mode by software control. In sleep mode the levels of serial port are kept in corresponding status and can be switched to any other status. It only needs 20uS to wake up the module from sleep mode, which means data can be output to serial port after SETA pin is set to low more than 20uS. When the module is in transmit or receive process, it only can enter PWR-saving or sleep mode after the transmitting or receiving process is finished even though the SETA pin is set to high. Users can take this advantage to set SETA pin to high and make the module enter into

sleep status because it will detect SETA pin after a data transfer is finished.

3. Parameter Setting

Users can configure the parameters (frequency, data rate, output power, etc.) of RF modules by PC or MCU.

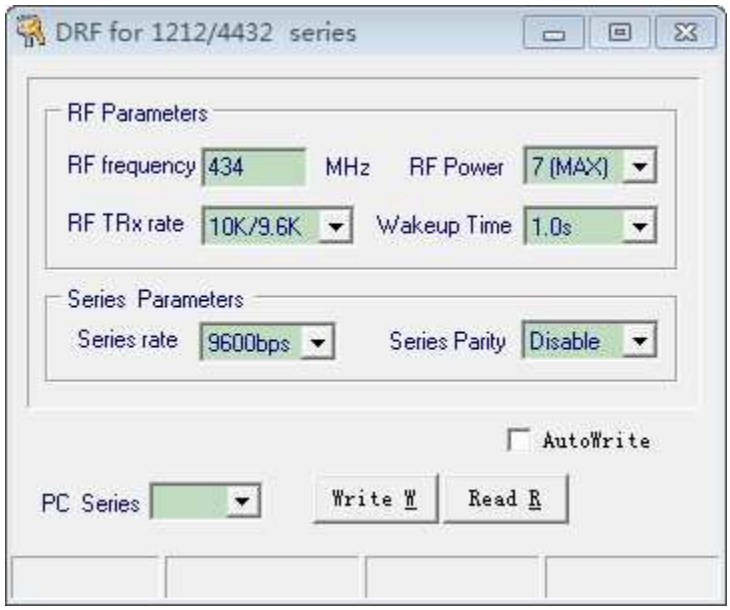

Figure 3 Configuration Tool

BY PC The interface of RF1212 is UART/TTL. If connecting it to PC, users need to use a TTL-to-RS232 level converter to transform the different levels. We also provides converter board for configuration.

Firstly users need to connect converter board to PC by cable and open RF Magic. Then insert the module into converter board. After that the status column of tool should display “Found Device”. Users then can read/write the module.

BY MCU. The module can work normally after powering on for 50ms (T1) or more. When configuring the module, users need to switch it to Mode 4 and monitor AUX pin which should be in high level without any transmit or receive. The module then can be configured after it enters into sleep mode for 10uS or more (T2).

When commands are output to RXD pin, the module will be waken up no matter what

status of UART interface is in and it will use 9600 bps (data rate) and no parity check as default format to configure parameters. If the commands are set correctly, the module will feed back the written commands; then it will be reset and initialized. After 100ms (T4), the module will work with the new parameters. Please note that if the commands are set incorrectly, the module will give no feedback but it will still be reset and initialized. Users can take this advantage to wake up modules in long-term sleep or reset the modules.

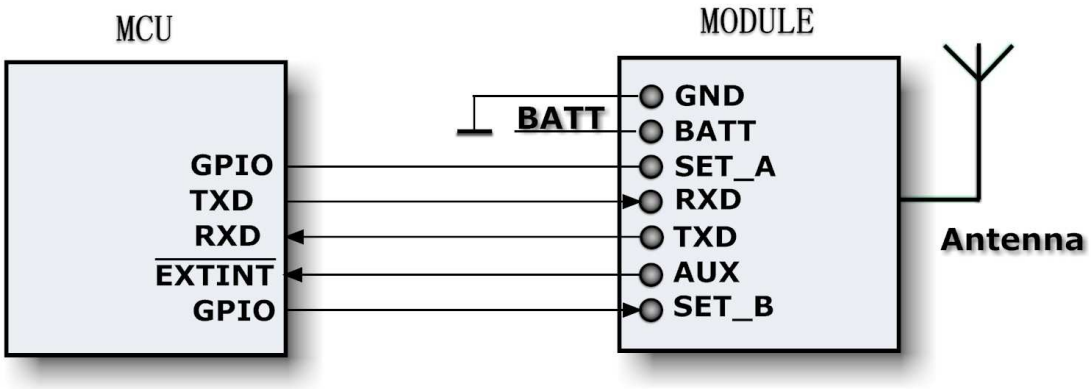

Figure 4：Conjunction Diagram with MCU

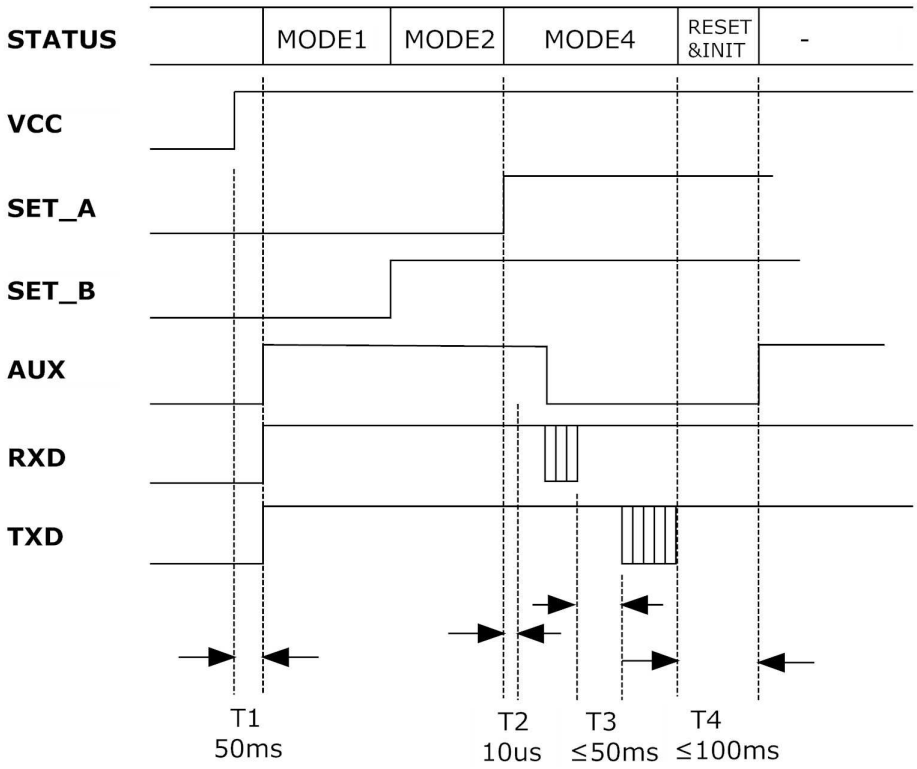

Figure 5 Timing Diagram of Configuration

The commands of RF1212 are in HEX format. The configuring data rate is 9600 bps and no parity check included. The command set include two commands: Read command and Write command.

Read command: 0xFF,0x56,0xAE,0x35,0xA9,0x55,0xF0

Response: 0x24, 0x24, 0x24+Freq+DRFSK+POUT+DRIN+Parity+TW

Write command:

0xFF,0x56,0xAE,0x35,0xA9,0x55,0x90+Freq+DRIN+POUT+DR FSK+ Parity+TW

Response: 0x24, 0x24, 0x24+Freq+DRFSK +POUT+ DRIN+Parity+TW

Parameter	Unit	Length(Byte)	Decription
Freq.	KHz	3	433.92MHz = 0x06, 0x9F, 0x00
DR_{FSK}	K bps	1	1, 2, 5,10, 20, 40 equals to 0x00,0x01,0x02,0x03,0x04,0x05
Pout	dB	1	From 0 to 7 represents 0x00 to 0x07. One increment increases 3dBm. “0x07” equals to the Max. output power (10dBm).
DR_{IN}	Kbps	1	1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 57.6 equals to 0x00,0x01,0x02,0x03,0x04,0x05,0x06
Parity		1	x00: No parity; 0x01: Even parity; 0x02: Odd parity
Tw	S	1	0.05, 0.1, 0.2, 0.4, 0.6, 1, 1.5, 2, 2.5, 3, 4, 5 corresponding to 0x00~0x0b

Table 6 RF1212 Parameter Coding

E.g. If the user wants to set the module work at Freq (433.92MHz), DRFSK (10K bps), POUT (10dBm), DRIN (9.6k bps), Parity (no parity), TW (1second), the command could be written as follows:

Write Command: 0xFF,0x56,0xAE,0x35,0xA9,0x55,0x90, 0x06,0x9F,0x00, 0x03, 0x07, 0x03, 0x00,0x05

Response: 0x24,0x24,0x24, 0x06,0x9F,0x00, 0x03,0x07,0x03,0x00,0x05

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