REXENSE 瑞贏

Sub 1GHz Module Datasheet

REX2SP63

| Copyright Information

| Version History

V1.0.0	2014/02/08	Preliminary
V1.0.1	2015/03/19	Preliminary

Content

1. Introduction

1.1. Introduction

REX2SP63 modules are designed for wireless communication for ISM119-1050MHz applications. Itenables users to implement wireless solution which satisfies the needs of low-cost, low-power wireless sensor networks. The easy-to-useREX2 modules saveboard space and offer reliable delivery of data between devices

1.2. Applications

RexBee module is compatible with robust IEEE 802.15.4/ZigBee stack that supports a self-healing, self-organizing mesh network, while optimizing network traffic and minimizing power consumption. Rexense offers two stack configurations: Custom and Transparent (currently supports STM32W RexBee module only). Custom software supports reliable, scalable, and secure wireless applications running on RexBee modules. Transparent software allows programming of the module via serial AT-command interface.

The applications include, but are not limited to:

- Building automation & monitoring
  - Wireless smoke and CO detectors
  - Structural integrity monitoring
- HVAC monitoring & control
- Inventory management
- Environmental monitoring
- Security
- Water metering
- Industrial monitoring
  - Machinery condition and performance monitoring
  - Monitoring of plant system parameters such as temperature, pressure, flow, tank level, humidity, vibration, etc.
- Automated meter reading (AMR)

1.3. Key Features

- Advanced RF chip SI4463
- Easy-application
- Support automatic big mesh network
- Good RF performance
- Size：31.6*20.7*3.9mm
- High RX sensitivity：-110dBm@9600 bps
- Communication distance：1000m（visual distance）
- Output power 20dBm
- Low consumption
  - Sleep mode：9μA
  - RX mode：26mA
  - TX mode：127mA@20dBm;
- Storage
  - STM32F：64K bit Flash；8K bit RAM
- Interface：both analog and digital
  - 14xGPIO, 1xUSART With hardware flow control
  - 1xI^2C
  - Capability to write own MAC address into the Flash
  - Optional antenna reference designs
  - IEEE 802.15.4 compliant transceiver
  - Custom embedded software, including serial bootloader and AT command set

1.4. Advantage

- Small physical footprint and low profile for optimum fit in even the smallest of devices.
- Best-in-class RF link range
- 4 PCB board
- Ample memory for user software application
- Mesh networking capability
- Easy-to-use low cost Evaluation Kit

1.5. Abbreviations and Acronyms

ADC	Analog-to-Digital Converter
API	Application Programming Interface
DC	Direct Current
DTR	Data Terminal Ready
DIP	Dual In-line package
EEPROM	Electrically Erasable Programmable Read-Only Memory
ESD	Electrostatic Discharge
GPIO	General Purpose Input/Output
HAL	Hardware Abstraction Layer
HVAC	Heating, Ventilating and Air Conditioning
HW	Hardware
TWI	Inter-Integrated Circuit
IEEE	Institute of Electrical and Electronics Engineers
IRQ	Interrupt Request
ISM	Industrial, Scientific and Medical radio band
JTAG	Digital interface for debugging of embedded device, also known as IEEE 1149.1 standard interface
MAC	Medium Access Control layer
MCU	Microcontroller Unit. In this document it also means the processor, which is the core of RF module
NWK	Network layer
OEM	Original Equipment Manufacturer
OTA	Over-The-Air upgrade
PCB	Printed Circuit Board
PER	Package Error Ratio
PHY	Physical layer
RAM	Random Access Memory
RF	Radio Frequency
RTS/CTS	Request to Send/ Clear to Send
RX	Receiver
SMA	Surface Mount Assembly

SPI	Serial Peripheral Interface
SW	Software
TX	Transmitter
UART	Universal Asynchronous Receiver/Transmitter
USART	Universal Synchronous/Asynchronous Receiver/Transmitter
USB	Universal Serial Bus
802.15.4	The IEEE 802.15.4-2003 standard applicable to low-rate wireless PAN

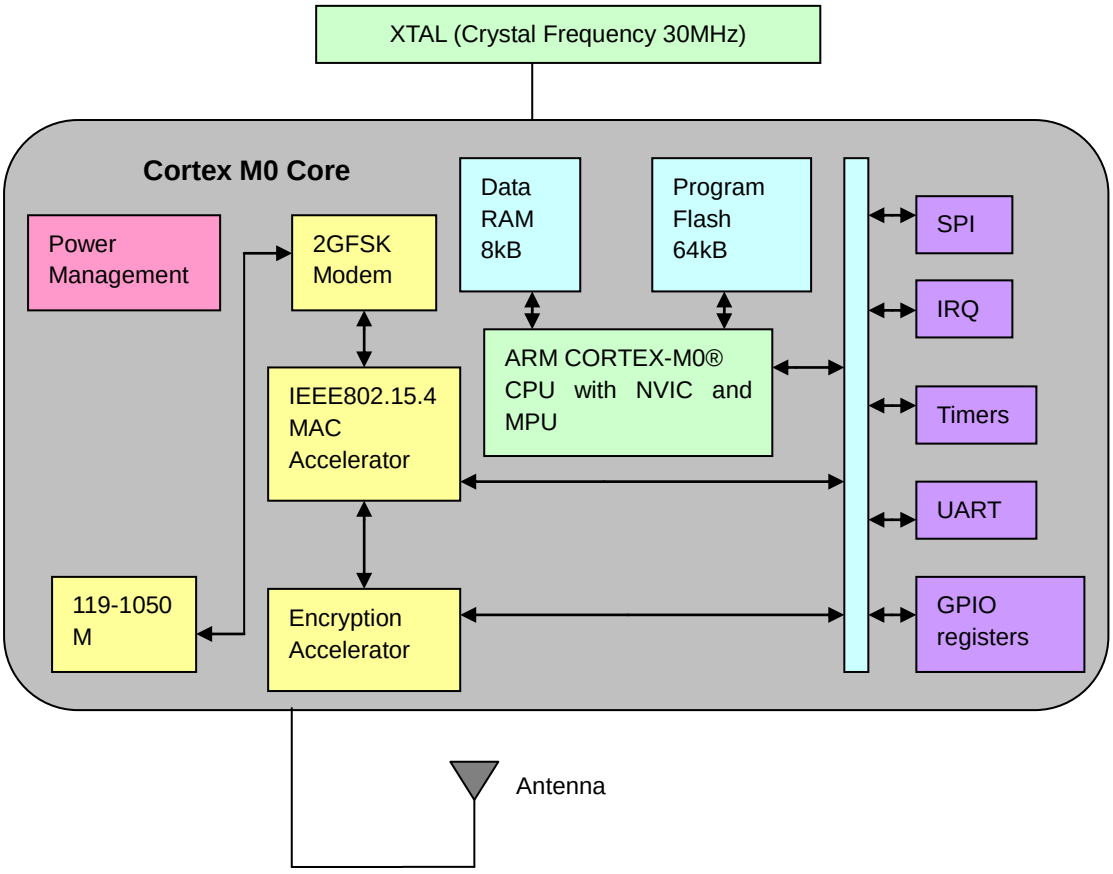
1.6. Related Documents

[1] IEEE Std 802.15.4-2003 IEEE Standard for Information technology - Part 15.4 Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low-Rate Wireless Personal Area Networks (LR-WPANs)

2. Product Overview

REX2SP63 is a low-power, high-sensitivity IEEE 802.15.4/ ZigBee-compliant module. This multi-functional state-of-art module occupies ultra-small space, which is comparable to a typical size of a single chip. Based on a solid combination of Rexense's latest MCU Wireless hardware platform, the RexBee module offers superior radio performance, ultra-low power consumption, and exceptional ease of integration.

Figure 2-1. Diagram



REX2SP63 according with FCC, IC, CE, can be used in many devices.

To jumpstart evaluation and development, Rexense also offers a complete set of evaluation and development tools. The ZigBee Development Kit comes with

everything you need to develop and test your own applications.

3. Specifications

Item No.	**REX2SP3263**
Type	**Enhanced**
package	SMD
Internal PA	Yes
MCU	STM32F051 (Cortex-M0)
Storage	64K Flash，8K SRAM
size（L×W×H）	31.6×20.7×3.9mm
Transmitting distance（visual distance）	About 1000m (external antenna)
Max output power	20dBm
RF data transmitting speed	Max 500kbps （adjustable）
Serial baud rate (adjustable)	1200-230400 bps
RX sensitivity (1% Packct Loss)	-110dBm@9600 bps
Supply voltage	3.3V±0.3V
Working current (TX)	127mA@20.0dBm
Working current (RX)	26mA
Sleeping current	9uA
Working temp.	ISM 119-1050MHz
Antenna interface	-40 to 85℃
interface	U.FL；SMA；spring
package	14xGPIO； 1xUART； 1xI^2C

3.1. Electrical characteristics

3.1.1. Electrical characteristics

table 3-1. Absolute Maximum Ratings

Parameter	min	max
Pin working voltage range （except “Reset”）	-0.3V	3.6V
Max driver current of all I/O		40 mA
Max RX signal strength		+10 dBm

Note:

Absolute Maximum Ratings are the values beyond which damage to the module may occur. Under no circumstances must the absolute maximum ratings given in this table be violated. Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the module.

3.1.2. Test Conditions

table 3-2. Test Conditions (unless otherwise stated), VCC = 3.3V, Temp = 25°C

Parameter	Range	Unit
Supply Voltage, VCC	3.0 to 3.6	V
RX current	26	mA
TX current	127@20dBm	mA
Sleeping current	9	μA

3.1.3. RF Characteristics

table 3-3. RF Characteristics

Parameter	Condition	Range	Unit
Frequency Band		119~1050	MHz
Numbers of Channels		16	
Channel Number		0B~1A	Hex
Channel Interval		1	MHz
Transmitter Output Power		-3 to +20	dBm
Receive Sensitivity	Packct Loss≤1%	-110@9600bps	dBm
Max data transmit speed		500	kbps
TX Output/ RX Input Nominal Impedance	For unbalanced output	50	Ω

3.1.4. Microcontroller Characteristics

table 3-4. Microcontroller Characteristics

Parameter	Condition	Range	Unit
On-chip Flash Memory size		64K	bytes
On-chip RAM size		8K	bytes
Operation Frequency		40	MHz

3.1.5. Module Interfaces characteristics

table 3-5. Module Interfaces characteristics

Parameter	Condition	Range	Unit
UART Maximum Baud Rate		230400	bps
GPIO Output Voltage (high)	-8/ 4 mA	2.8~3.6	V
GPIO Output Voltage (low)	-8/ 4 mA	0~0.9	V
Real Time Oscillator Frequency		4	MHz

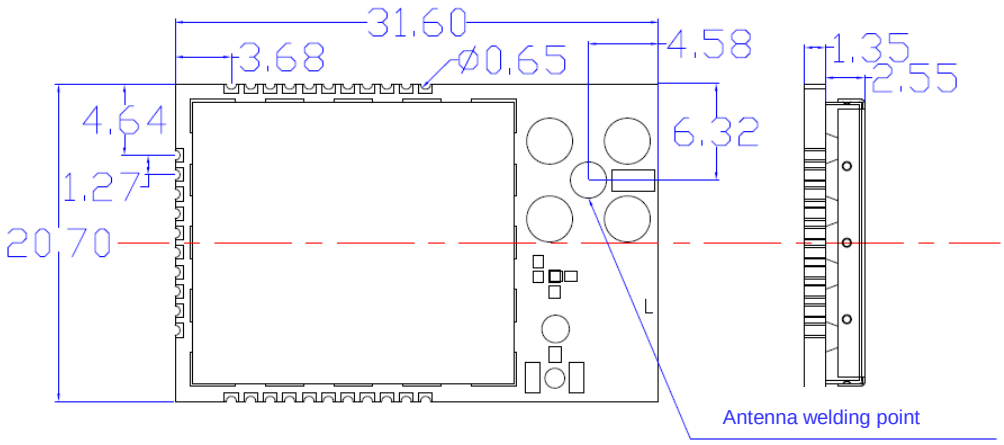
3.2. Physical/Environmental Characteristics

table 3-6. Physical/Environmental Characteristics

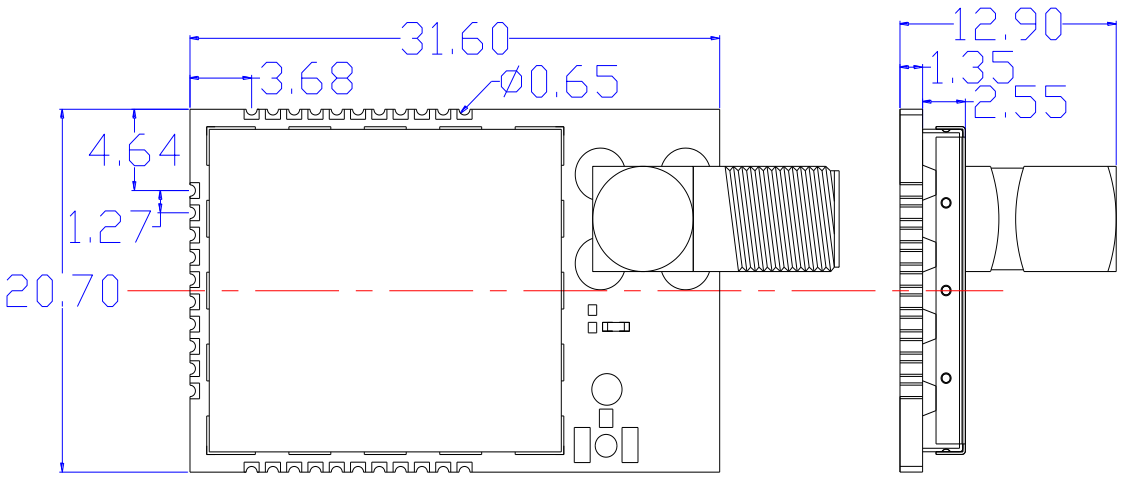
Parameter	Value	Remark
Size (L*W*H)	31.6*20.7*3.9mm	
Weight	3.0g	
Working temp.	-40°C to +85°C	
Operating Relative Humidity Range	< 95%	

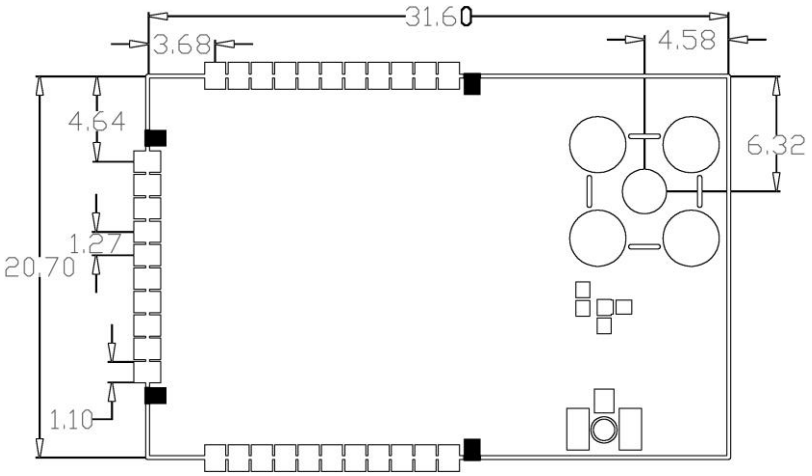
3.3. Pin Configuration

Picture 3-1. size



picture 3-1: size (mm)





picture 3-2. Pin Configuration

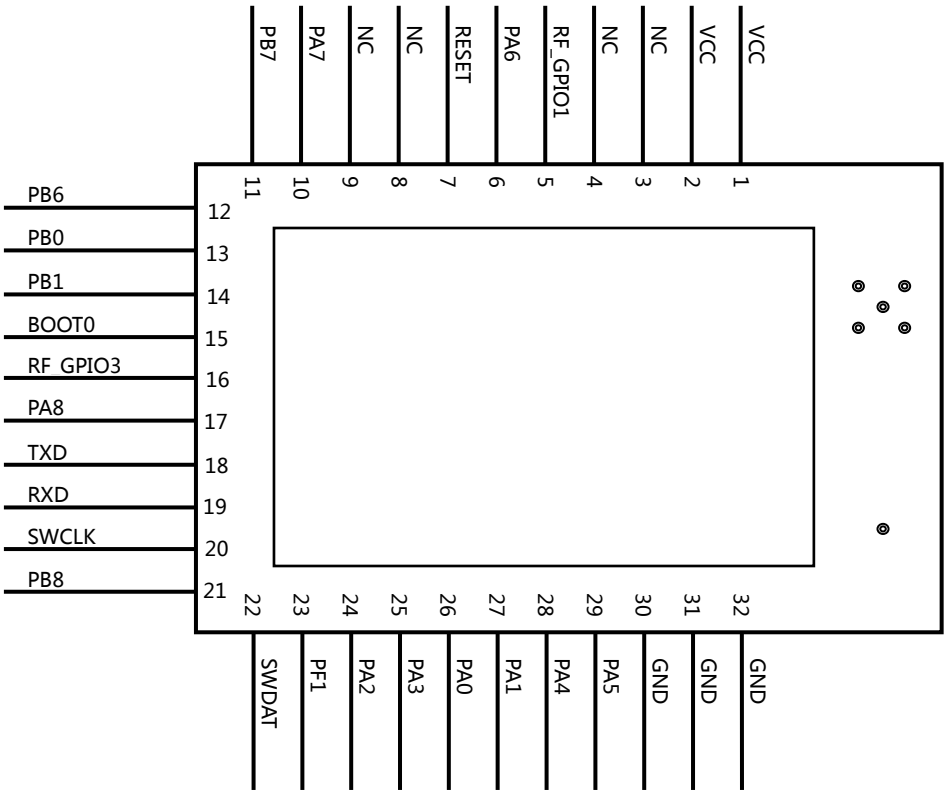
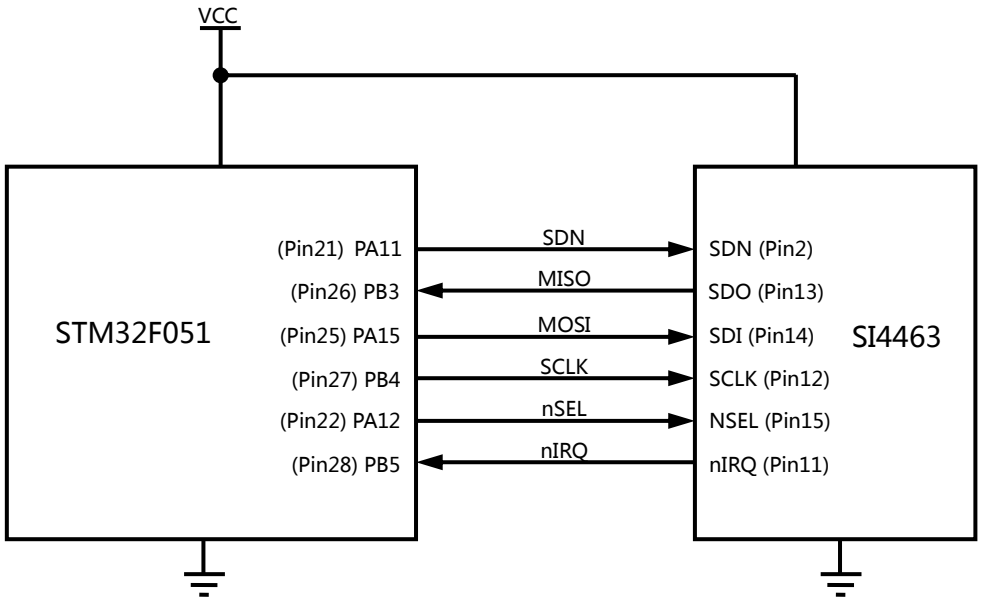


table 3-7. Pin Configuration

Module Pin No.	STM32F051 Pin No.	Signal	Direction	Description
1	5	VCC	-	Power supply
2	5	VCC	-	Power supply
3	-	NC	-	Not Connect
4	-	NC	-	Not Connect
5	16	RF_GPIO1	I	RF_CTS STATUS
6	12	PA6	I/O	SPI1_MISO/I2S1_MCK, TIM3_CH1, TIM1_BKIN, TIM16_CH1, COMP1_OUT, TSC_G2_IO3, EVENTOUT
7	4	RESET		Chip Reset
8	-	NC	-	Not Connect
9	-	NC	-	Not Connect
10	13	PA7	I/O	SPI1_MOSI/I2S1_SD, TIM3_CH2, TIM14_CH1, TIM1_CH1N, TIM17_CH1, COMP2_OUT, TSC_G2_IO4, EVENTOUT
11	30	PB7	I/O	II2C1_SDA, USART1_RX, TIM17_CH1N, TSC_G5_IO4
12	29	PB6	I/O	I2C1_SCL, USART1_TX, TIM16_CH1N, TSC_G5_IO3
13	14	PB0	I/O	TIM3_CH3, TIM1_CH2N, TSC_G3_IO2, EVENTOUT
14	15	PB1	I/O	TIM3_CH4, TIM14_CH1, TIM1_CH3N, TSC_G3_IO3
15	31	BOOT0	I	Boot memory selection
16	2	RF_GPIO3	I	RF STATUS
17	18	PA8	I/O	USART1_CK, TIM1_CH1, EVENTOUT, MCO
18	19	TXD / PA9	O	USART1_TXD, TIM1_CH2, TIM15_BKIN, TSC_G4_IO1
19	20	RXD / PA10	I	USART1_RXD, TIM1_CH3, TIM17_BKIN, TSC_G4_IO2

20	24	SWCLK / PA14	O	USART2_TX, SWCLK
21	32	PB8	I/O	I2C1_SCL, CEC, TIM16_CH1, TSC_SYNC
22	23	SWDAT	-	IR_OUT, SWDAT
23	3	PF1	-	OSC_OUT
24	8	PA2	I/O	USART2_TX, TIM2_CH3,
25	9	PA3	I/O	USART2_RX, TIM2_CH4, TIM15_CH2, TSC_G1_IO4
26	6	PA0	I/O	USART2_CTS, TIM2_CH1_ETR, COMP1_OUT, TSC_G1_IO1
27	7	PA1	I/O	USART2_RTS, TIM2_CH2, TSC_G1_IO2, EVENTOUT
28	10	PA4	I/O	SPI1_NSS/I2S1_WS, USART2_CK, TIM14_CH1, TSC_G2_IO1
29	11	PA5	I/O	SPI1_SCK/I2S1_CK, CEC, TIM2_CH_ETR, TSC_G2_IO2
30	4	GND		Ground
31	4	GND		Ground
32	4	GND		Ground

picture 3-3．Interior controlling



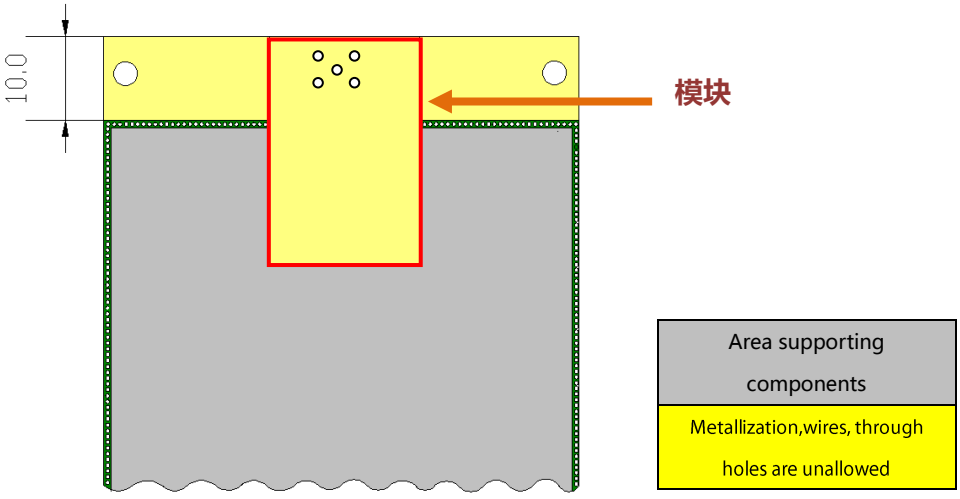
3.4 Antenna Specifications

Three antennas can be optional：

3.4.1. Spring antenna

picture 3-4 . Spring antenna

picture 3-5. PCB Layout of the Proposed Antenna Selection



Attention when using PCB antenna：

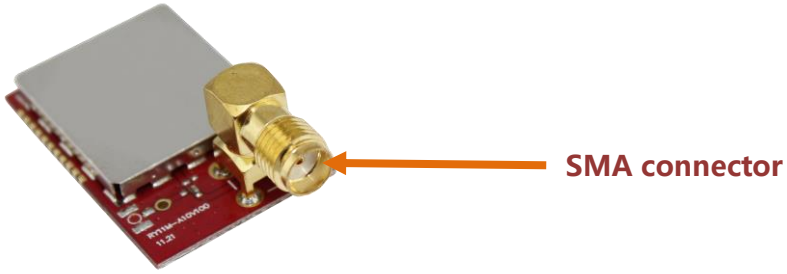
1. Please avoid installing the module in a complete metal enclosure.
2. Please avoid placing high profile components next to antenna （1 cm at least, suggest more than 2.7 cm）
3. ZigBee module should not be placed next to consumer electronics which might interfere with ZigBee's RF frequency band.

User should try to avoid other components or line interfere PCB antenna when designing board：

- Wires or other components avoid surrounding PCB antenna
- PCB antenna should be extended to the board
- Don’ t use metal shell to cover the PCB antenna

3.4.2. SMA antenna

picture 3-7 . SMA antenna



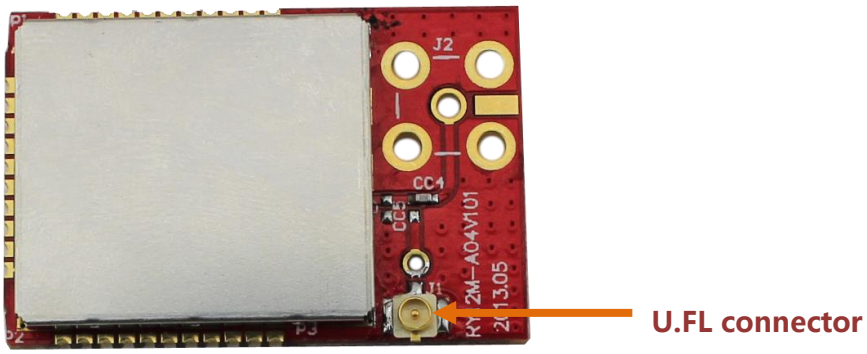
picture 3-8 SMA antenna

SMA antenna (AN2400): benefit(2dBi)

picture 3-9. complete picture

3.4.3. U.FL external SMA antenna

picture 3-10 . U.FL connector



Remark：Note: when the U.FL (IPEX) connector is used, it's necessary to use the antenna cable and the SMA antenna at the same time. Please see the pictures below.

picture 3-11. antenna cable

Antenna cable (AN11): length(11cm)，insertion loss (1dBi)

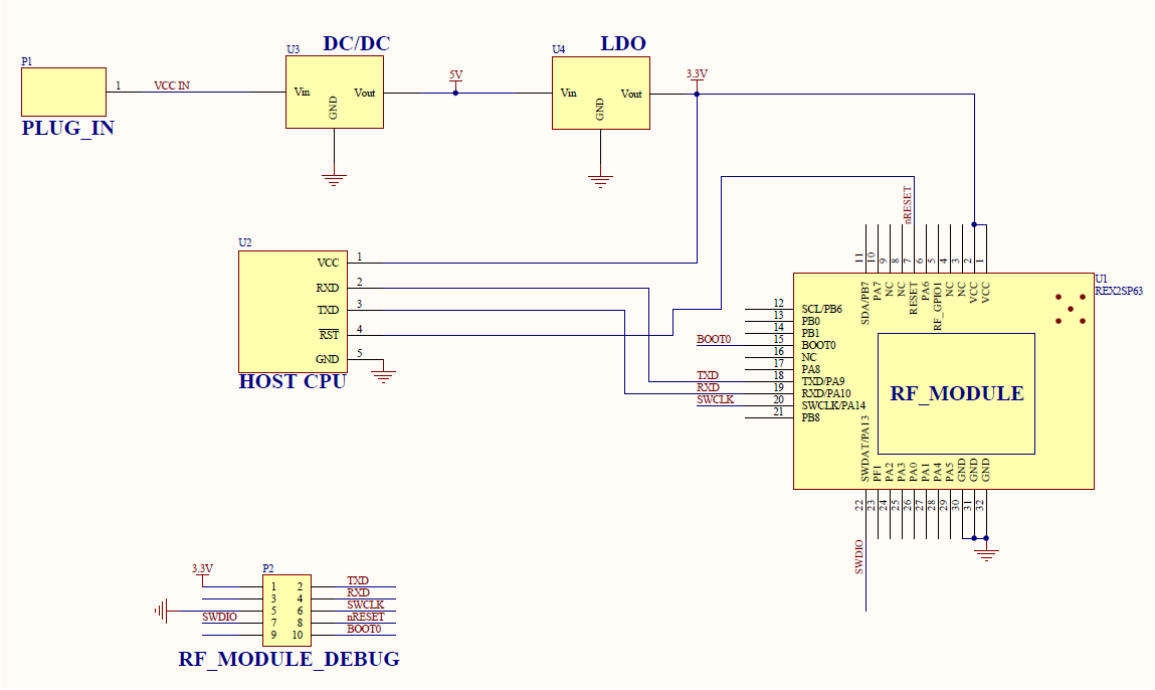
picture 3-12. SMA antenna

SMA antenna (AN2400): benefit (2dBi)

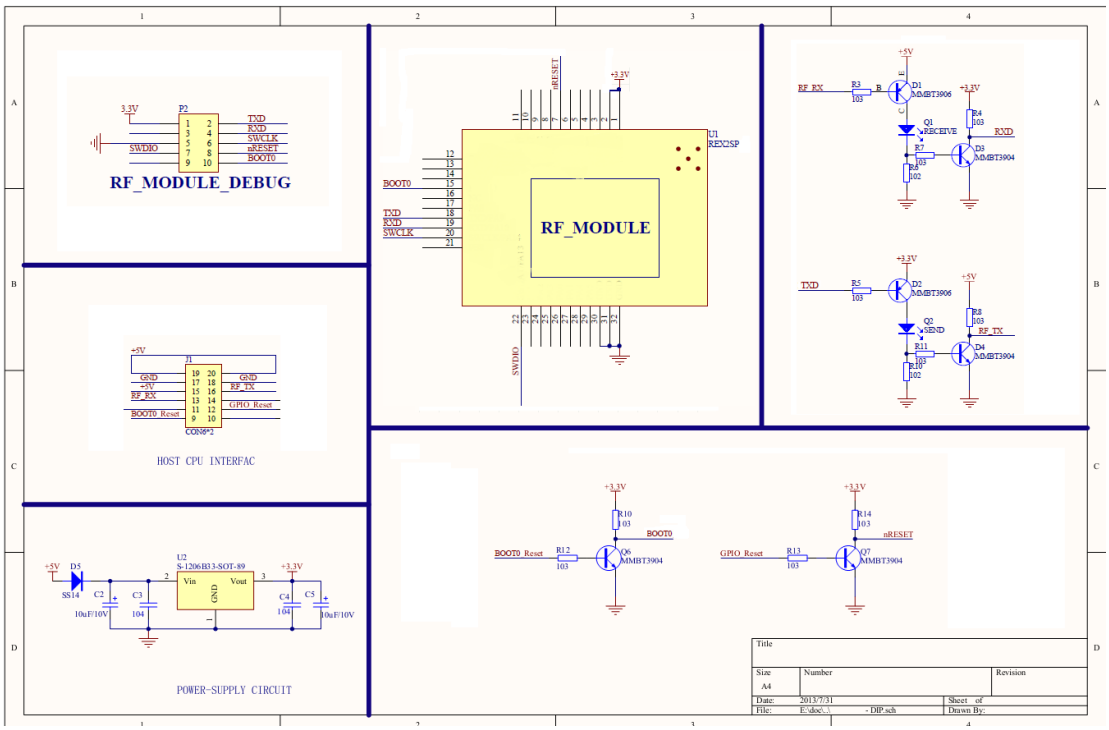
Picture 3-13. Complete picture

3.5 Module Circuit Reference Design (external MCU)

3.5.1. When system voltage is 3.3V

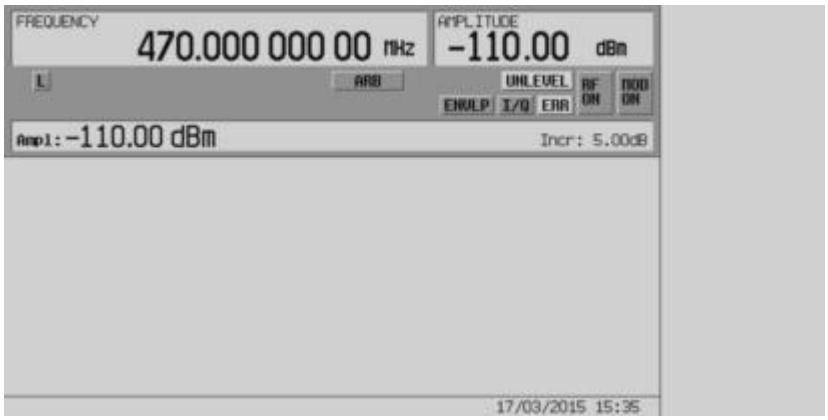


3.5.2 When system voltage is 5.0V

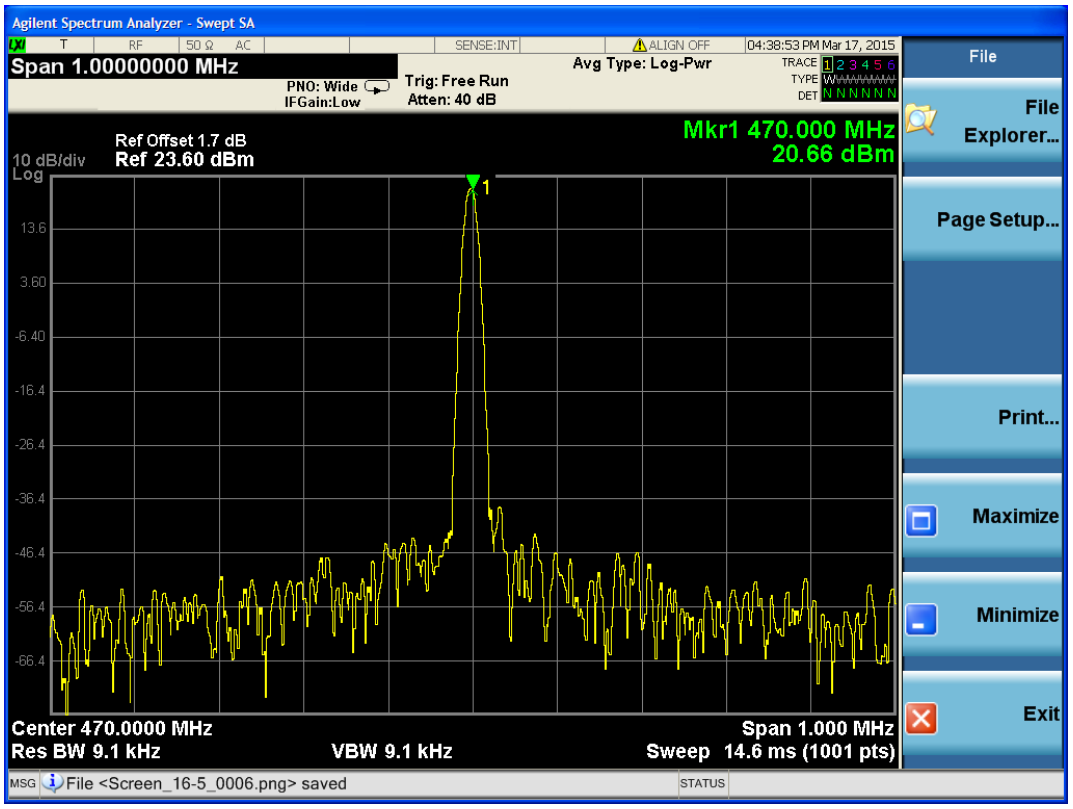


3.6 Test Result of RF Performance

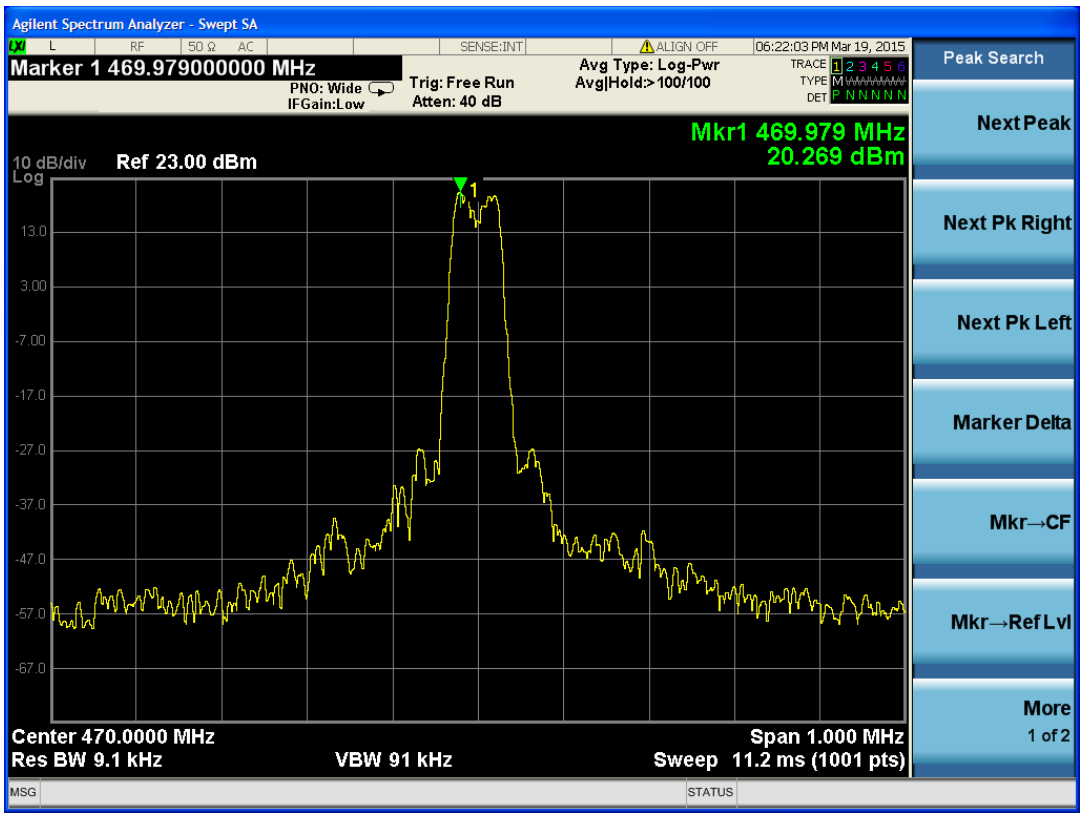
picture 3-14. RX sensitivity



picture 3-15. Carrier Signal Testing



picture 3-16. Modulating Signal Testing



4. Ordering Information

REX 2 S P 63 1 U

Manufacturer

REX=REXENSE

serial

2=sub-GHz network

Package

D=DIP
S=SMD
U=Ultra-compact
UG= Ultra-compact GPS

output power

N/A=no PA (standard)
P=with PA (enhanced)

RF Chip

32=Si4432
63=Si4463

shielding cover

1=no cover
2= integral cover
3=segregate cover

antenna interface

B=PCB
U=U.FL connector
L=steel antenna
P= Half the output
S=SMA antenna

6. Contact Us

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