



Rexense Sub 1GHz Module

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**REXENSE** 瑞瀛

Sub 1GHz Module Datasheet

REX1SP63

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# 1. Introduction

## 1.1. Introduction

REX1SP32 modules are designed for wireless communication for ISM 119-1050MHz applications. It enables users to implement wireless solution for low-cost, low-power wireless sensor networks. The microcontroller is STM8L from ST company.

## 1.2. Applications

The application of module including but not limited to following :

- HVAC monitoring & control
- Storage management
- Environmental monitoring
- Security
- Water metering
- Industrial monitoring
- Automated meter reading (AMR)

## 1.3. Key Features

- Advanced RF chip SI4432
- Simple development and easy for application
- Support "point to point" , "point to multi-point" communication
- Outstanding RF performance
- Size : 31.6\*20.7\*3.9mm
- High RX sensitivity : -110dBm@9600bps
- Communication distance : 1000m ( view of sight )
- Output power 20dBm
- Low power consumption
  - Sleep mode : 5 $\mu$ A
  - RX mode : 17mA
  - TX mode : 120mA@20dBm
- Storage:

- 8K byte Flash ; 1.5K byte RAM
- Interface : both analog and digital
- 6 个 GPIO
- 1 个 USART With hardware flow control
- 1 个 I<sup>2</sup>C interface
- multiple choice of antenna

## 1.4. Advantage

- Small physical footprint and low profile for optimum fit in even the smallest of devices.
- 4 PCB board
- Ample memory for user software application
- Easy-to-use low cost Evaluation Kit available

## 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

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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

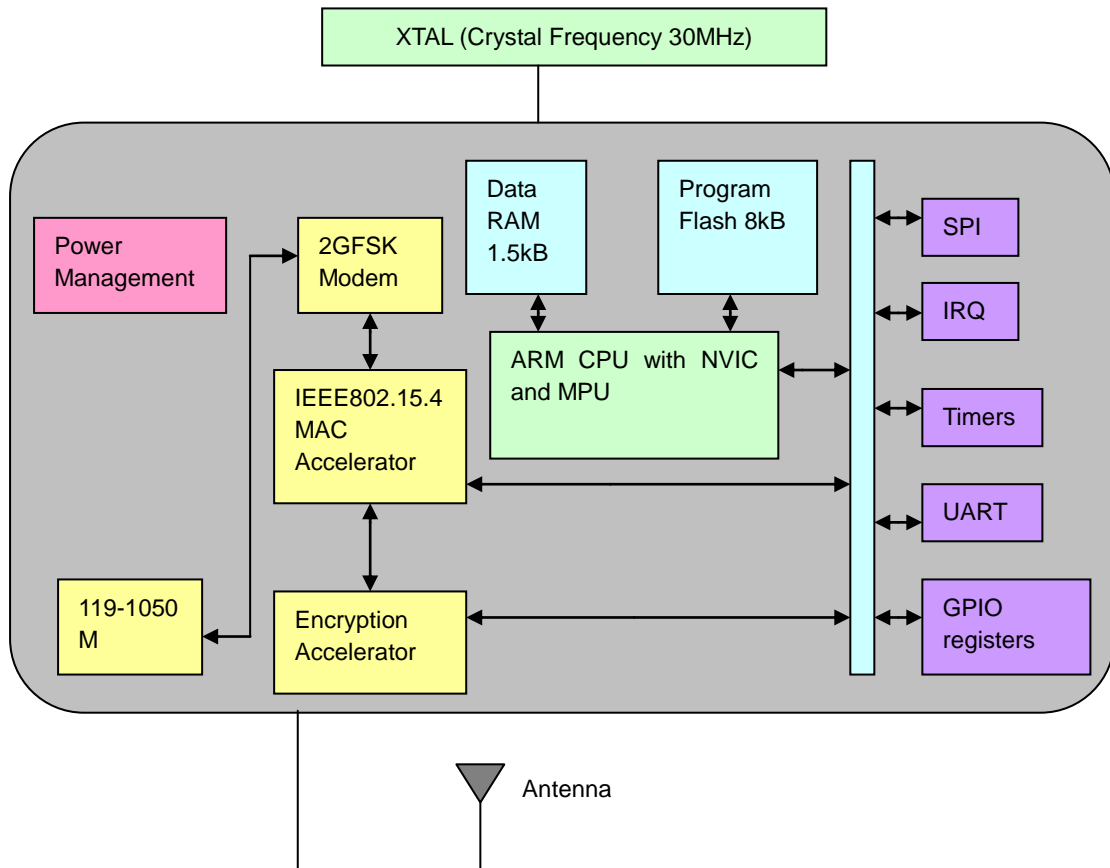
## **1.6. Related Documents**

[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

REX1SP32 is a low-power, high RF performance wireless module. This delicately designed module has ultra-small footprint, which fit wide application requirements.

**Figure 2-1.** Diagram



REX1SP32 compatible with FCC, IC, CE, can be used in many devices.

## 3. Specifications

Item No.	REX1SP32
Type	Enhanced
package	SMD
Internal PA	Yes
MCU	STM8L101 ( 8 bit )
Storage	8K Flash , 1.5K SRAM
size ( L×W×H )	31.6×20.7×3.9mm

Max transmitting distance ( view of sight )	About 1000m ( with external antenna)
Max output power	20.0dBm
RF data rate	Max 500kbps ( adjustable )
Serial baud rate (adjustable)	1200-115200 bps
RX sensitivity (1% SER)	-110dBm@9600 bps
Supply voltage	3.3V±0.3V
Working current (TX)	120mA@20.0dBm
Working current (RX)	17mA
Sleeping current	4uA
Operation Frequency	ISM 119-1050MHz
Working temp	-40 to 85°C
Antenna interface	U.FL ; SMA ; Spring
interface	6 x GPIO ; 1 x UART ; 1 x I <sup>2</sup> C

## 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	17	mA
TX current	120@20dBm	mA
Sleeping current	5	μA

### 3.1.3. RF Characteristics

**table 3-3.** RF Characteristics

Parameter	Condition	Range	Unit
Frequency Band		119~1050	MHz
Numbers of Channels		16	
Transmitter Output Power		-3 to +20	dBm
Receive Sensitivity	SER≤1%	-110@9600bps	dBm
Max data rate		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		8K	bytes
On-chip RAM size		1.5K	bytes
Operation Frequency		16	MHz

### 3.1.5. Module Interfaces characteristics

**table 3-5.** Module Interfaces characteristics

Parameter	Condition	Range	Unit
UART Maximum Baud Rate		115200	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		16	MHz

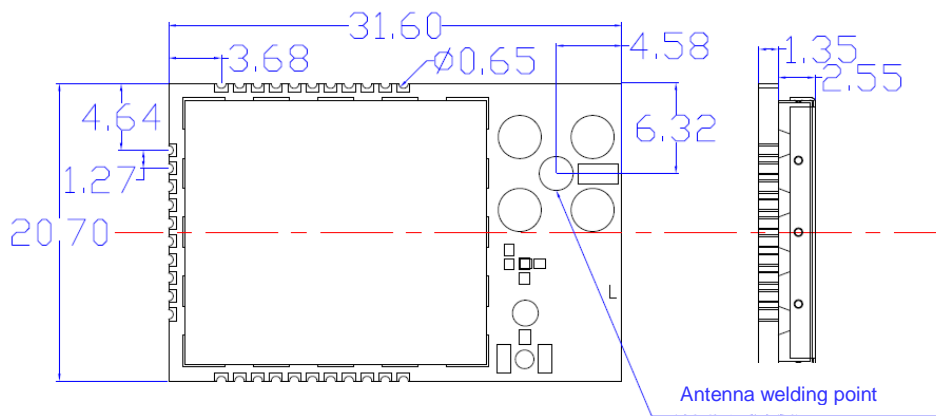
### 3.2. Physical/Environmental Characteristics

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%	

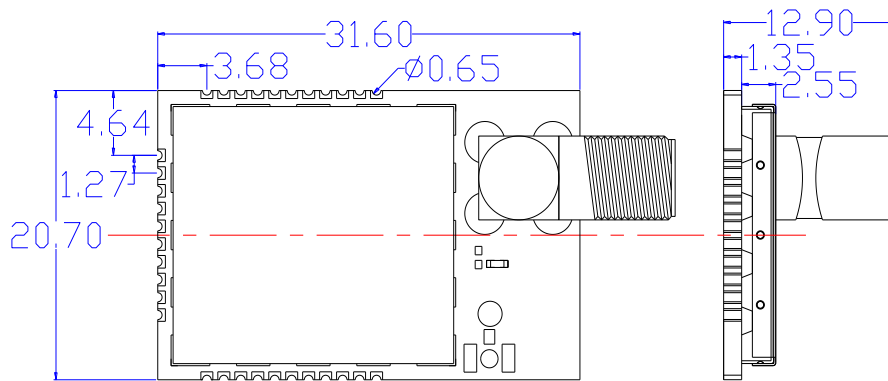
### 3.3. Pin Configuration

Picture 3-1. size ( with cover ) unit : mm



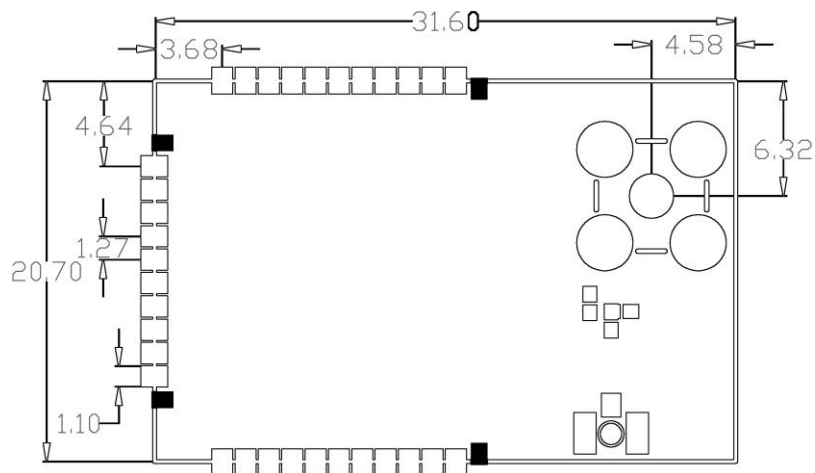
Picture 3-2. size ( with cover, SMA connector )

unit : mm

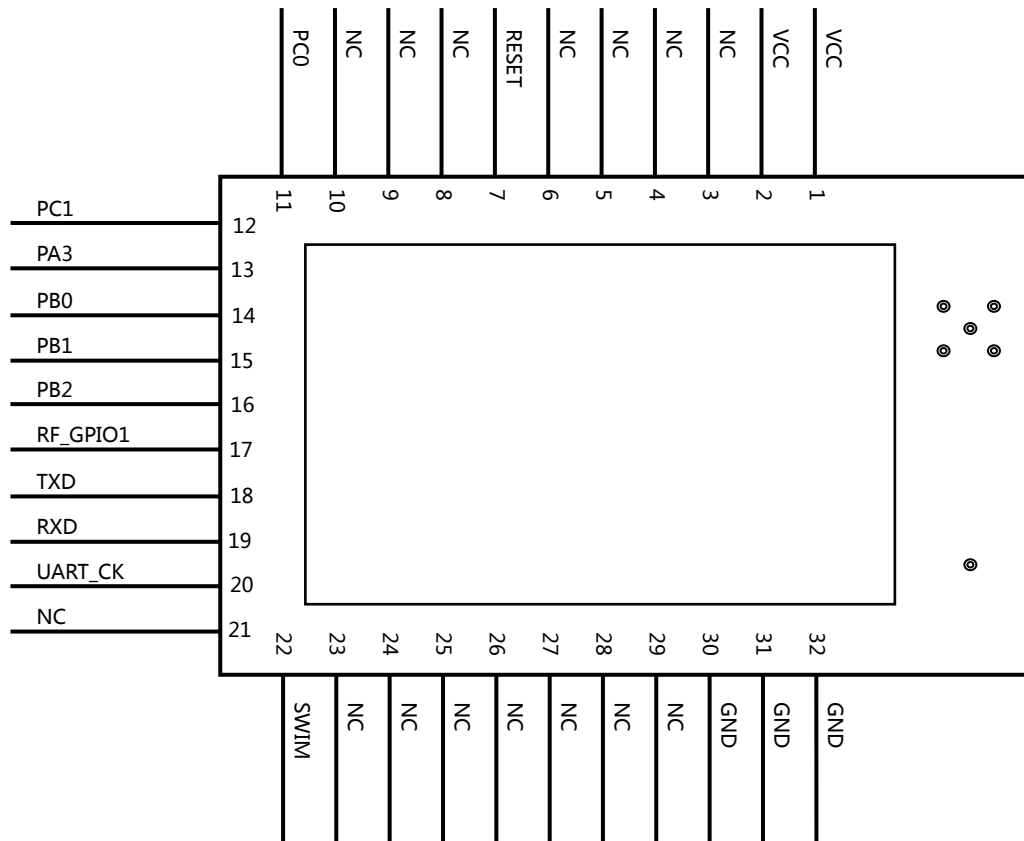


Picture 3-3. size ( without cover and SMA connector )

unit : mm



**Picture 3-4.** Pin Configuration



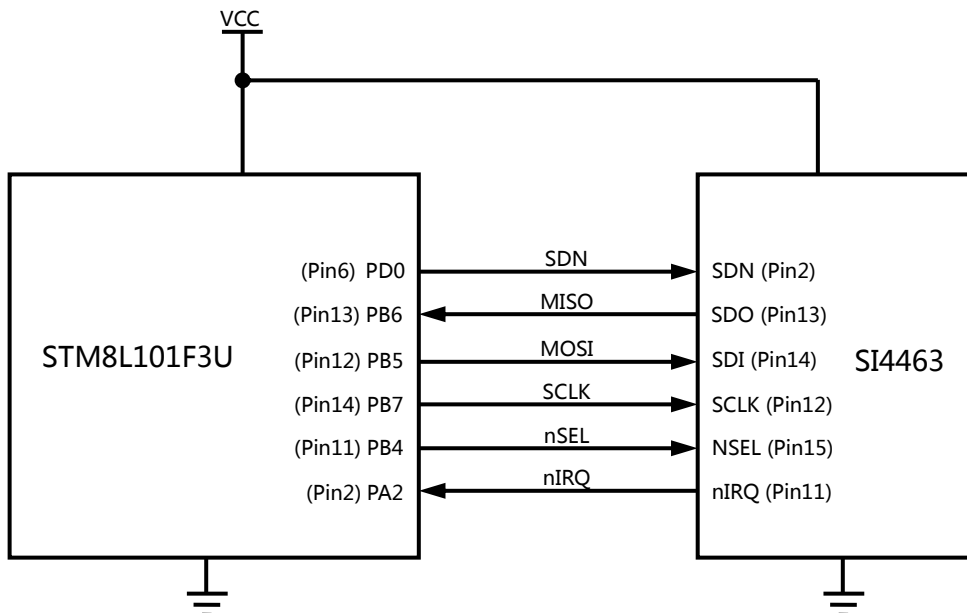
**table 3-7.** Pin Configuration

Module Pin No.	STM8L101 Pin No.	Signal	Direction	Description
1	5	VCC	-	Power supply
2	5	VCC	-	Power supply
3	-	NC	-	Not Connect
4	-	NC	-	Not Connect
5	-	NC	-	Not Connect
6	-	NC	-	Not Connect
7	1	RESET		Chip Reset

Module Pin No.	STM8L101 Pin No.	Signal	Direction	Description
8	-	NC		Not Connect
9	-	NC		Not Connect
10	-	NC		Not Connect
11	15	PC0	I/O	I2C data
12	16	PC1	I/O	I2C clock
13	3	PA3	I/O	PA3
14	7	PB0	I/O	Timer 2 - channel 1
15	8	PB1	I/O	Timer 3 - channel 1
16	9	PB2	I/O	Timer 2 - channel 2
17	10	RF_GPIO1	I	RF_CTS STATUS
18	18	TXD	O	UART RXD
19	17	RXD	I	UART RXD
20	19	UART_CK	O	USART synchronous clock / Configurable clock output
21	-	NC	-	Not Connect
22	20	SWIM	-	SWIM input and out-put /Beepout-put/Timer Infrared output
23	-	NC	-	Not Connect
24	-	NC	-	Not Connect

Module Pin No.	STM8L101 Pin No.	Signal	Direction	Description
25	-	NC	-	Not Connect
26	-	NC	-	Not Connect
27	-	NC	-	Not Connect
28	-	NC	-	Not Connect
29	-	NC	-	Not Connect
30	4	GND		Ground
31	4	GND		Ground
32	4	GND		Ground

picture 3-5 . Interior controlling

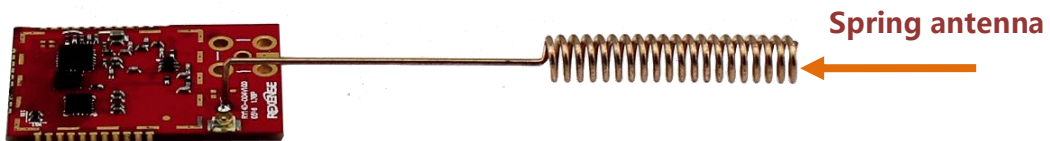


## 3.4 Antenna Specifications

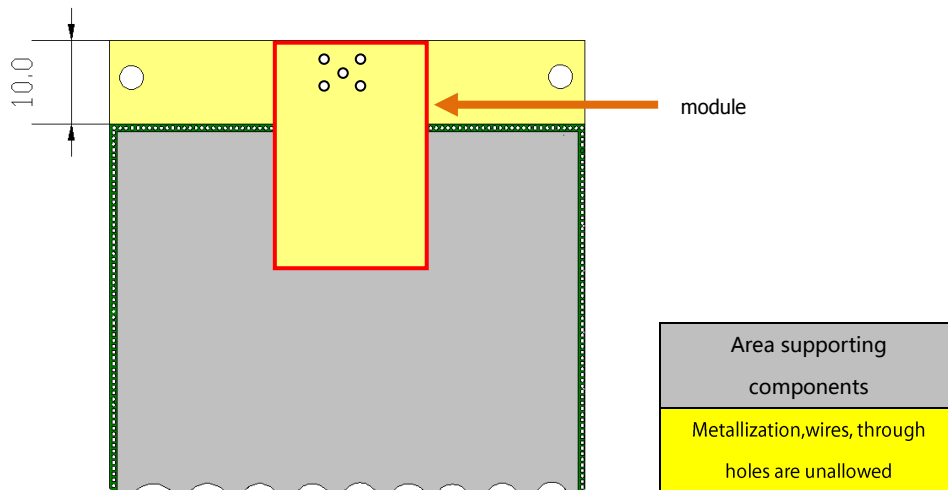
Three antenna options:

### 3.4.1. Spring antenna

picture 3-5 . Spring antenna



picture 3-7. PCB Layout of the Proposed Antenna Selection



Attention when designing with module :

1. Avoid installing the module in a complete metal enclosure.
2. Keep antenna have clear space ( place other components more than 10 cm away )
3. Module should not be placed next to any components that might interfere with module's RF frequency band.

### 3.4.2. antenna

picture 3-8 . SMA antenna



picture 3-9. SMA antenna



SMA antenna (AN2400): benefit (2dBi)

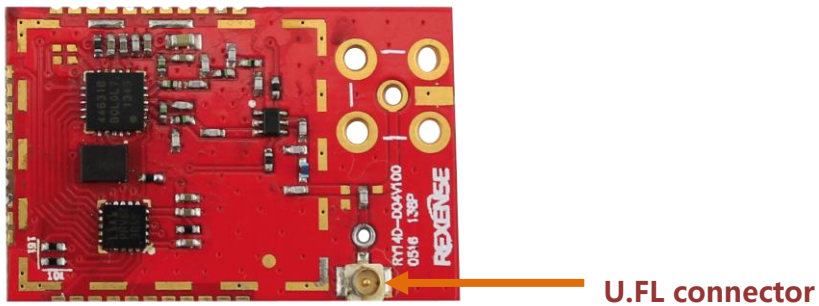
picture 3-10. Complete picture





### 3.4.3. U.FL external SMA antenna

picture 3-11 . U.FL connector



Remark: when choose U.FL connector, it must connect to a SMA antenna at the same time, as following picture:

Picture 3-12. antenna cable



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



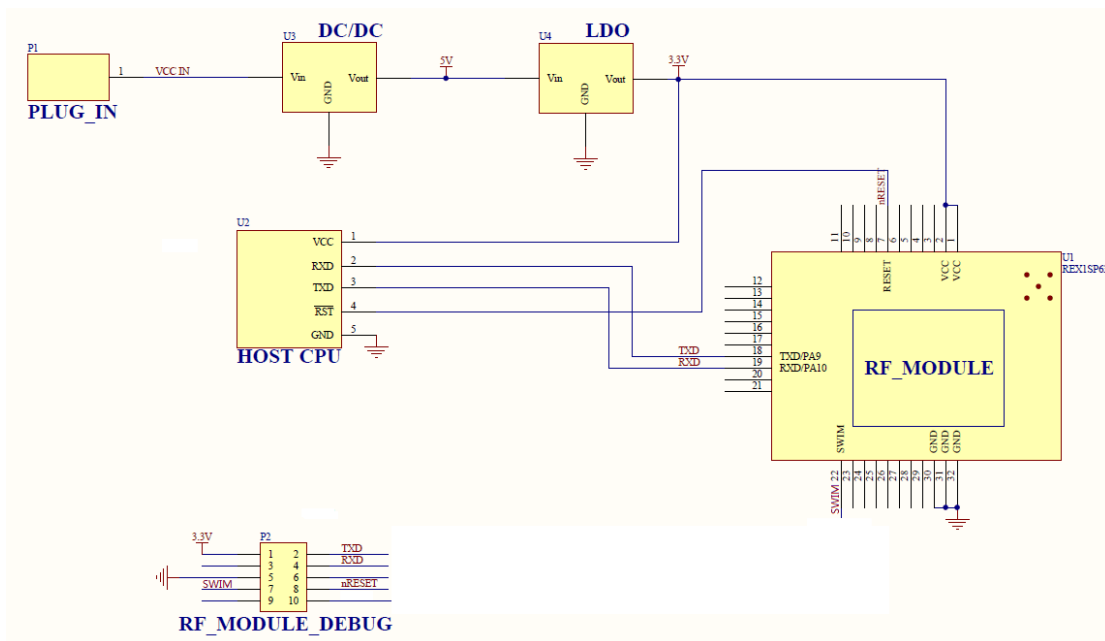
picture 3-13. SMA antenna

SMA antenna (AN2400): benefit (2dBi)

Picture 3-14. Complete picture

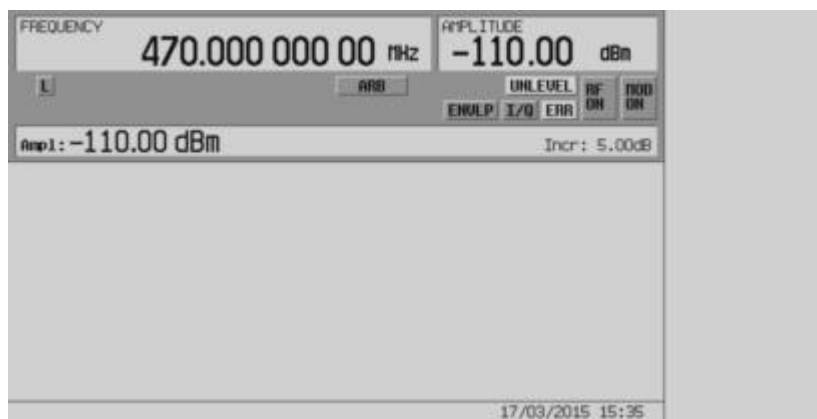


### 3.5 Module Circuit Reference Design ( with external MCU )

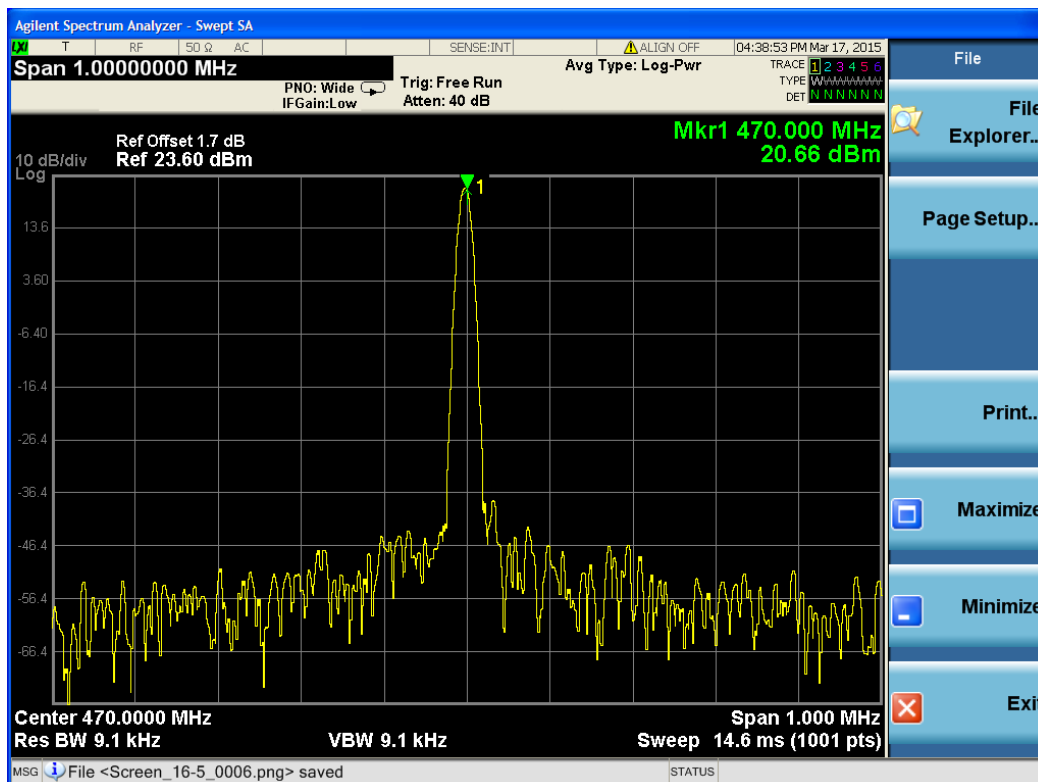


### 3.6 Test Result of RF Performance

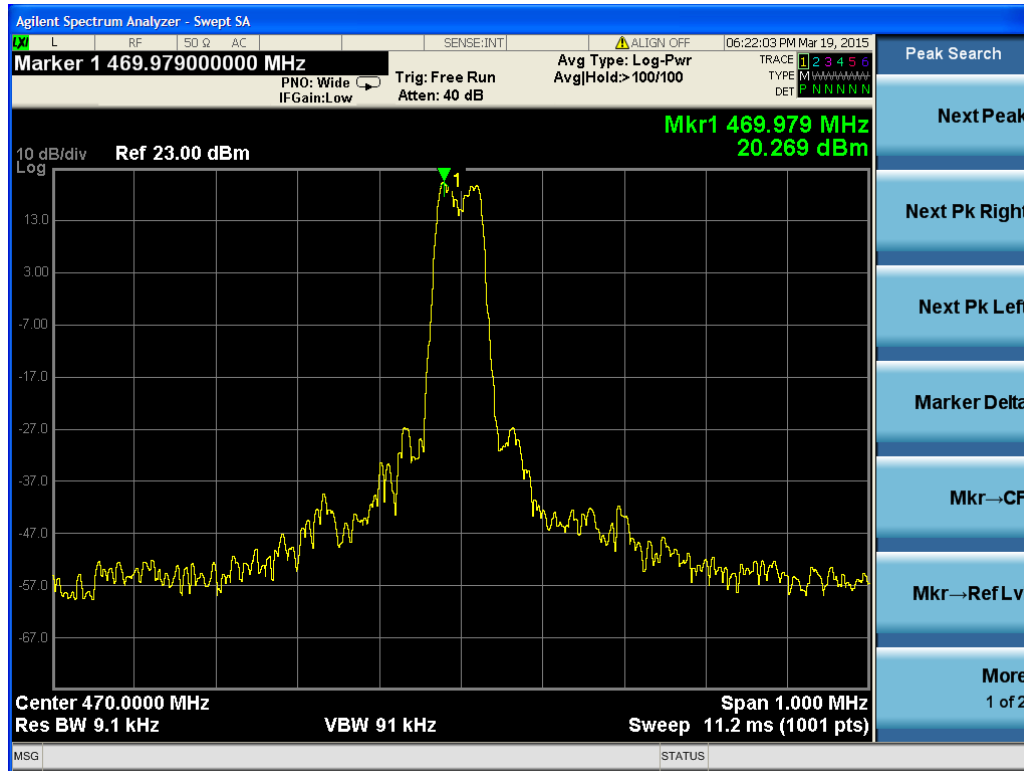
picture 3-15. RX sensitivity



picture 3-16. Carrier Signal Testing



picture 3-17. Modulating Signal Testing



## 4. Ordering Information

	REX	1	S	P	63	1	U
<b>Manufacturer</b>							
REX=REXENSE							
<b>serial</b>							
1=sub point to point							
<b>Package</b>							
D=DIP ( Dip )							
S=SMD ( sma )							
U=Ultra-compact							
UG= Ultra-compact GPS							
<b>output power</b>							
N/A=no PA ( standard )							
P=with PA ( enhanced )							
<b>RF chip</b>							
32=Si4432							
63=Si4463							

### **shielding cover**

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

### **antenna interface**

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B=PCB  
U=U.FL connect  
S=steel antenna  
P=half hole output  
S=SMA antenna

## **5. Contact Us**

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