

Zigbee Module Data Sheet

REX3P

V3.0.0



Copyright

The information contained in this document is the proprietary information of Zhejiang Rexense Technology Co., Ltd. (hereinafter referred to as Rexense or the company). All rights reserved. Without the written permission of the company, the content of the document shall not be disclosed to the company's employees, agents, partners or any unauthorized parties in any form without authorization, copying or dissemination of this document is prohibited. Our company shall reserve rights to the legal responsibility again any user's violation of copyright protection.

Document Change List

- V1.0.0 Initial version
- V3.0.0 2019/1/30 Hardware Version Added

Content

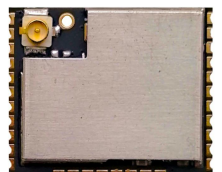
| | |
|---------------------------------|-----|
| 1. Production Introduction..... | 3 - |
| 1.1 Introduction..... | 3 - |
| 1.2 Application..... | 3 - |
| 1.3 Main Characteristics..... | 4 - |

| | |
|--|--------|
| 1.4 Product Advantage..... | - 4 - |
| 1.5 Abbreviations..... | - 5 - |
| 1.6 Related documents..... | - 6 - |
| 2. Product Overview..... | - 6 - |
| 2.1 Overview..... | - 6 - |
| 3. Technical Specification..... | - 7 - |
| 3.1. Electrical Specification..... | - 7 - |
| 3.2. Physical/Ambient Characteristics..... | - 9 - |
| 3.3. Pin Configuration..... | - 9 - |
| 3.4. Test Result of RF Performance..... | - 16 - |
| 3.5. Packing Layout Of Module..... | - 18 - |
| 4. Ordering Information..... | - 19 - |
| 5. Contact Us..... | - 19 - |

1. Production Introduction

1.1 Introduction

REX3P is a low-power ZigBee module with high sensitivity and compact in dimension. Based on Rexense innovative RexBee hardware platform, this module conforms to IEEE 802.15.4 specification



and ZigBee3.0 protocol standard. It has been widely used in fields of wireless sensing, control and data collection. The application of this module saves users much time and energy in the development.

1.2 Application

REX3B module conforms to IEEE 802.15.4 specification and ZigBee3.0, supports the mesh network which is self-healing and self-assembling, optimizes the network rate and power consumption. This module supports the setting and configuration as below:

- Standard ZigBee 3.0
- Transparent transmitting: users can develop according to our AT command
- Customization: we can provide customers with reliable and safe application software according to their specific application.

Application of module, included but not limited to:

- Smart home
 - Light control
 - Security system
 - Air quality monitoring
 - Smart lock
 - Motorized curtain
 - Air-conditioning, heating and ventilation
 - Scenario automation
- Building automation and monitoring
- HVAC monitoring and control
- Warehouse management
- Smart agriculture
- Industrial monitoring
- Smart transportation
- Wireless meter reading

1.3 Main Characteristics

- Dimension: 18*15*2.6mm
- Output power:

| | | |
|-------------------|-----|---------|
| EFR32MG1B132F256 | max | 16.5dBm |
| EFR32MG1B232F256 | max | 19.5dBm |
| EFR32MG13P632F512 | max | 10dBm |
| EFR32MG13P732F512 | max | 19dBm |

- Max receiving sensitivity: -101dBm
- Max link budget: 120dBm
- Reliable communication distance: 1000m (view distance)
- Extreme low power consumption
 - Sleep mode: <2.8μA
 - Receiving mode: 12mA
 - Transmitting mode: [127mA@19.5dBm](#)
- Big storage resource:
 - EFR32MG1B132F256 256K Flash; 32K RAM
 - EFR32MG1B232F256 256K Flash; 32K RAM
 - EFR32MG13P632F512GM 512K Flash; 64K RAM
 - EFR32MG13P732F512GM 512K Flash; 64K RAM
- 25 GPIOs can be configured for various functional interfaces according to application
 - GPIO
 - External interrupts
 - 12 bytes precision ADC sampling channel
 - USART UART hardware flow control
 - TWI interface
 - SPI/I²C interface
 - PWM output
 - hardware watchdog

1.4 Product Advantage

- Small package, suitable to small PCB
- Advanced link budget in the industry
- Outstanding battery life
- PCB design of 4-layers
- Rich storage resource, good for client software application
- Powerful mesh network forming ability
- 易 With development kit, easy to use and cost-effective
- ISM band license free

1.5 Abbreviation

| | |
|-----|-----------------------------------|
| 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 ZigBee 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 |
| ZDK | ZigBee Development Kit |
| ZigBeePRO | Wireless networking standards targeted at low-power applications |
| 802.15.4 | The IEEE 802.15.4-2003 standard applicable to low-rate wireless PAN |

1.6 Related documents

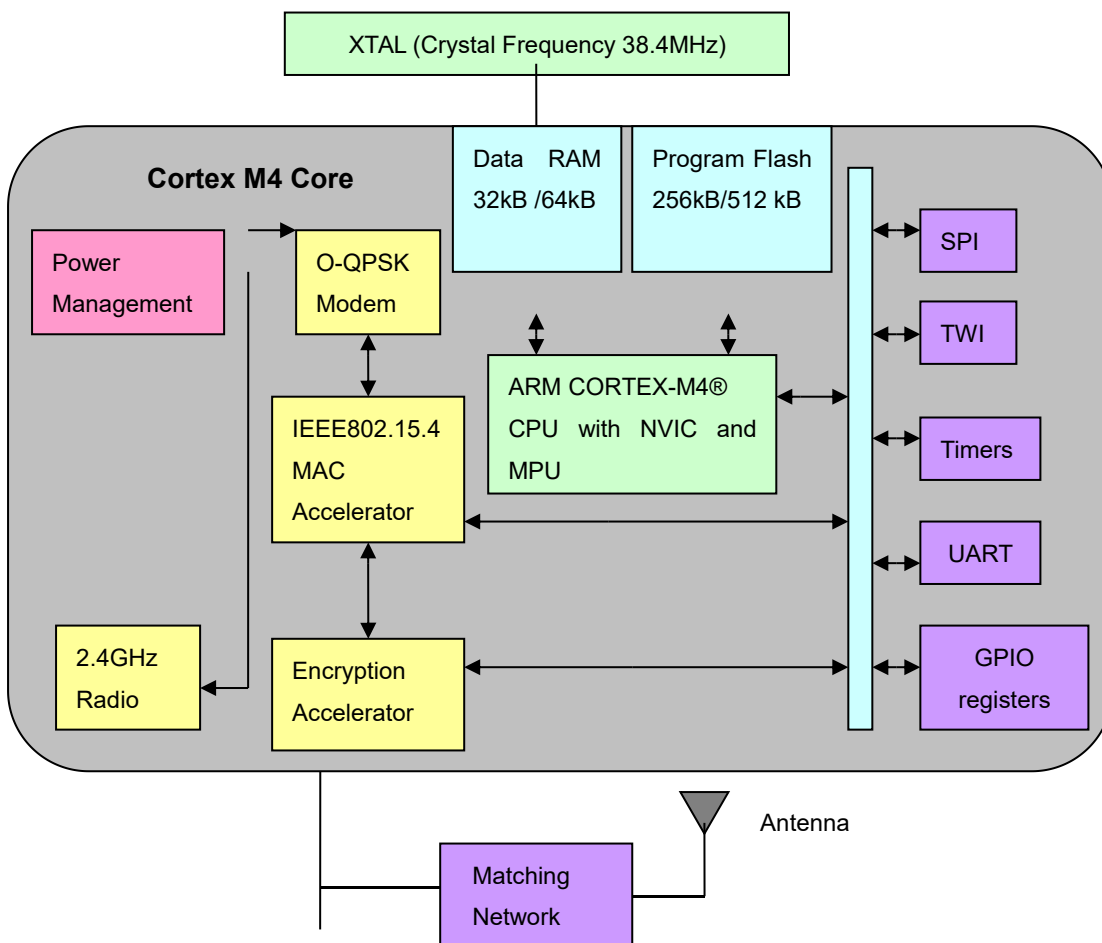
[1] ZigBee 3.0 – The Open, Global Standard for the Internet of Things December 2, 2014

2. Product Overview

2.1 Overview

REX3P is a ZigBee module of compact layout, higher sensitivity and lower power, and conforms to IEEE 802.15.4 and ZigBee 3.0 standard protocol. Based on Rexense’s innovative RexBee hardware platform, this module has outstanding RF characteristics, lower power consumption, powerful.

Table 2-1 Product diagram



REX3P module conforms to the FCC, IC, CE, and RoHS, which can be applied to various devices in

different environments.

At the same time, our company also provides a complete set of development and evaluation kits, users can choose kits of different versions for testing and development according to their requirements.

3. Technical Specification

3.1. Electrical Specification

3.1.1. Electrical Specification

Table 3-1. Absolute Maximum Ratings

| Parameter | Min | 最Max |
|--|-------|--------------|
| (VCC) Module input voltage (VCC) | 1.85V | 3.8V |
| Pin voltage (except ADC pin) | -0.3V | VDD_PADS+0.3 |
| ADC Pin voltage | -0.3V | 2.1V |
| Data of maximum drive current of all I/Os | | 50 mA |
| Maximum RF signal receiving density of chips | | +10 dBm |

Note: exceeding the absolute maximum ratings may damage module. In any case, the user shall not violate the absolute maximum ratings listed in the previous table. If there is a violation, it may cause irreparable damage to the module.

3.1.2. Test Conditions

Table 3-2. Test conditions(unless otherwise agreed), VCC = 3.3V, temperature = 25°C

| Parameter | Range | Unit |
|-------------------------------|-------------|------|
| Receiving current | 12 | mA |
| (@19dBm) Transmitting current | 127 | mA |
| Sleeping current | 2.8 | μA |
| Transmitting power | -9 to +19.5 | dBm |
| Receiving sensitivity | -101 | dBm |

3.1.3. RF Electrical Characteristics

Table 3-3. RF Electrical Characteristics

| Parameter | Test condition | Range | Unit |
|--------------------------------|-----------------------|-------------|------|
| Frequency range | | 2400~2483.5 | MHz |
| Channels | | 16 | |
| Signal No. | | 0B~1A | Hex |
| Channel spacing | | 5 | MHz |
| Transmitting power | | -9 to +19 | dBm |
| Receiving sensitivity | Packet loss ≤ 1% | -100 | dBm |
| Max transmitting rate | | 250 | kbps |
| Rated Input / Output Impedance | For unbalanced output | 50 | Ω |

3.1.4. Processor Characteristics

Table 3-4. Processor Characteristics

| Parameter | Test Conditions | Range | Unit |
|-----------------------|-----------------|-----------|-------|
| On-chip flash storage | | 256K/512K | bytes |
| On-chip RAM storage | | 32K/64K | bytes |
| Working frequency | | 38.4 | MHz |

3.1.5. Module Interface Characteristics

Table 3-5. Module Interface Characteristics

| Parameter | Test Conditions | Range | Unit |
|--|------------------|--------------|---------|
| UART Max baud rate | | 230400 | bps |
| The resolution / conversion time of the analog channel | Half-duplex mode | 12/4096 | Bits/μs |
| Analog input impedance | | > 1 | MΩ |
| Analog reference voltage (VREF) | | 3.3 | V |
| Analog input voltage | | 0 - VREF | V |
| I2C bus maximum clock frequency | | 400 | KHz |
| GPIO output voltage (logic 0) | -8/ 4 mA | 0 ~ 0.18*VCC | V |
| GPIO output voltage (logic 1) | -8/ 4 mA | 0.82*VCC ~ | V |

| | | | |
|---------------------------|--|--------|-----|
| | | VCC | |
| Real-time clock frequency | | 32.768 | KHz |

3.2. Physical/Ambient Characteristics

Table 3-6. Physical/Ambient Characteristics

| Parameter | Value | Note |
|---------------------------|-----------------|------|
| Physical size | 18.0*15.0*2.6mm | |
| Weight | <1g | |
| *Working temperature | -40°C to +85°C | |
| Relative working Humidity | <95% | |

3.3. Pin Configuration

Figure3-1.Layout Dimension

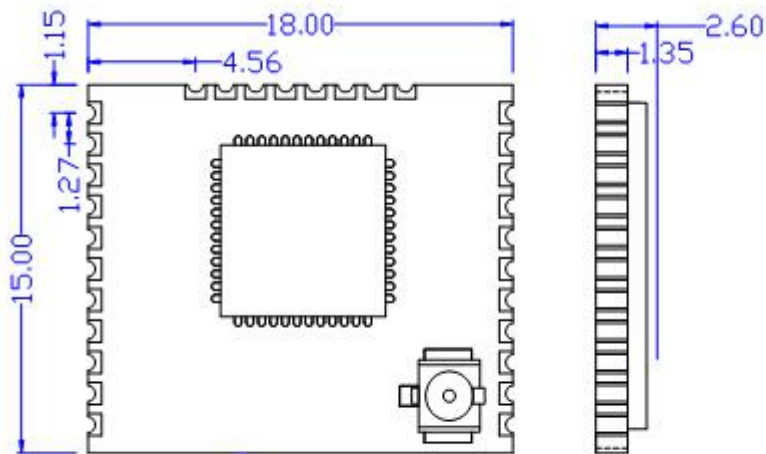


Figure3-2. Product Packages

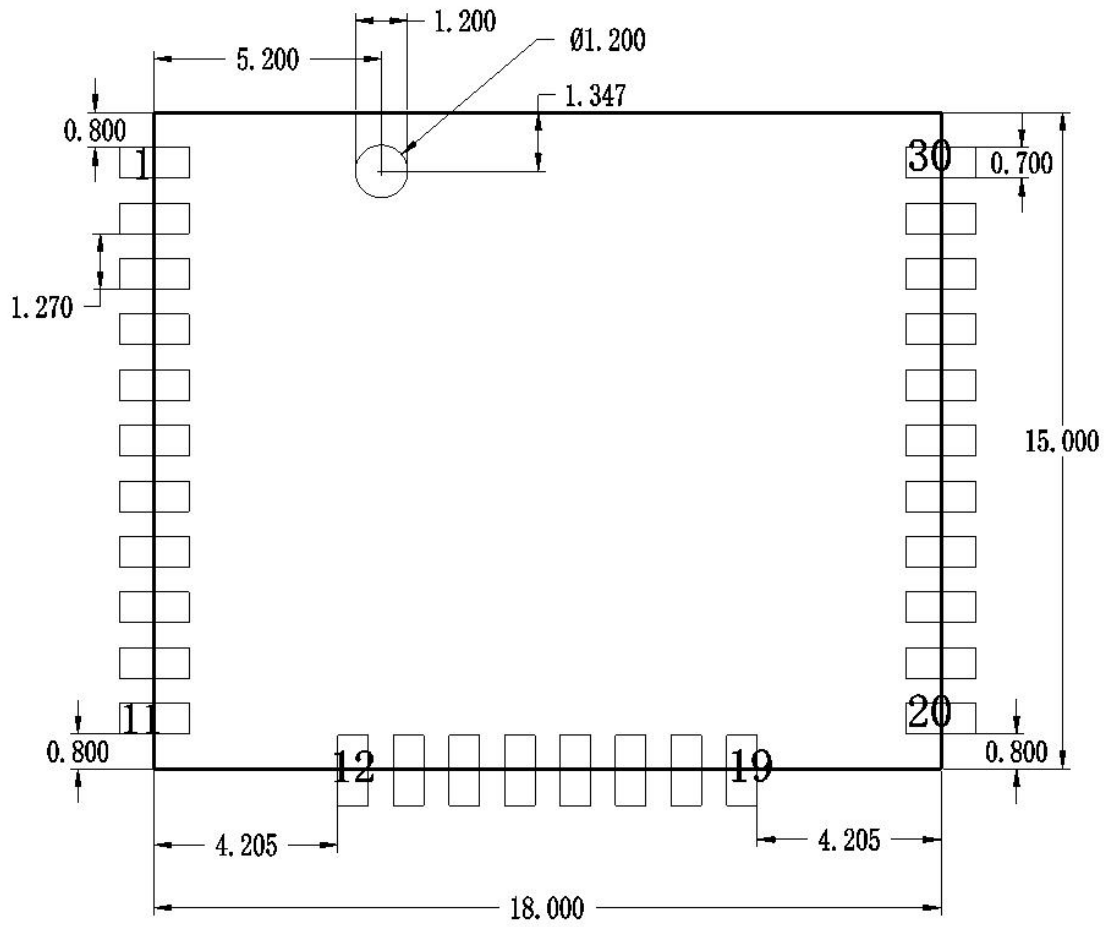


Table 3-9. Pin Configuration

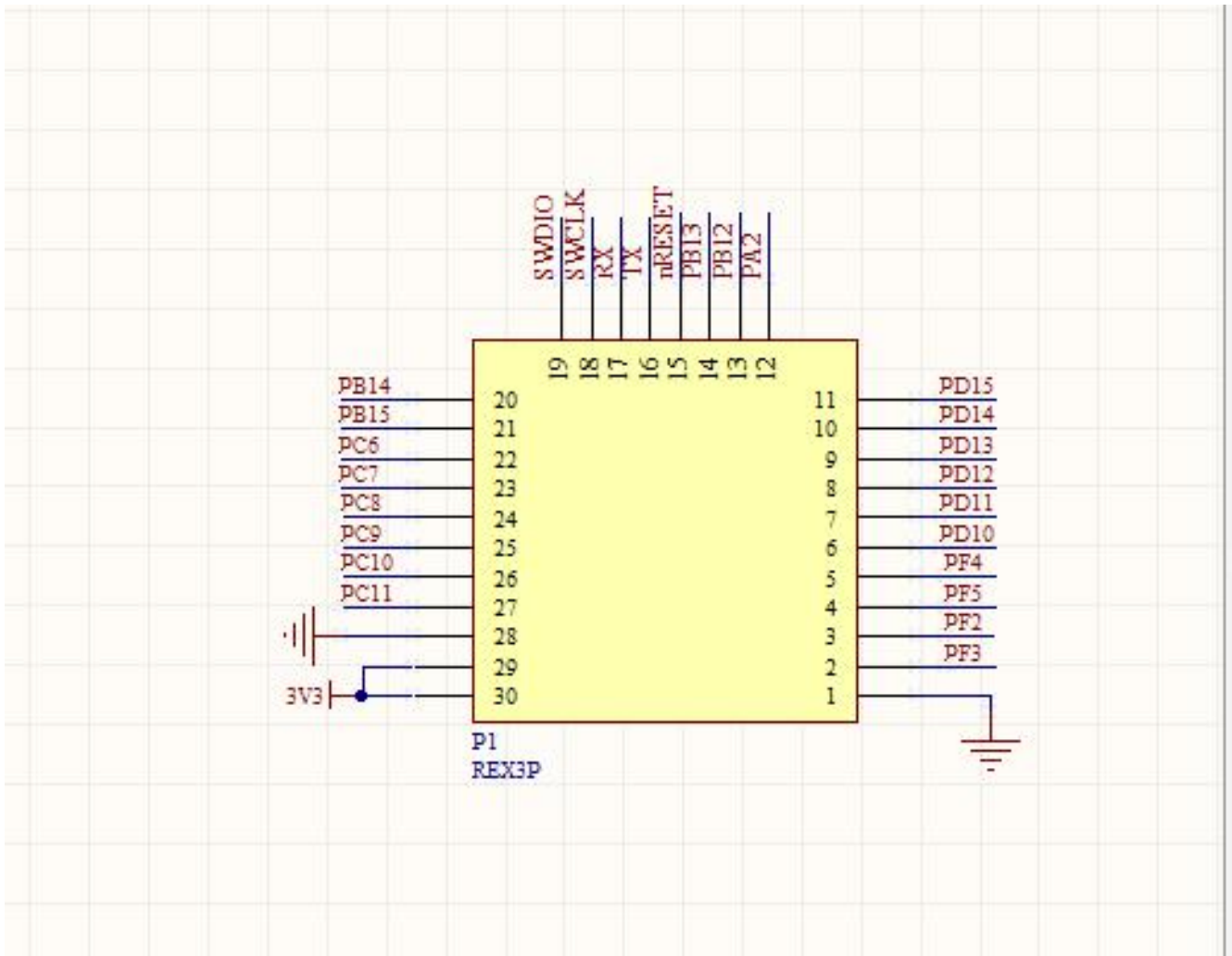


Table 3-10. Pin Description

| No. of module pins | No. of QFN48 package pins | Pin signal | Direction | Pin specification |
|--------------------|---------------------------|------------|-----------|-------------------|
| 1 | 14, 15, 37 | GND | - | Ground |
| 2 | 4 | PF3 | I/O | Digital I/O; |
| 3 | 3 | PF2 | I/O | Digital I/O; |
| 4 | 6 | PF5 | I/O | Digital I/O |
| 5 | 5 | PF4 | I/O | Digital I/O. |

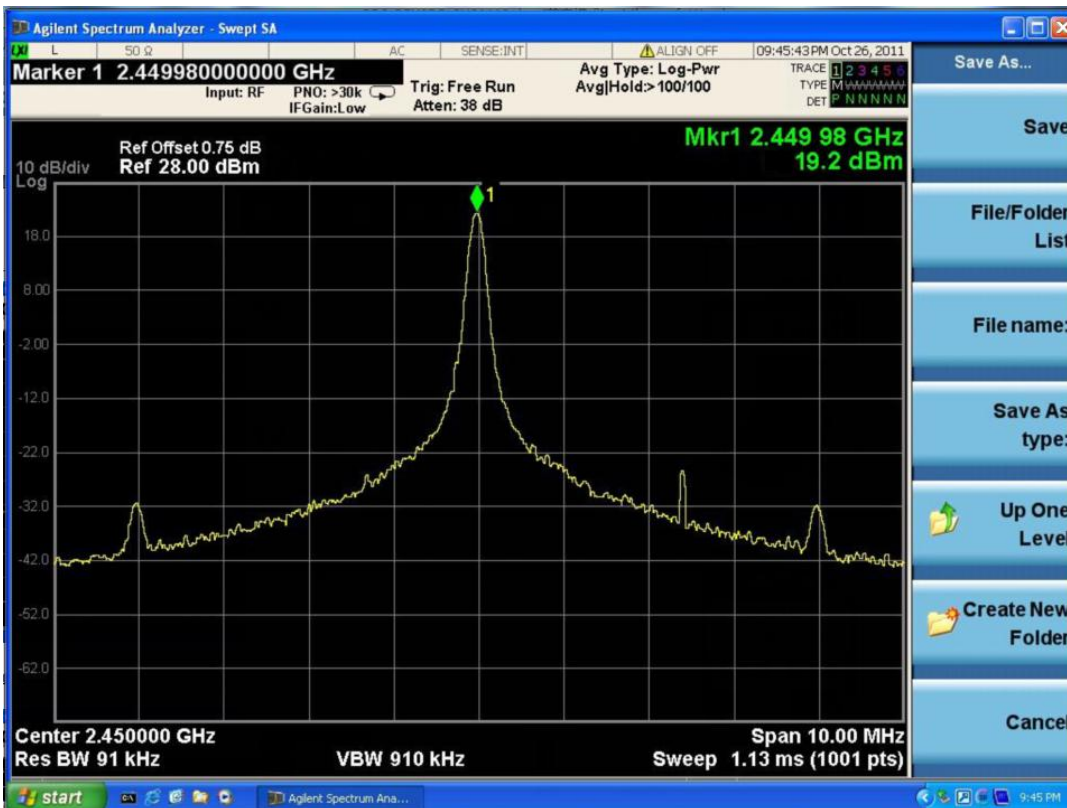
| No. of module pins | No. of QFN48 package pins | Pin signal | Direction | Pin specification |
|--------------------|---------------------------|------------|-----------|--|
| 6 | 19 | PD10 | I/O | Digital I/O |
| 7 | 20 | PD11 | I/O | Digital I/O |
| 8 | 21 | PD12 | I/O | Digital I/O |
| 9 | 22 | PD13 | I/O | Digital I/O; PTA_PRIORITY |
| 10 | 23 | PD14 | I/O | Digital I/O; PTA_GRANT |
| 11 | 24 | PD15 | I/O | Digital I/O ; PTA_REQUEST |
| 12 | 27 | PA2 | I/O | Digital I/O |
| 13 | 32 | PB12 | I/O | Digital I/O ;PTI_DATA |
| 14 | 33 | PB13 | I/O | Digital I/O ;PTI_FRAME |
| 15 | 12 | nRESET | I | Active low chip reset (internal pull-up) |
| 16 | 25 | PA0 | I/O | Digital I/O ;TXD |
| 17 | 26 | PA1 | I/O | Digital I/O ;RXD |
| 18 | 1 | SWCLK | I/O | SWD Clock |
| 19 | 2 | SWDIO | I/O | SWD Data |
| 20 | 35 | PB14 | I/O | Digital I/O ; VCOM_TX |
| 21 | 36 | PB15 | I/O | Digital I/O ; VCOM_RX |
| 22 | 43 | PC6 | I/O | Digital I/O |
| 23 | 44 | PC7 | I/O | Digital I/O |
| 24 | 45 | PC8 | I/O t | Digital I/O |
| 25 | 46 | PC9 | I/O | Digital I/O |
| 26 | 47 | PC10 | I/O | Digital I/O |
| 27 | 48 | PC11 | I/O | Digital I/O |
| 28 | 14, 15, 37 | GND | - | Ground |
| 29 | 9, 18, 34, 40 | 3.3V | I | DC3.3V supply |
| 30 | | | | |

3.4. Test Result of RF Performance

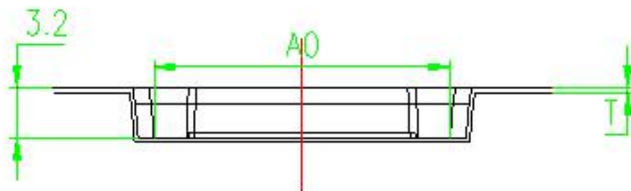
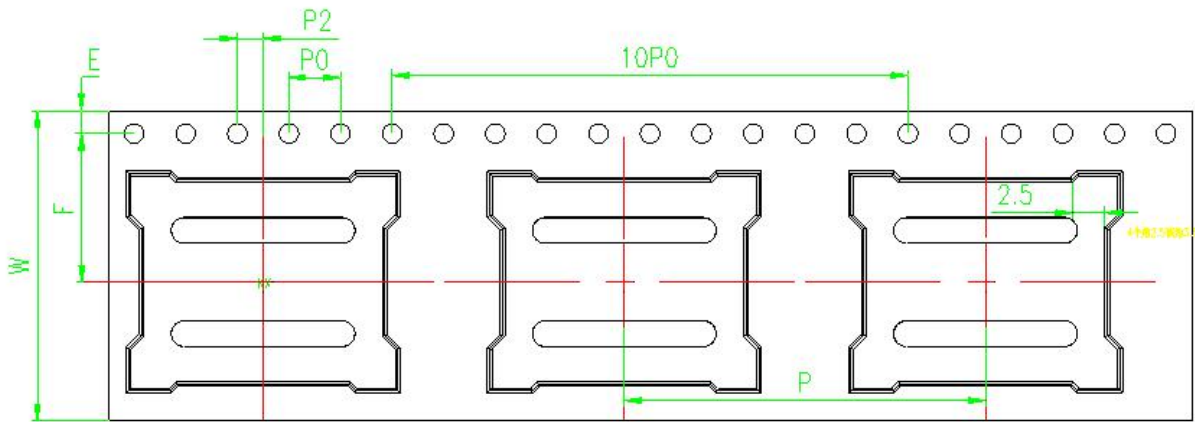
Figure3-17. Table 3-17 Receiving Sensitivity



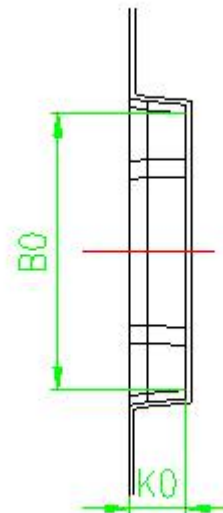
Figure 3-18. Test of Carrier Signal



3.5. Packing Layout Of Module



| ITEM | SPEC(mm) |
|------|-----------------------------------|
| W | 24.00±0.30 |
| F | 11.50±0.10 |
| E | 1.75±0.10 |
| P | 28.00±0.10 |
| P2 | 2.00±0.10 |
| φD0 | 1.50 ^{+0.1} ₀ |
| P0 | 4.00±0.10 |
| 10P0 | 40.0±0.20 |
| A0 | 18.50±0.10 |
| B0 | 15.43±0.10 |
| K0 | 3.20±0.10 |
| T | 0.40±0.05 |



4. Ordering Information

Manufacturer

REX=REXENSE

REX

3

P

012

U

-

V4

B1

-

Series

3=Zigbee

Packaging Type

M=MINI zigbeemodule

B = Module for Smart Light(default)

P =EFR32 Ultra-small Module(default)

Chip Model

011= EFR32MG1B232F256

012= EFR32MG1B232F256(default)

136= EFR32MG13P632F512

137= EFR32MG13P732F512

Antenna

L=L, No IPEX connector

U=U.FL Interface(default)

Hardware Version

V4

Appearance

B1= Black Ink with Shielding (default)

B= Black Ink

G= Green Ink

1= With Shielding

0= Without Shielding

For Industrial Application

Blank=Normal 85°C (Default)

I =Industrial Application(Version for Hi-temp)

5. Contact Us

Zhejiang Raying IoT Technology Co., Ltd.

Add: 10F, North of Building No.10, Wellong Science & Technology Park,
No.88 Jiangling Road, Binjiang District, Hangzhou, 310051 China

Tel: +86-571-85395623

Fax: +86-571-87987620

Email: intl@rexense.com

Web: www.rexense.com

Antenna

Manufacturer: Shenzhen boantong technology co. LTD
深圳市博安通科技股份有限公司

Model: An2400p

Gain: 1.5dbi

FCC Statement

FCC standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

External antenna with antenna gain 1.5dBi

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.

We will retain control over the final installation of the modular such that compliance of the end product is assured. In such cases, an operating condition on the limit modular approval for the module must be only approved for use when installed in devices produced by a specific manufacturer. If any hardware modify or RF control software modify will be made by host manufacturer, C2PC or new certificate should be apply to get approval, if those change and modification made by host manufacturer not expressly approved by the party responsible for compliance, then it is illegal.

FCC Radiation Exposure Statement

This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: 2AOE2-REX3P Or Contains FCC ID: 2AOE2-REX3P"

When the module is installed inside another device, the user manual of the host must contain below warning statements;

1. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference.

(2) This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.

2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

Any company of the host device which install this modular with limit modular approval should perform the test of radiated & conducted emission and spurious emission, etc. according to FCC part 15C : 15.247 and 15.209 & 15.207, 15B Class B requirement, Only if the test result comply with FCC part 15C : 15.247 and 15.209 & 15.207, 15B Class B requirement, then the host can be sold legally.