

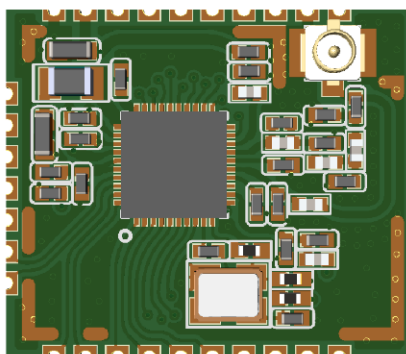
## RFM23A020 Sub-G Transceiver Module

### Description

RFM23A020 is a high-performance, long-range, cost-effective wireless transceiver module. The high integration of the RFM23A020 module simplifies the system design. The module equipped with the SoC which has a single die, multi-core solution, provides industry-leading security, low power consumption with fast wakeup times, and an integrated power amplifier to enable the next level of secure connectivity for IoT devices.

The RFM23A020 supports up to 20dBm TX power, along with the high sensitivity that results in an industry-leading link budget allowing extended ranges and highly robust communication links.

It is an ideal solution for sub-GHz “Internet of Things” applications in smart homes, security, lighting, building automation, and metering.



**RFM23A020**

### Features

- Extremely strong anti-interference capability, suitable for use in complex electromagnetic environments
- Frequency: 868MHz、915MHz
- Modulation: OOK, (G)FSK, (G)MSK, OQPSK
- Power Supply: 1.8V-3.8V
- Receive Sensitivity: -118dBm @868MHz 2.4bps GFSK
- TX Current: 77mA@+20dBm, 868MHz 73mA@+20dBm, 915MHz
- RX Current: 5mA
- Sleep Current: 1.2uA

### Applications

- Smart meter
- Home and Building Automation and Security
- Industrial Automation
- Street lighting
- Wireless remote control

### Ordering Information

Module	Frequency
RFM23A020-868S2	868MHz
RFM23A020-915S2	915MHz

## Pin Configuration

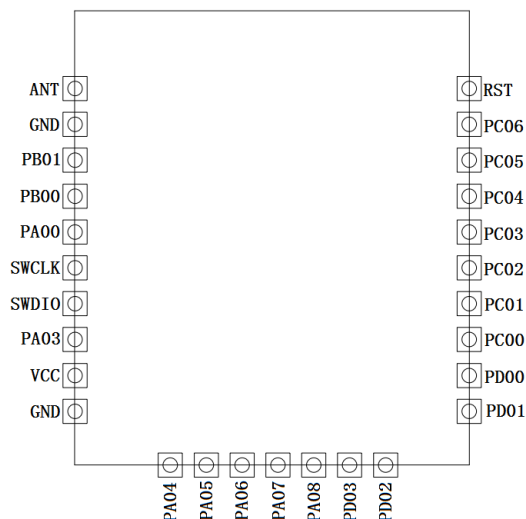


Figure 1. RFM23A020 Top View

Table 1. RFM23A020 Pin description

Pin #	Pin Name	I/O	Description
1	ANT <sup>[1]</sup>		RF signal output/input, antenna impedance must be well matched to 50 $\Omega$
2	GND		Connect to PCB ground
3	PB01		GPIO
4	PB00		GPIO
5	PA00		GPIO
6	SWCLK <sup>[2]</sup>		Serial Wire Clock Input
7	SWDIO <sup>[3]</sup>		Serial Wire Data Input/Output
8	PA03		GPIO
9	VCC		VDD supply pin (1.8V-3.8V)
10	GND		Connect to PCB ground
11	PA04		GPIO
12	PA05		GPIO
13	PA06		GPIO
14	PA07		GPIO
15	PA08		GPIO
16	PD03		GPIO
17	PD02		GPIO
18	PD01		GPIO
19	PD00		GPIO
20	PC00		GPIO
21	PC01		GPIO
22	PC02		GPIO
23	PC03		GPIO
24	PC04		GPIO
25	PC05		GPIO
26	PC06		GPIO
27	RST		Reset pin (active low)

### Note:

[1] The PI matching network is recommended on the ANT pin, and fine tuning of the component values may be required based on the layout design.

[2][3] The SWCLK and SWDIO pin connections are enabled by default, it is possible to configure these pins as PA01 and PA02 respectively.

## Electrical Specifications

All electrical parameters in all tables are specified under the following conditions, unless stated otherwise:

- Typical values are based on TA=25 °C and all supplies at 3.3 V
- The crystal frequency is 39.0 MHz

**Table 2. Electrical Specifications**

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Supply Voltage Range	V <sub>DD</sub>		1.8		3.8	V
Frequency	F <sub>C</sub>	Matching network for different bands		868		MHz
				915		MHz
Modulation	MOD		GFSK			
Maximum TX Power	P <sub>out</sub>	RFM23A020-868S2		20		dBm
		RFM23A020-915S2		20		dBm
TX Mode Current	I <sub>TX</sub>	868MHz band, Pout=20dBm		77	85	mA
		915MHz band, Pout=20dBm		73	85	mA
Receiver Sensitivity	SENS	868MHz, DR=2.4kbps, F <sub>DEV</sub> =1.2kHz		-118		dBm
		915MHz, DR=2.4kbps, F <sub>DEV</sub> =1.2kHz		-116		dBm
RX Mode Current	I <sub>RX</sub>	868MHz		5	7.5	mA
		915MHz		5	7.5	mA
Sleep Current	I <sub>Sleep</sub>	EM2 deep sleep mode		1.2		uA
Operating ambient temperature range	T <sub>OP</sub>		-40		85	°C

**Note:** The RFM23A020 supports up to 20 dBm transmit power. Continuous data transmission can result in significant temperature rise, which may affect the accuracy of the crystal and result in communication failures.

For applications with extremely low data rates, operating environments experiencing high temperatures (above 75°C) or low temperatures (below -25°C), narrowband communication, etc., it is recommended to select modules with TCXO crystal oscillators to ensure more stable communication performance.

## Absolute Maximum Ratings

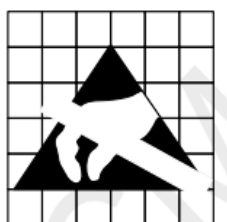
Table 3. Absolute Maximum Ratings <sup>[1]</sup>

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Voltage supply	V <sub>DD</sub>		-0.3		3.8	V
DC voltage on any GPIO	V <sub>IN</sub>		-0.3		V <sub>DD</sub> +0.3	V
Junction temperature	T <sub>J</sub>		-40		105	°C
Storage temperature range	T <sub>STG</sub>		-50		150	°C
DC voltage on RESETn pin <sup>[2]</sup>	T <sub>SDR</sub>		-0.3		3.8	V
Voltage ramp rate on any supply pin	VDD <sub>RAMP</sub> MAX				1	V/us
Total current into VDD power lines	I <sub>VDD</sub> MAX				200	mA

### Note:

[1] Stresses above those listed may cause permanent damage to the device. This is a stress rating only and functional operation of the devices at those or any other conditions above those indicated in the operation listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

[2] The RESETn pin has a pull-up device to the VDD supply. For minimum leakage, RESETn should not exceed the voltage at VDD.



### Caution: ESD sensitive device.

It should thus be handled with all the necessary ESD precautions to avoid any permanent damage.

### Reference schematic design

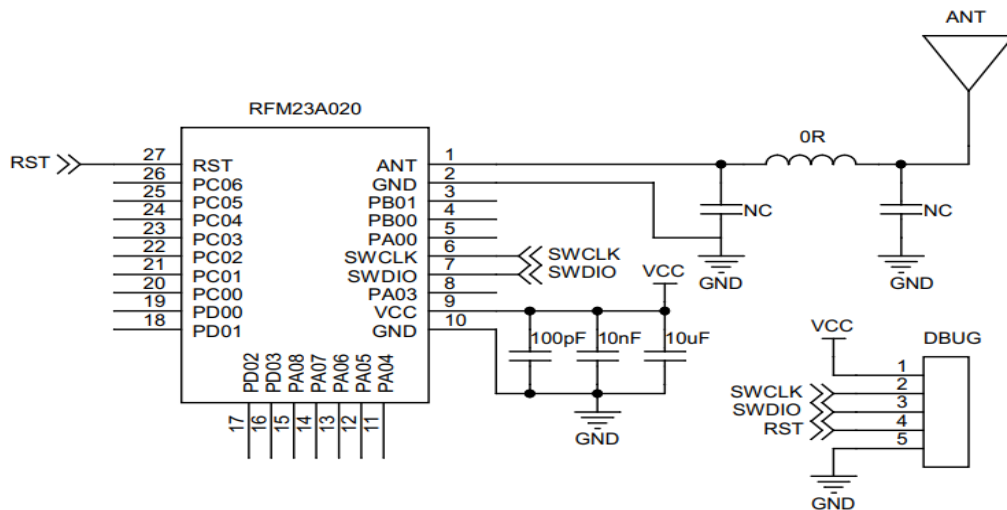


Figure 2. Reference Schematic design

Note: The figure above illustrates the suggested PI matching network of the ANT pin, and fine tuning of the component values may be required based on the layout design.

### Range test

The range test made in open field and can achieve ranges of over 1.3km. The RF settings of the radio, as data rate, modulation, frequency settings and output power are listed below.

- Frequency: 915MHz
- Modulation: OQPSK
- Data rate: 9.6kbps
- Antenna: Rubber antenna
- Antenna Gain: 3 dBi

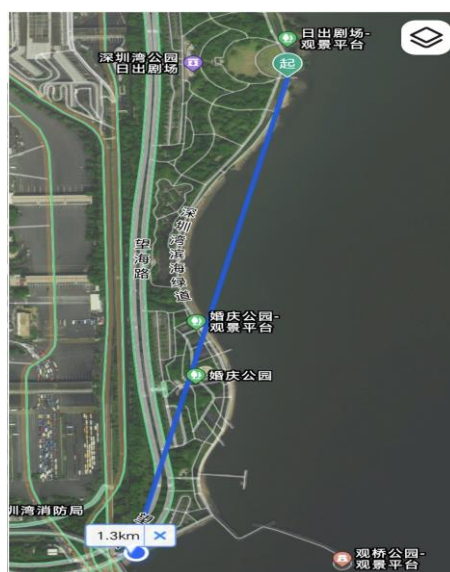


Figure 3. Range test

## Mechanical Dimension

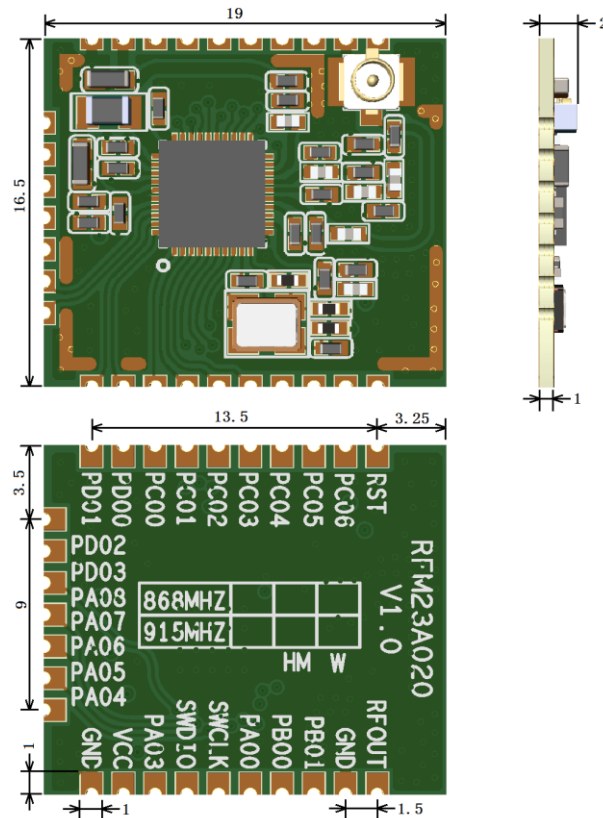


Figure 4. Mechanical Dimensions (Unit: mm)

## PCB Land Pattern

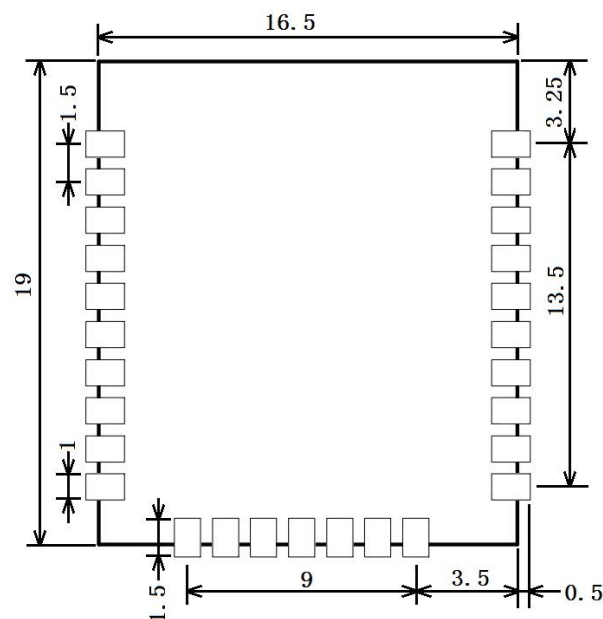


Figure 5. Recommended Land Pattern (Unit: mm)

**Revision History**

Version	Date	Modification
V1.0	2023.5.6	Initial version
V1.1	2024.2.18	Update module description
V1.2	2024.3.21	Update the mechanical dimension
V1.3	2024.4.10	Add the PCB land pattern information