

## General Description of RFM95C

RFM95C is an ultra-low-power, high-performance LoRa transceiver for various frequency of 137-1020 MHz wireless applications. It is part of the SEMTECH RF product line, which includes complete transmitters, receivers and transceivers. The high integration of RFM95C simplifies the peripheral materials needed in the system design. The sensitivity up to -138 dBm which can optimize the link performance of applications. In addition, RFM95C also supports Duty-Cycle operation mode, channel interception, high-precision RSSI, power-on reset, noise output and other more functions, which makes the application design more flexible thus to achieve product differentiation design. The working voltage of RFM95C is 1.8V~3.7V. When the sensitivity is reaching -138 dBm, it only consumes 9.9 mA current. This ultra-low power mode can further reduce the power consumption of the chip.

### Features

- Frequency Range: 915MHz
- Modulation: LoRa
- Sensitivity: -138 dBm , BW=500KHz, SF=12
- Voltage Range: 1.8~3.7 V
- Receiving Current: 12.5 mA
- Supports Ultra Low Power Receiving Mode
- 4-wire SPI Interface
- Supports Full-automatic Independent Working Mode



RFM95C

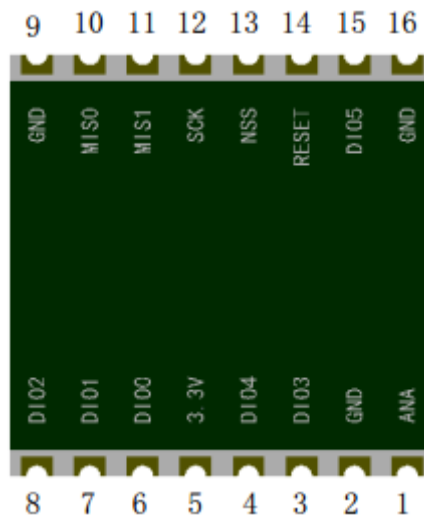
### Ordering Information

| Model No. | Working Frequency |
|-----------|-------------------|
| RFM95C    | 915MHz            |

## Applications

- Automatic meter Reading
- Home Security&Building automation
- ISM Band Data Communication
- Industrial Monitoring & Controlling
- Security System
- Remote Control Application
- Intelligent Instrument
- Supply Chain & Logistics
- Intelligent Agriculture
- Smart City
- Retailing
- Asset Following
- Smart Lighting System
- Smart Parking
- Environmental Monitoring
- Health Monitoring
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## Product Pin



**Bottom View of RFM95C**

**Table1. Module Pin Definition of RFM95C**

| Pin No. | Pin Name | Description                                 |
|---------|----------|---|
| 1       | ANT      | Antenna Input &Output                       |
| 2       | GND      | Digital Ground                              |
| 3       | DIO3     | Data Input & Output, Software Configuration |
| 4       | DIO4     | Data Input & Output, Software Configuration |
| 5       | 3.3V     | Voltage 3.3V                                |
| 6       | DIO0     | Data Input & Output, Software Configuration |
| 7       | DIO1     | Data Input & Output, Software Configuration |
| 8       | DIO2     | Data Input & Output,Receiving Data Output   |
| 9       | GND      | Digital Ground                              |
| 10      | MISO     | SPI Data Output                             |
| 11      | MOSI     | SPI Data Input                              |
| 12      | SCK      | SPI clock Input                             |
| 13      | NSS      | SPI slave Input                             |
| 14      | RESET    | Reset, Active Low                           |
| 15      | DIO5     | Data Input & Output, Software Configuration |
| 16      | GND      | Digital Ground                              |

## Electrical parameters

Testing conditions: Power supply 3.3V, temperature 25°C

**Table2. Recommended Operating Conditions**

| Parameter                  | Symbol | Conditions | Minimum | Typical Value | Maximum | Unit  |
|----------------------------|--------|------------|---------|---------------|---------|-------|
| Supply Voltage             | VDD    |            | 1.8     | 3.3           | 3.7     | V     |
| Operating Temperature      | T      |            | -40     |               | 85      | °C    |
| Power Supply Voltage Slope |        |            | 1       |               |         | mV/us |

**Table3. Absolute Maximum Rating**

| Parameter             | Symbol  | Conditions            | Minimum | Maximum | Unit |
|-----------------------|---------|-----------------------|---------|---------|------|
| Supply Voltage        | VDD     |                       | -0.5    | 3.9     | V    |
| Interface Voltage     | VIN     |                       | -0.3    | 3.3     | V    |
| Junction Temperature  | TJ      |                       | -40     | 125     | °C   |
| Storage Temperature   | TSTG    |                       | -50     | 150     | °C   |
| Soldering Temperature | TSDR    | Last for at least 30s |         | 255     | °C   |
| ESD Level[2]          | HBM     |                       | -2      | 2       | kV   |
| Latch Current         | @ 85 °C |                       | -100    | 100     | mA   |

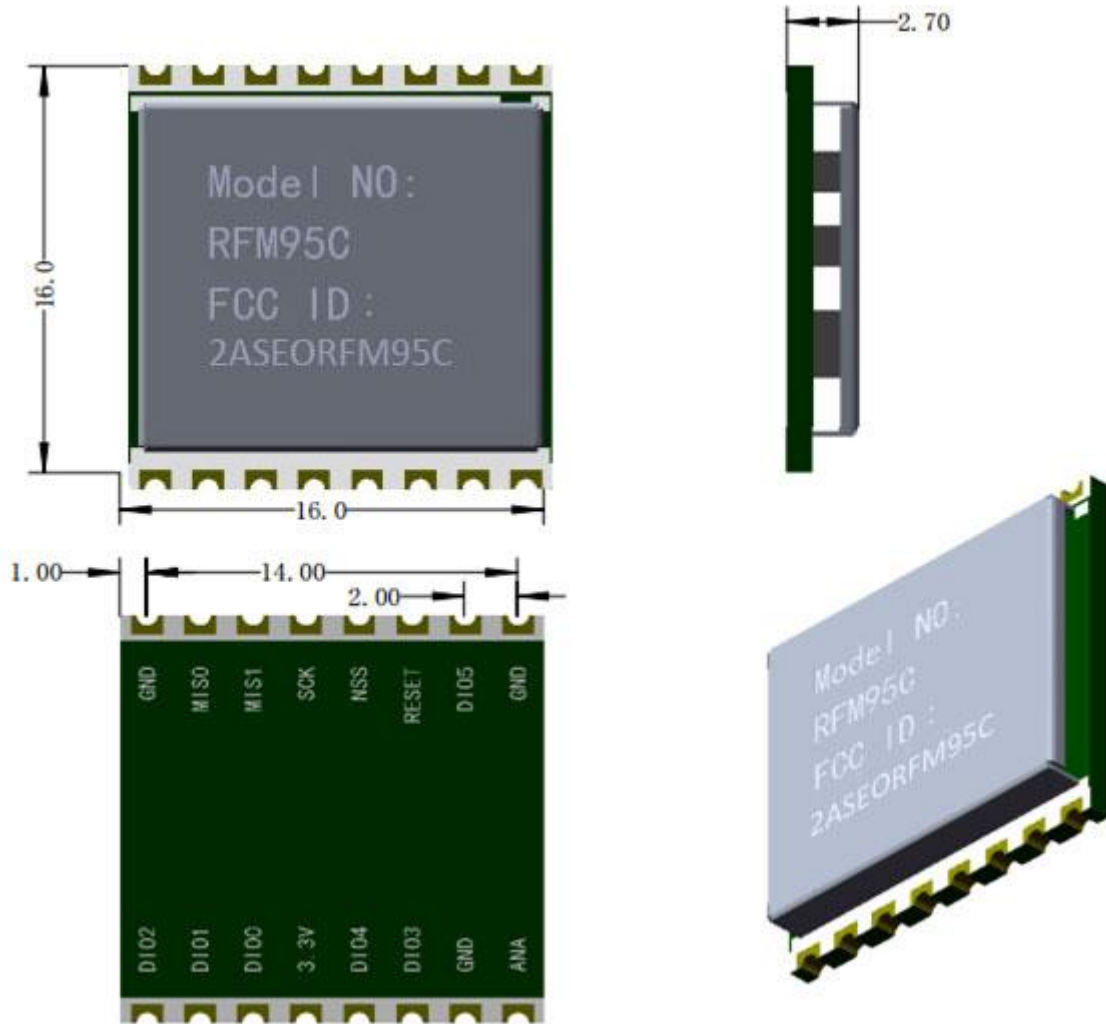
**Table4. Receiving Parameters**

| Parameter            | Conditions        | Minimum | Typical Value | Maximum | Unit |
|----------------------|-------------------|---------|---------------|---------|------|
| Frequency Tolerance  | 915 MHz           | 914.988 | 915           | 915.012 | MHz  |
| Transmitting Power   | 915MHz band       | -       | 18.3          | --      | dBm  |
| Power Reduction      | 16.3dBm Vbat=2.7V | -       | 2             | -       | dBm  |
|                      | 15.3dBm Vbat=2.4V | -       | 3             | -       |      |
|                      | 12.3dBm Vbat=1.8V | -       | 6             | -       |      |
| Transmitting Current | 915MHz            |         | 134           | 140     | mA   |

**Table5. Receiving Parameters**

|   |        |   |      |   |     |
|---|--------|---|------|---|-----|
| Receiving Sensitivity (Lora)<br>SF12, BW 500KHz CR4/5 | 915MHz | - | -138 | - | dBm |
|---|--------|---|------|---|-----|

## Module Label Size



Pic2.

Unit: mm

#### Modular installation instructions

Module Integrates high-speed GPIO and peripheral interface. Please pay attention to the installation direction (pin direction).

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

#### 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.

FCC ID: 2ASEORFM95C

**ATTENTION**

This device is intended only for OEM integrators under the following conditions:

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) This device and its antenna(s) must not be co - located with any other transmitters except in accordance with FCC multi - transmitter product procedures. Referring to the multi - transmitter policy, multiple - transmitter(s) and module(s) can be operated simultaneously without C2P.
- 3) For all products market in US, OEM has to limit the operation channels in 915MHz by supplied firmware programming tool. OEM shall not supply any tool or info to the end - user regarding to Regulatory Domain change.

**USERS MANUAL OF THE END PRODUCT:**

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio - frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of 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.

**LABEL OF THE END PRODUCT:**

The final end product must be labeled in a visible area with the following " Contains FCC ID: 2ASEORFM95C ". If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of 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.

|   |   |
|---|---|
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