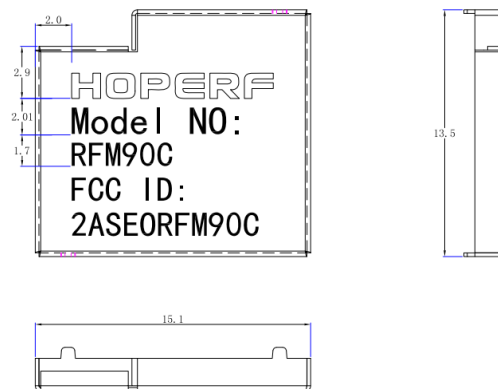


## RFM90C - LoRa Wireless module

### ➤ General Description

RFM90C sub-GHz radio transceivers are ideal for long range wireless applications. It is designed for long battery life with just 8mA of active receive current consumption. It can transmit up to +22dBm with highly efficient integrated power amplifiers. These devices support LoRa® modulation for LPWAN use cases and (G)FSK modulation for legacy use cases. The devices are highly configurable to meet different application requirements utilizing the global LoRaWAN™ standard or proprietary protocols. The devices are designed to comply with the physical layer requirements of the LoRaWAN™ specification released by the LoRa Alliance™. The radio is suitable for systems targeting compliance with radio regulations including but not limited to ETSI EN 300 220, FCC CFR 47 Part 15, China regulatory requirements and the Japanese ARIB T-108. Continuous frequency coverage from 150 MHz to 960 MHz allows the support of all major sub-GHz ISM bands around the world.



### ➤ KEY PRODUCT FEATURES

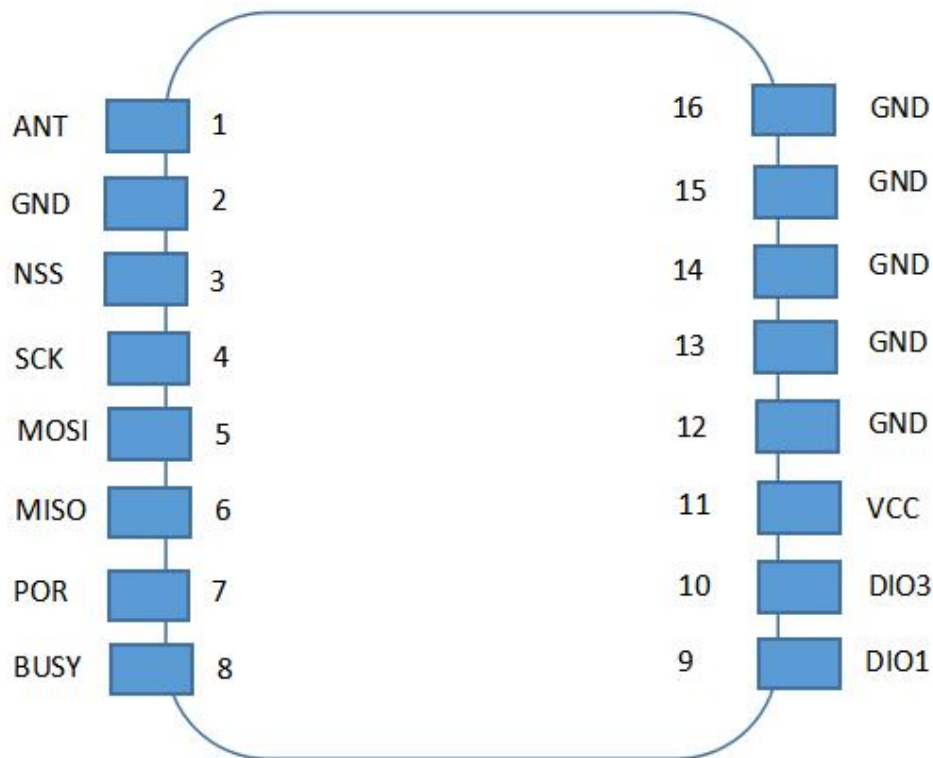
- ◆ LoRa™ Modem.
- ◆ +22dBm RF output .
- ◆ Programmable bit rate up to LORA.
- ◆ Excellent blocking immunity.
- ◆ Low RX current of 8mA, 600 nA register retention.
- ◆ Fully integrated synthesizer with step 0.95 Hz.
- ◆ LoRa™ modulation.
- ◆ Built-in bit synchronizer for clock recovery.
- ◆ Preamble detection.
- ◆ 127dB Dynamic Range instantaneous/ Packet RSSI.
- ◆ Automatic CAD .
- ◆ Module Size: 16\*16mm

## ➤ Applications

The level of integration and the low consumption within RFM90C enable a new generation of Internet of Things applications.

- Smart meters
- Supply chain and logistics
- Building automation
- Agricultural sensors
- Smart cities
- Retail store sensors
- Asset tracking
- Street lights
- Parking sensors
- Environmental sensors
- Healthcare
- Safety and security sensors
- Remote control applications

## ➤ Pin Diagram



**Picture 2: RFM90C Pin Diagram**

## ➤ Pin Description

NO.	Name	Description
1	ANT	RF signal output/input
2	GND	Ground
3	NSS	SPI slave Select
4	SCK	SPI clock
5	MOSI	SPI slave input
6	MISO	SPI slave output
7	POR	Reset
8	BUSY	Busy indicator
9	DIO1	Interrupt Signal output
10	DIO3	Interrupt Signal output/External XO power supply
11	VCC	Power supply
12	GND	Ground
13	GND	Ground
14	GND	Ground
15	GND	Ground
16	GND	Ground

## ➤ Electrical Characteristics

### ● Absolute Maximum Ratings

Symbol	Descriptio	Min	Max	Unit
VDDmr	Supply Voltage	-0.5	3.9	V
Tmr	Temperature	-55	+125	°C

### ● Operating Range

Symbol	Descriptio	Min	Max	Unit
VDD	Supply voltage	1.8	3.7	V
Temperature	Operational temperature range	-20	+70	°C
CL	Load capacitance on digital ports	-	20	pF

**● Transmit Mode Specifications**

Specification	Condition	Min	Typical	Max	Unit
Frequency Range	915 MHz	-	915	-	MHz
Tx Power	915MHz	-	22	-	dBm
Tx Drop	22dBm Vbat=2.7V	-	2	-	dB
	22dBm Vbat=2.4V	-	3	-	
	22dBm Vbat=1.8V	-	6	-	
IDDTX	915MHz	-	145	-	mA

**● Receive Mode Specifications**

Specification	Condition	Min	Typical	Max	Unit
Sensitivity	FSK: Rate=38.4kbps,FDA=50KHz 915MHz	-	-106	-	dBm
	LoRa: SF=12,BW=125KHz 915MHz band	-	-137	-	dBm
IDDRX	FSK: Rate=38.4kbps	-	9.1	-	mA
	LoRa: SF=12, BW=125KHz	-	8.8	-	

**Configuration of Module**

## INTEGRATION INSTRUCTIONS

### **FCC rules**

The RFM90C is an LoRa Wireless module with frequency hopping using an LoRa modulation. It operates on the 902-928 MHz band and, therefore, is within U.S. FCC part 15.247 standard.

### **Modular installation instruction**

RFM90C Integrates high-speed GPIO and peripheral interface. Please pay attention to the installation direction (pin direction).

If the application requires the disconnection of VDD from the RFM90C, despite of the extremely low Sleep Mode current, the user should wait for 10 ms from of the end of the POR cycle before commencing communications over the SPI bus. Pin 7 (NRESET) should be left floating during the POR sequence.

### **Trace antenna designs**

Not Applicable

### **RF exposure considerations**

To maintain compliance with FCC' s RF Exposure guidelines, This equipment should be installed and operated with minimum distance between 20cm the radiator your body: Use only the supplied antenna.

### **Antennas**

The RFM90C is an LoRa Wireless module beams signals and communicates with its antenna, which is Reverse SMA interface Rubber Bar antenna. The Antenna gain is 2.15dBi

### **LABEL OF THE END PRODUCT**

The final end product must be labeled in a visible area with the following " Contains FCC ID: 2ASEORFM97C. 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.

### **Information on test modes and additional testing requirements**

Data transfer module demo board can control the EUT work in RF test mode at specified test channel.

### **Additional testing, Part 15 Subpart B disclaimer**

The module without unintentional-radiator digital circuit, so the module does not required an evaluation by FCC Part 15 Subpart B. The host should be evaluated by the FCC Subpart B.

## FCC WARNING

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 generate, 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.

## Picture 3: RFM90C Module Configuration

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