

Grove is a very powerful platform developed by Seeed Studio to simplify your IoT projects.We have integrated the grove connector to most boards produced by Seeed to make them become a system. This time, we combined Grove with LoRa to provide an ultra-long-range wireless module for you.

The main functional module in Grove - LoRa Radio 433MHz is RFM98, which is a transceiver features the LoRa long range modem that provides ultra-long range spread spectrum communication and high interference immunity whilst mini-missing current consumption. The heart of Grove - LoRa Radio 433MHz is ATmega168, a widely used chip with very high-performance and low power consumption, especially suitable for this grove module.

There we already integrated a simple wire antenna to receive signal, if the signal is too weak to receive, don't worry, the MHF connector next to the antenna is for adding a second antenna which has MHF interface to gain more signal.

This is the 433MHz version, which can be used for 433MHz communication. You can also find the version for 868MHz at Grove - LoRa Radio 868MHz.

Version	Released Date	How to Buy
Grove - LoRa Radio 433 MHz	Dec 10, 2016	Get One Now [https://www.seeedstudio.com/Grove-LoRa- Radio-433MHz-p-2777.html]
Grove - LoRa Radio 868 MHz	Dec 10, 2016	Get One Now 📜 [https://www.seeedstudio.com/Grove-LoRa- Radio-868MHz-p-2776.html]

Features

• Using RFM95 module based on SX1276 LoRa®

- Working Voltage:5V/3.3V
- ~28mA(Avg) @+20dBm continuous transmit
- ~8.4mA(Avg)@standby mode
- ~20mA(Avg) @receive mode, BW-500kHz
- Working Temperature:-20 70°C
- Interface:Grove UART(RX,TX,VCC,GND)
- Simple wire antenna or MHF Connector for external high gain antenna
- Working Frequency:868MHz/433MHz
- +20dBm 100 mW Power Output Capability
- Size:20*40mm
- Rate:0.3kps~50kps
- Ready-to-go Arduino libraries
- Resered MHF antenna connector

👌 Tip

More details about Grove modules please refer to Grove System [https://wiki.seeedstudio.com/Grove_System/]

Platforms Supported

Arduino	Raspberry Pi	
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Caution

The platforms mentioned above as supported is/are an indication of the module's software or theoritical compatibility. We only provide software library or code examples for Arduino platform in most cases. It is not possible to provide software library / demo code for all possible MCU platforms. Hence, users have to write their own software library.

Hardware Overview



1. ATMega168 MCU (datasheet

[https://files.seeedstudio.com/wiki/Grove_LoRa_Radio/res/Atm el-2545-8-bit-AVR-Microcontroller-ATmega48-88-168_Datasheet.pdf])

- 2. MHF Connector
- 3. Wire Antenna

4. RFM95 Module (datesheet

[https://files.seeedstudio.com/wiki/Grove_LoRa_Radio/res/RF M95_96_97_98_DataSheet.pdf])

5. Grove Interface

PIN	NAME	FUNCTION
1	ТХ	TX of UART
2	RX	RX of UART
3	VCC	Power supply, 3.3V or 5V
4	GND	Connect Ground

Application Ideas

- Internet of Things
- Smart Home
- Sensor Hub

• Long distance wireless communication

Getting Started

After this section, you can make **Grove - LoRa Radio** run with only few steps.

Preparations

Now we are making a demo for P2P(point to point) communication with the Grove - Lora Radio 433MHz, the Grove - LoRa Radio 868MHz is the same way to use.



Grove - LoRa Radio 433MHz can't talk to Grove - LoRa Radio 868MHz.

ltem	Qty	Link
Seeeduino Lotus	2	GET ONE NOW! [https://www.seeedstudio.com/Seeeduino- Lotus-ATMega328-Board-with-Grove- Interface-p-1942.html]
Grove - LoRa Radio 433MHz	2	GET ONE NOW! [https://www.seeedstudio.com/Grove-LoRa- Radio-433MHz-p-2777.html]
Micro USB Cable	2	GET ONE NOW! [https://www.seeedstudio.com/Micro-USB- Cable-48cm-p-1475.html]

If this is your first time using Seeeduino Lotus

[https://www.seeedstudio.com/Seeeduino-Lotus-ATMega328-Board-with-Grove-Interface-p-1942.html], please refer to Seeeduino Lotus's wiki [https://wiki.seeedstudio.com/Seeeduino_Lotus/].

Seeeduino Lotus is fully compatible with Arduino which works as simple as Arduino.

If this is your first time using Arduino, Please put hand on here [https://arduino.cc] to start your Arduino journey.

Connecting hardware

Seeeduino Lotus [https://www.seeedstudio.com/Seeeduino-Lotus-ATMega328-Board-with-Grove-Interface-p-1942.html] is a combination of Seeeduino and Base Shield. We can connect the LoRa Radio module to the D5 socket directly as the below picture shows.



Download Library

Click to download the library and install it (How to install an Arduino Library

[https://wiki.seeedstudio.com/How_to_install_Arduino_Library/])

Download Arduino Library

[https://github.com/Seeed-

Studio/Grove_LoRa_433MHz_and_915MHz_RF/archive/master.zip]

Tips

The library supports AVR/SAMD/STM32F4 devices, both hardware and software serial as well.

There are 2 kinds of serial ports. One is COMSerial, stands for communication port(connecting with Grove-LoRa Radio). The other

is ShowSerial, stands for serial info display port(connectiong with PC).

Most of arduino boards have at least one Serial, some have multiple serials(Arduino Mega has 4 Serials). It communicates on digital pins 0 (RX) and 1 (TX) as well as with the computer via USB. So if you connect UART device on pin D0 and pin D1, you have to remove them before downloading program through USB. Or else it will cause upload fails. Sometimes you need more serial ports than the number of hardware serial ports available. If this is the case, you can use an Software Serial that uses software to emulate serial hardware. Software serial requires a lot of help from the Arduino controller to send and receive data, so it's not as fast or efficient as hardware serial. For more info about the Serial, please refer to Seeed Arduino Serial

[https://wiki.seeedstudio.com/Seeed_Arduino_Serial/].

- AVR: For the below example, We define Software Serial as SSCOM(connectiong with PC), you need USB to TTL adapter to connect with PC. NOT all the digital pins can be used for software serial. You can refer to Software Serial [https://www.arduino.cc/en/Reference/SoftwareSerial] for detail pins. We define hardware Serial as COMSerial(connecting with Grove-LoRa Radio). If you want to use the hardware serial as COMSerial and software serial as ShowSerial, you can define as #define ShowSerial Serial and #define COMSerial SSerial. If you use Arduino Mega, you can connect the hardware Serial to ShowSerial and the other Serial1/Serial2/Serial3 to COMSerial. So you can refer to AVR Mega setting.
- **SAMD:** For the below example, The SAMD does not support software serial. We use the hardware serial **Serial1** to

communcate with Grove-LoRa Radio and **SerialUSB** to print message on PC.

 STM32F4: For the below example, We use the hardware serial Serial to communcate with Grove-LoRa Radio and SerialUSB to print message on PC.

Note

For more info about the Serial, please refer to Seeed Arduino Serial [https://wiki.seeedstudio.com/Seeed_Arduino_Serial/].

```
1
   #include <RH RF95.h>
2
3
   4
5
   #ifdef AVR
6
7
   #include <SoftwareSerial.h>
8
   SoftwareSerial SSerial(10, 11); // RX, TX
9
10
  #define COMSerial Serial
   #define ShowSerial SSerial
11
12
  RH_RF95<HardwareSerial> rf95(COMSerial);
13
14
15
  #endif
16
   17
18
19
  #ifdef AVR
20
   #define COMSerial Serial1
21
22 #define ShowSerial Serial
23
24 RH RF95<HardwareSerial> rf95(COMSerial);
25
26 #endif
27
```

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```
28
   29
30
  #ifdef ARDUINO SAMD VARIANT COMPLIANCE
31
32
  #define COMSerial Serial1
  #define ShowSerial SerialUSB
33
34
35
  RH_RF95<Uart> rf95(COMSerial);
36
37
  #endif
38
39
   40
41
  #ifdef ARDUINO ARCH STM32F4
42
43
  #define COMSerial Serial
  #define ShowSerial SerialUSB
44
45
46
  RH RF95<HardwareSerial> rf95(COMSerial);
47
48 #endif
```

Open the example

Open your Arduino IDE, click File >

Examples>Grove_LoRa_433MHz_and_915MHz_RF-master you will get many examples for the module.



Node	Example Name	Function
Sender	rf95_client	Send "Hello World" every 1s
Receiver	rf95_server	Receive data and print it

Click **Tools>Board** to choose "Seeeduino Lotus" and select respective serial port then click on Upload button to finish the steps.



Review Results

After upload completed, you can open the serial monitor to see the result.

© COM9	© COM16	– 🗆 X
		Send
RF95 client test.	RF95 server test.	^
Sending to rf95_server	got request: Hello World!	
No reply, is rf95_server running?	Sent a reply	
Sending to rf95_server	got request: Hello World!	
No reply, is rf95_server running?	Sent a reply	
Sending to rf95_server	got request: Hello World!	
got reply: And hello back to you	Sent a reply	
Sending to rf95_server	got request: Hello World!	
got reply: And hello back to you	Sent a reply	
Sending to rf95_server	got request: Hello World!	
got reply: And hello back to you	Sent a reply	
Sending to rf95_server	got request: Hello World!	
got reply: And hello back to you	Sent a reply	
Sending to rf95_server	got request: Hello World!	
got reply: And hello back to you	Sent a reply	
Sending to rf95_server	got request: Hello World!	
got reply: And hello back to you	Sent a reply	
Sending to rf95_server	got request: Hello World!	
got reply: And hello back to you	Sent a reply	
Sending to rf95_server	got request: Hello World!	~
Autoscroll	Autoscroll	Both M. & CR > 115200 haud

Data Rate

The below chart shows the relationships between the band rate signal band width spreding factor and sensitivity.

SingnalBandWidth	SpreadingFactor	Sensitivity(dbm)	ActualBandRate(pbs)
62.5kHz	SF=7	-126	2169
62.5kHz	SF=8	-129	1187
62.5kHz	SF=9	-132	656
62.5kHz	SF=10	-135	296
62.5kHz	SF=11	-137	164
62.5kHz	SF=12	-139	91
125kHz	SF=7	-123	4338
125kHz	SF=8	-126	2375
125kHz	SF=9	-129	1312
125kHz	SF=10	-132	733
125kHz	SF=11	-133	328
125kHz	SF=12	-136	183
250kHz	SF=7	-120	8676
250kHz	SF=8	-123	4750
250kHz	SF=9	-125	2624
250kHz	SF=10	-128	1466
250kHz	SF=11	-130	778
250kHz	SF=12	-133	366
500kHz	SF=7	-118	17353
500kHz	SF=8	-121	9501
500kHz	SF=9	-124	5249
500kHz	SF=10	-127	2932
500kHz	SF=11	-129	1557
500kHz	SF=12	-130	830

433MHz

868MHz

Resources

• Schematics

 Grove - LoRa Radio 433MHz v1.0 Schematics (Eagle files) [https://files.seeedstudio.com/wiki/Grove_LoRa_Radio/res /433_eagle.zip]

- Grove LoRa Radio 433MHz v1.0 Schematics (PDF files) [https://files.seeedstudio.com/wiki/Grove_LoRa_Radio/res /433_sch.pdf]
- Grove LoRa Radio 868MHz v1.0 Schematics (Eagle files) [https://files.seeedstudio.com/wiki/Grove_LoRa_Radio/res /868_eagle.zip]
- Grove LoRa Radio 868MHz v1.0 Schematics (PDF files) [https://files.seeedstudio.com/wiki/Grove_LoRa_Radio/res /868_sch.pdf]
- Datasheet
 - RFM95/96/97 Datasheet

[https://files.seeedstudio.com/wiki/Grove_LoRa_Radio/res /RFM95_96_97_98_DataSheet.pdf]

• Atmega168 Datasheet

[https://files.seeedstudio.com/wiki/Grove_LoRa_Radio/res /Atmel-2545-8-bit-AVR-Microcontroller-ATmega48-88-168_Datasheet.pdf]

- References
 - LoRa Alliance [https://www.lora-alliance.org/]
- Library
 - Grove LoRa Radio Library and Examples
 [https://github.com/Seeed Studio/Grove_LoRa_433MHz_and_915MHz_RF/]
 - LMIC Library

[https://github.com/matthijskooijman/arduino-Imic]

Download ALL Above

[https://files.seeedstudio.com/wiki/Grove_LoRa_Radio/res/res.

zip]

Tech Support

Please submit any technical issue into our forum

[https://forum.seeedstudio.com/].



[https://www.seeedstudio.com/act-4.html? utm_source=wiki&utm_medium=wikibanner&utm_campaign=newpr oducts]