SX1278

Contents

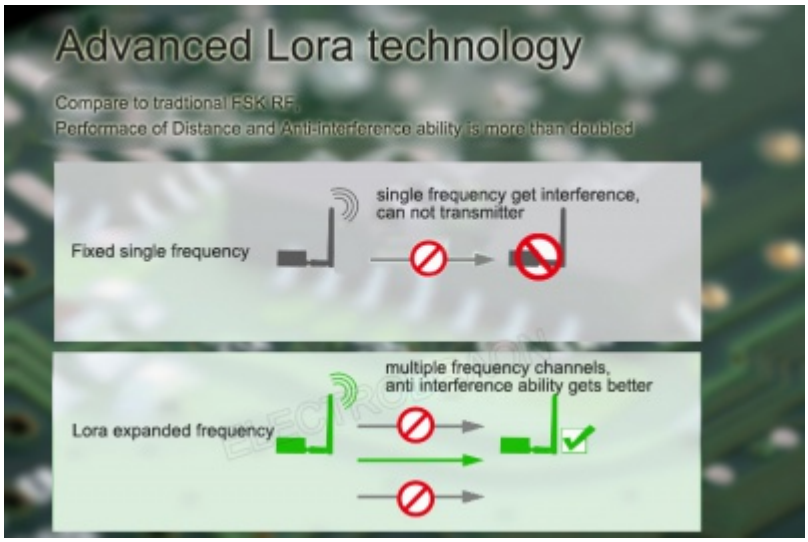
Introduction

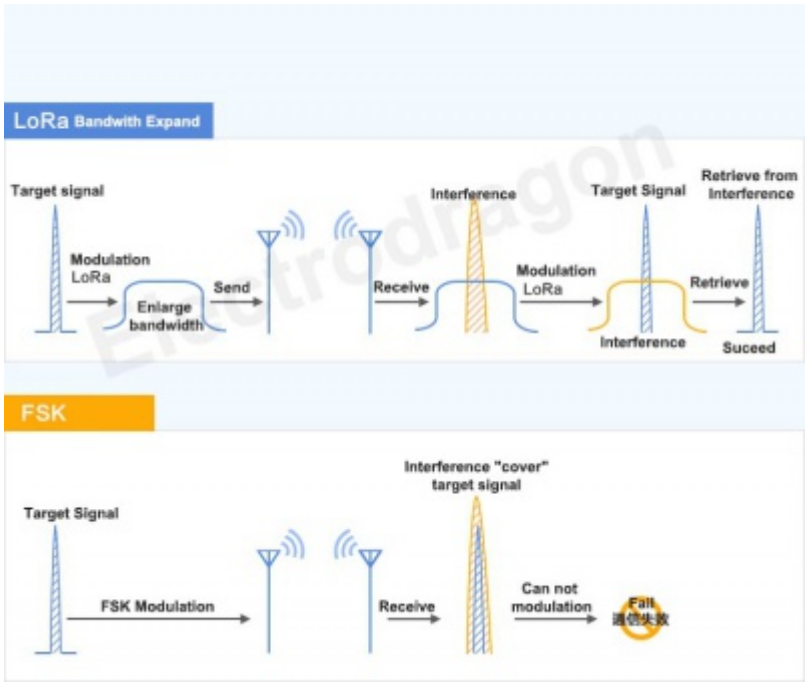
LORA = Long range EX78 wireless front-end module, using high-performance, highly integrated RF transceiver chip SX1278 design and production.

Advanced LoRa spread spectrum communication technology to ensure that the module communication distance and anti-jamming capability greatly improved, and also do a very low current consumption.

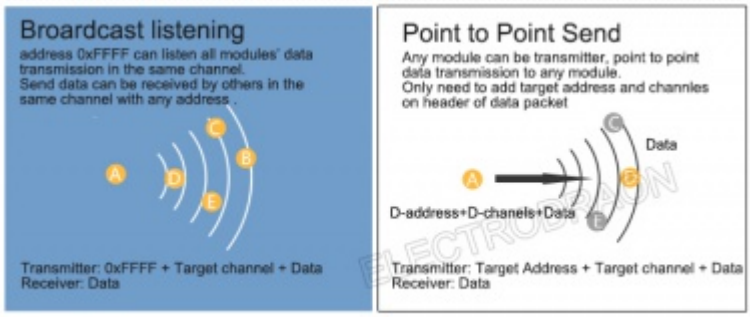
In the LoRa mode, the EX78 offers higher reception sensitivity performance, stronger anti-jamming coding capability, and improved communication range and reliability compared to the same transmit and receive modules on the market. In the normal (G) FSK mode, can also provide the industry's products equivalent to the receiver sensitivity, and very high communication speed.

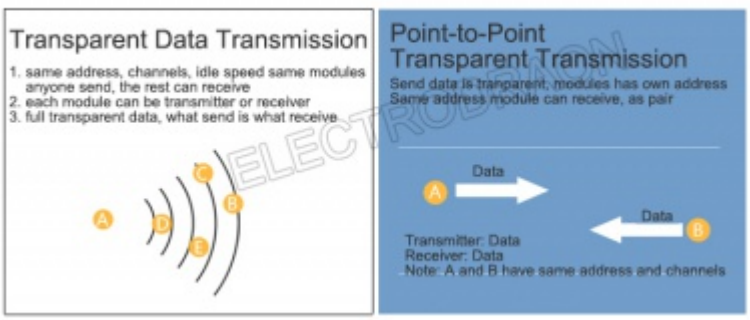
EX78 is a wireless module that supports powerful spread spectrum communication technology and low current consumption. It can be widely used in meter reading system, energy monitoring system, wireless industrial remote control, wireless data acquisition and control, wireless security Alarm, smart home and other fields.





Lora bandwidth techlogy





Features

Main features

- SPI Interface
- central frequency 433mhz, or 470mhz
- referencial distance 10KM
- SX1278 IC, TTL output
- Max power rate 20dbm, can be setup by software

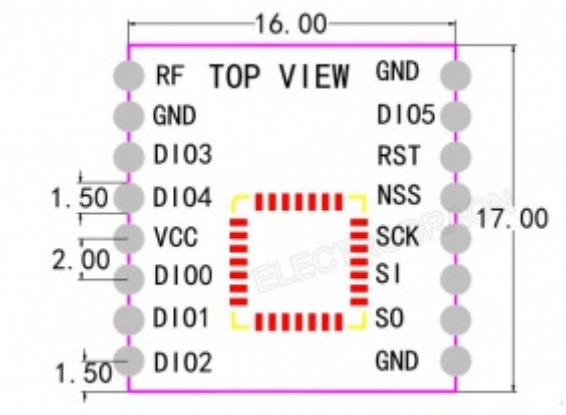
- 1.7-3.8V power supply

Specfication

- Operating voltage: 1.8 ~ 3.7V
- Receiving current: 10 ~ 14mA
- Tranmission current:
- 120 mA @ + 20 dBm
- 90mA @ + 17dBm
- 29mA @ + 13dBm
- Operating frequency: 433MHz, 475MHz
- Transmit power: +20 dBm
- Receiver sensitivity:
- -139dBm @ LoRaTM & 62.5Khz & SF = 12 & 146bps
- -136 @ LoRaTM & 125Khz & SF = 12 & 293bps
- -118 @ LoRaTM & 125Khz & SF = 6 & 9380bps
- -123@FSK&5Khz&1.2Kbps
- -117@FSK&5Khz&4.8Kbps
- -110@FSK&20Khz&38.4Kbps
- Frequency error: +/- 10ppm
- FIFO space: 64 bytes
- Data rate:
- 1.2K~300Kbps@FSK
- 0.018K ~ 37.5Kbps @ LoRaTM
- Modulation: FSK, GFSK, MSK, GMSK, LoRaTM, OOK
- Interface type: SPI
- Sleep Current: 0.2uA@SLEEP, 1.5uA @ IDLE
- Operating temperature: -40 ℃ ~ +85 ℃
- Digital RSSI function
- Automatic frequency correction
- Automatic Gain Control
- RF wake-up function
- Low voltage detection and temperature sensors
- Fast wake-up and frequency hopping
- Highly configurable packet handlers
- Antenna diversity and TX / RX switch control

Pin definition, size

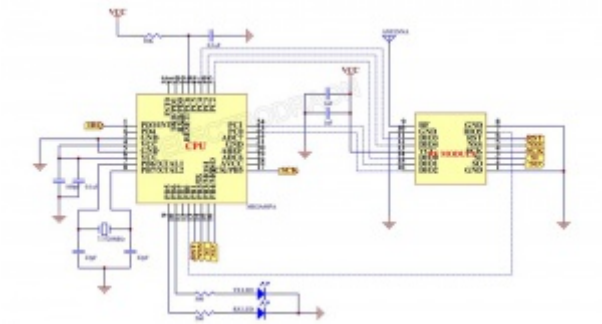
- 1 GND - Negative power ground
- 2 SO I SPI interface MISO data output
- 3 SI O SPI interface MOSI data input
- 4 SCK I SPI interface SCLK clock input
- 5 NSS I SPI Interface NSS Select input
- 6 RESET I Reset pin
- 7 DIO5 I / O direct connect chip DIO5 digital I / O pin, software setting
- 8 GND - Negative power ground
- 9 RF I / O RF signal input / output, connected to 50Ω antenna
- 10 GND - Negative power ground
- 11 DIO3 I / O direct connect chip DIO3 digital I / O pin, software setting
- 12 DIO4 I / O direct connect chip DIO4 digital I / O pin, software setting
- 13 VCC - positive power supply 1.8 ~ 3.7V
- 14 DIO0 I / O direct connect chip DIO0 digital I / O pin, software setting
- 15 DIO1 I / O direct connect chip DIO1 digital I / O pin, software setting
- 16 DIO2 I / O Direct Connect DIO2 Digital I / O pin, software setting



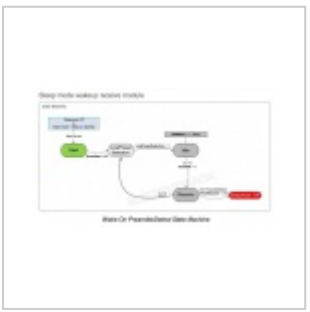
Application

- Use with atmega48 IC

Use



Wakeup Sequency



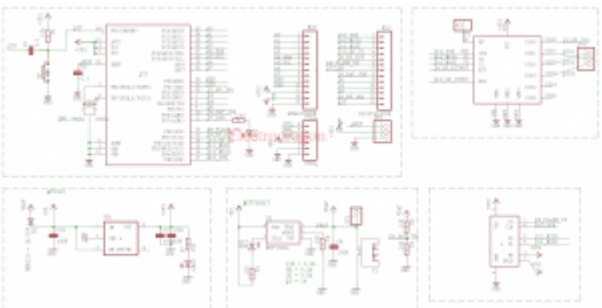
- Note: Why there is only one switch on board, has one transistor missed?

SMETECH factory recommended application circuit, RF switch selection is PE4259, we are using the model. SX1278 chip 20PIN control PE4259 4PIN, to achieve automatic switching transceiver. Mainly PE4259 function than ordinary RF switch powerful, the use of ordinary RF switch, you need to add a transistor in the circuit board in order to achieve automatic switching transceiver or CPU / SX1278 two GPIO to control the general RF switch tube Two I / O, to achieve transceiver switch (but not automatically switch). In order to reduce the on-board components, 16 * 16mm PCBA area reserved on the location of the shield, so choose this higher price of PE4259 RF switch design circuit. PE4259 than ordinary RF switch you about 3 to 5 times.

Loraduino

- Demo sketch please find at, RF95 client send is default flashed in board - https://github.com/Edragon/Arduino/tree/master/Sketchbook/02_LORA
- if you have a pair, just flash another one to client server, LED will blink when data is transceiving between two modules, and 9600 baudrate serial output hello to you.
- Sketch include battery check function, but not yet fine tuned (to-do)

Pin Definition



customer please see wiki login info in tracking info email to access

Atmega328	D13-D11 SPI	D10	D9	D8	D7	D6	D2
Function	D13-D11 SPI	SX1278 CS	SX1278 RST	SPI Flash CS	LED	Battery Check	SX1278 IRQ

- Demo Sketch - Use Radiohead RF95 library, preload demo sketch rf95_reliable_client
- Schematic see on this right.

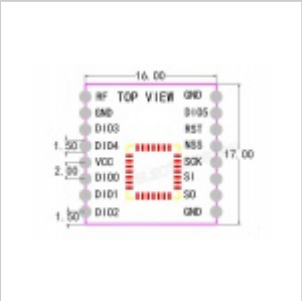
Set Frequency

```
...
  if (!manager.init())
   Serial.println("init failed");
 driver.setFrequency(470.0);   // add frequency set here
...
```

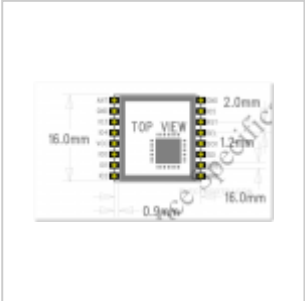
- Further low power test could see here. and [thread on forum. (https://b.electrodragon.com/t/9)]

LORA Modules

EE1 Lora Module 100mW



Pin definition



Dimension

Pin Definition

- GND - negative ground
- SDO 0 SPI Interface MISO Data Output
- SDI I SPI Interface MOSI Data Input
- SCK I SPI Interface SCLK Clock Input
- SEL I SPI Interface NSS Select Input
- RST I/O reset pin
- IO5 I/O Direct Chip DIO5 Digital I/O Pin, Software Set
- GND - negative ground
- ANT I/O RF Signal Input/Output with 50Ω Antenna
- GND - negative ground
- IO3 I/O Direct Connect Chip DIO3 Digital I/O Pin, Software Setup
- IO4 I/O Direct Connect Chip DIO4 Digital I/O Pin, Software Setup
- VCC - Positive Power Supply 1.8 to 3.7V
- IO0 I/O directly connected to the chip DIO0 digital I/O pin, software setting
- IO1 I/O Direct connection to chip DIO1 digital I/O pin, software setting
- IO2 I/O Direct Connect Chip DIO2 Digital I/O Pin, Software Setup

Specification

- Interface form: SPI
- Sleep current: 0.2uA@SLEEP, 1.5uA@IDLE
- Working temperature: -40°C ~ +85°C
- Digital RSSI function

- Automatic frequency correction
- Automatic gain control
- RF wake up function
- Low voltage detection and temperature sensor
- Fast wake-up and frequency hopping
- Highly configurable packet handler
- Antenna diversity and TX/RX switch control
- Size: 16*16*2.7mm, including plate thickness 1mm
- Operating voltage: 1.8 to 3.7V
- Receiving current: 10~14mA
- Send current: 120mA@+20dBm, 90mA@+17dBm, 29mA@+13dBm
- Operating frequency: 433MHz, 470MHz
- Transmission power: +20dBm
- Receiving sensitivity:

```
-139dBm@ LoRa TM &62.5Khz&SF=12&146bps
-136@LoRa TM &125Khz&SF=12&293bps
-118@LoRa TM &125Khz&SF=6&9380bps
-123@FSK&5Khz&1.2Kbps
-117@FSK&5Khz&4.8Kbps
-110@FSK&20Khz&38.4Kbps
```

- Frequency error: +/-10ppm
- FIFO space: 64Byte
- Data rate:

```
1.2K to 300Kbps@FSK
0.018K～37.5Kbps@ LoRa TM
Modulation: FSK, GFSK, MSK, GMSK, LoRaTM, OOK
```

EE2 Lora Module 1W

Version	433	868	915	170
Frequency	410~441mhz	862~893mhz	900~931mhz	160~173.5mhz
Feature	ISM - Asia	EU	America	High peneration
Chip	SX1278	SX1276	SX1276	SX1278
Power	30dBm (1W)	30dBm (1W)	30dBm (1W)	30dBm (1W)
Distance	8Km	8Km	8Km	8Km
Communication	UART	UART	UART	UART
Footprint and Size	43*24 mm DIP	43*24 mm DIP	43*24 mm DIP	43*24 mm DIP
Current	610 mA	680 mA	700 mA	680 mA
Voltage	3.3-5.2VDC	3.3-5.2VDC	3.3-5.2VDC	3.3-5.2VDC
Baud rate	1200-115200	1200-115200	1200-115200	1200-115200
On Air speed	0.3-19.2kbps	0.3-19.2kbps	0.3-19.2kbps	0.3-19.2kbps
Transmission length	512 bytes	512 bytes	512 bytes	512 bytes
Sensitivity	-147dbm@0.3kbps	-147dbm@0.3kbps	-147dbm@0.3kbps	-147dbm@0.3kbps

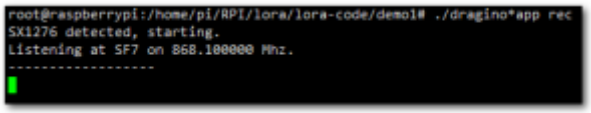
Working Mode

- M0/M1 - 0/0 - normal mode
- M0/M1 - 1/0 - wake up on air from transitter mode, auto add wake code
- M0/M1 - 0/1 - wake up on air from receiver mode, can not send in this mode

- M0/M1 - 1/1 - sleep mode, also enter into config mode

Lora Shield for RPI

- Demo code page (https://github.com/Edragon/RPI)
- For demo1 code, Config value

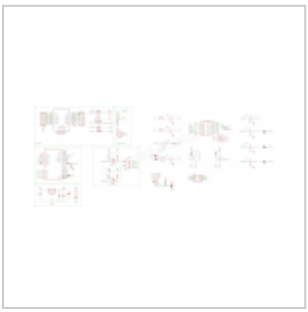



```
// SX1272 - Raspberry connections
int ssPin = 6; // GPIO25, IO_GEN6
int dio0  = 7; // GPIO4, IO_GCLK
int RST   = 0; // GPIO17, IO_GEN0

// Set spreading factor (SF7 - SF12)
sf_t sf = SF7; //?

// Set center frequency
uint32_t  freq = 868100000; // in Mhz! (868.1) //?
```

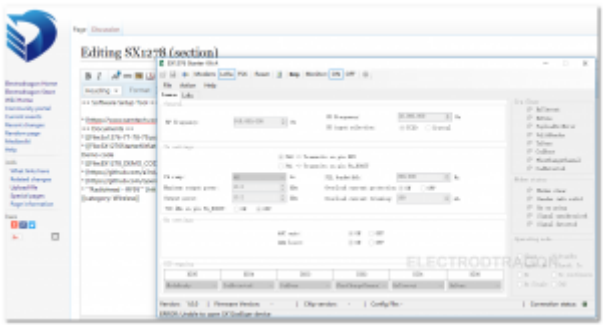
Reference Schematic



ESP Lora schematic

Software Setup Tool

- Use PC GUI to setup IOs
- Download SX1276 starter kit exe (https://www.semtech.com/uploads/documents/SX1276StarterKitSetup-20140728-v1.0.0.exe)



Documents

- File:Sx1276-77-78-79.pdf
- File:SX1276StarterKitSetup-20140728-v1.0.0.zip - pass electrodragon

Demo code

- File:EX1278 DEMO CODE.zip - pass electrodragon, AVR C demo code
- Arduino demo code (https://github.com/a3rd/lora-inair4)
- openelectronic demo code (https://github.com/open-electronics/LoRa/releases)
- **Radiohead - RF95** recommended (http://www.airspayce.com/mikem/arduino/RadioHead/)

Retrieved from "http://www.electrodragon.com/w/index.php?title=SX1278&oldid=23790"