



LRCR1-1276H Wireless SPI Transmission Module V2.0

# **LRCR1-1276H Wireless SPI Transmission Module**

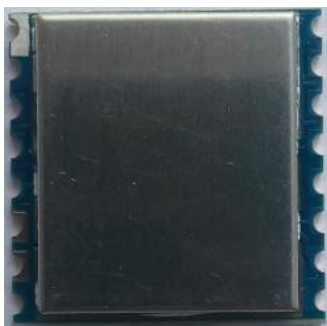
## **Version 2.0**



## 1. Product description

SX1276 wireless SPI module is developed based on long distance and high capacity internet system solution by SEMTECH. Except the configuration technology of traditional GFSK module, the new SX127x use LORA long-distance spread spectrum technology. The module has high performance of transmission sensitivity and anti-interference. The module can easily embedded to existing product or system and get rid of wire transmission way. User needs to customize the communication protocols on existing micro-controller unit (MCU) to activate the bidirectional communication and realizing data transmission.

### 1.1 Product Appearance



### 1.2

#### Technical Parameter

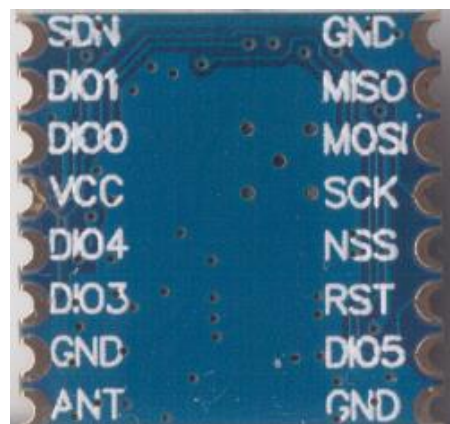
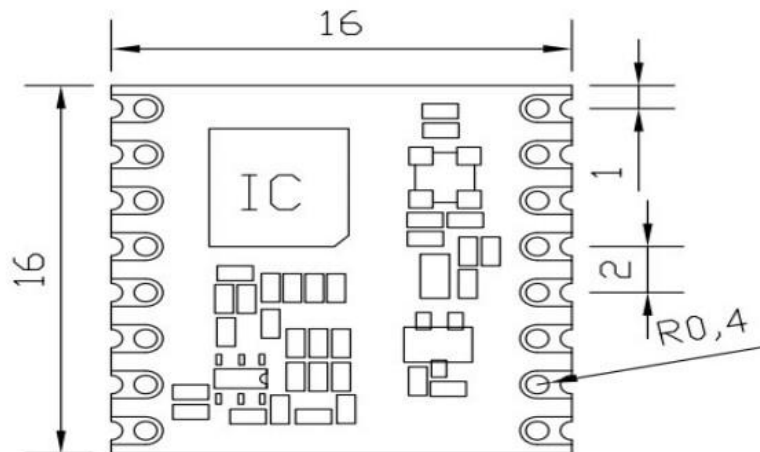
Type	Index Name	Wireless Module
RF	Modulation mode	LoRaTM spread spectrum, FSK mode
	Frequency range	902-928MHz
	Transmitting power	< 16dBm ( EIRP)
	Transmission sensitivity	-143dBm
	Transmission speed	Spread spectrum factor (SF) and bandwidth (BW) setting
	Transmission distance	3000-5000 Meter
	Antenna connection	External SMA antenna, spring antenna, sucker
	FIFO	Max 256 bytes



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	Low-voltage detection	Voltage lower than threshold, voltage interrupts
	CAD detection	Support wak-on-wireless
Power Consumption	Input voltage	DC 3.3V
	Max emission current	$\leq 120\text{mA}(20\text{dBm})$
	Max receiving current	$< 10\text{mA}$
	Static Current	$< 1\mu\text{A}$
Work Environment	working temperature	$-40^{\circ}\text{C} \sim 85^{\circ}\text{C}$

### 1.3 Appearance size chart



Provide data interference of SPI wireless module for users' convenient to install and use. The specific pin is as below:



Left Side:

Identification	Function	Remark
SDN	Control RF switch	High level for general transmission, low level for static current
DIO1	I/O Digital I/O Port	GPIO I/O GPIO output I/O
DIO0	Digital I/O Port	GPIO output I/O
3.3V	Power	3.3V(1.8~3.3V)
DIO4	Digital I/O Port	GPIO output I/O
DIO3	Digital I/O Port	GPIO output I/O
GND	Wire ground	
ANT	Wire output	

Right Side:

Identification	Function	Remark
GND	Power ground	
MISO	SPI data output	GPIO output
MOSI	SPI data input	GPIO input
SCK	SPI clock	GPIO input
NSS	SPI select	GPIO input
NRESET	Reset trigger	GPIO output I/O
DIO5	Digital I/O port	GPIO output I/O
GND	Power ground	

## 2. Hardware specific description

### 2.1 SPI bus

NSS(SEL): SPI chip select

MOSI: master output slave input

MISO: master input slave output

SCK: SPI clock

### 2.2 DIO0-DIO5 instruction

LORA mode per below:



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Operating Mode	DIOx Mapping	DIO5	DIO4	DIO3	DIO2	DIO1	DIO0
ALL	00	ModeReady	CadDetected	CadDone	FhssChangeChannel	RxTimeout	RxDone
	01	ClkOut	PllLock	ValidHeader	FhssChangeChannel	FhssChangeChannel	TxDone
	10	ClkOut	PllLock	PayloadCrcError	FhssChangeChannel	CadDetected	CadDone
	11	-	-	-	-	-	-

FSK mode per below:

	DIOx Mapping	Sleep	Standby	FSRx/Tx	Rx	Tx
DIO0	00	-	-	-	PayloadReady	PacketSent
	01	-	-	-	CrcOk	-
	10	-	-	-	-	-
	11	-	TempChange / LowBat	TempChange / LowBat	-	-
DIO1	00	FifoLevel	FifoLevel	FifoLevel	-	-
	01	FifoEmpty	FifoEmpty	FifoEmpty	-	-
	10	FifoFull	FifoFull	FifoFull	-	-
	11	-	-	-	-	-
DIO2	00	FifoFull	FifoFull	FifoFull	-	-
	01	-	-	-	RxReady	-
	10	FifoFull	FifoFull	FifoFull	TimeOut	FifoFull
	11	FifoFull	FifoFull	FifoFull	SyncAddress	FifoFull
DIO3	00	FifoEmpty	FifoEmpty	FifoEmpty	FifoEmpty	-
	01	-	-	-	-	TxReady
	10	FifoEmpty	FifoEmpty	FifoEmpty	FifoEmpty	-
	11	FifoEmpty	FifoEmpty	FifoEmpty	FifoEmpty	-
DIO4	00	-	TempChange / LowBat	TempChange / LowBat	-	-
	01	-	-	-	PllLock	-
	10	-	-	-	TimeOut	-
	11	-	-	-	Rssi / PreambleDetect	-
DIO5	00	ClkOut if RC	ClkOut	-	-	ClkOut
	01	-	-	-	PllLock	-
	10	-	-	-	-	Data
	11	-	ModeReady	ModeReady	-	-

### 2.3 Simple application specification

Per LORA mode as example:

DIO0 use as instruction of transmitting and receiving, DIO4 use as instruction of lead code. DIO3 and DIO4 use for preventing wireless data collision.

**Remark:**

The precondition of realizing communication between two modules are they have same frequency, spread spectrum factor and bandwidth.

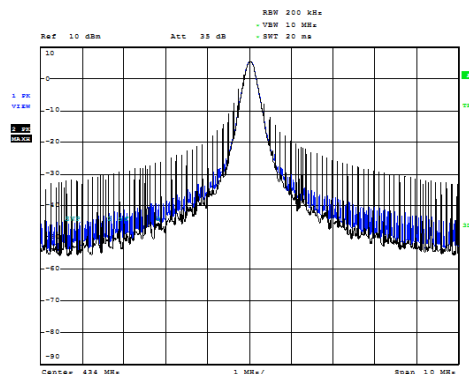
## 3. Parameters

### 3.1 Carrier frequency:

To spread or carrier the frequency based on the frequency. It's a carrier signal if no digital transmitted.



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### 3.2 Spreading spectrum factor (SF)

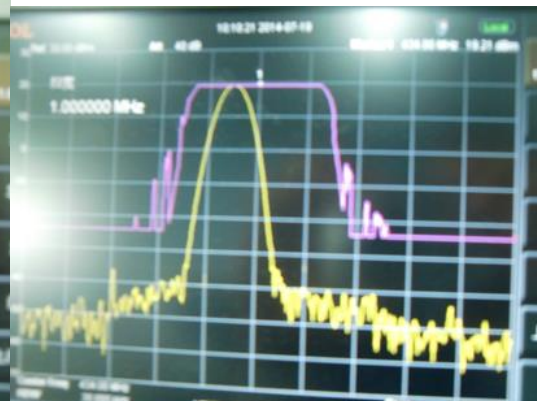
Spreading factor is the basic component of CDMA (code division multiple access),  $\text{chip speed} = \text{symbol rate} \times \text{SF}$ , the use of SF ensure the wider selection of symbol rate in TD information channel and provide solid support for QOS. SF also determines the quantity of access to end. The size of SF determines the size of real digital data rate for user (remark, data refer to real digital data. take data 11111111 as example, user A use 11 to represent 1, his real data is 1111; user B use 1111 to represent 1, however his real data is 11. User B is less likely to make mistakes than user A, but user B's data rate is less than user A.) Due the existing of orthocode, if we increased SF, the user's real data decreased from control center's view. However, the available user numbers are (spreading code) increased and real data rate remain unchanged.

### 3.3 LORA

LORA, in another way, is to modulate the signal under wider spectrum than basic. Below is the LORA figure of 125K and 250K (the broadband refer to purple line, signal modeling line refer to yellow line). The setting of LORA decided by crystal accuracy, our recommendation on Min ROLA is 125K.



125K ROLA



250K ROLA

## 4. Wire selection

Antenna is the main part of communication system. The quality of antenna affect the communication index directly. It is important for a user to select the antenna.

Generally there're two points on selecting antenna:

- (1) Antenna type: if the wave of antenna met system design requirement
- (2) Electric performance: if the broadband, transmission gain, impedance, rated power met system design. Generally the transmission gain is  $50\Omega$ , stationary wave is less than 1.4.

We provide multiple antenna solution for users to realizing best transmission result.



## 5. Fault description

Here are the common problems with the module:

Fault	Cause of fault	Solution
Transmissi on distance short	Complex environment, too many obstacles	Use in external open air and put up high support for antenna



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	Bad weather, like fog, rain, snow, dust etc.	Avoiding bad weather or use high power module
	Antenna is not match leads to less gain	Select right antenna and use high gain antenna
	Transmission rate over fast	Lower the rate, including gorge line and air rate.
	The interference from similar frequency or strong magnetic or power	Switch channel to avoid interference
Communic ation fault	Incorrect connection	Reconnect the line according to diagram
	Loose contact	Reconnect the power, signal line and bound them
	Module match fault with level	Use TTL/RS232/RS485 connection
	Module match fault with device parameter	Reset parameter, baud rate, checksum etc.
	Transmitting and receiving match fault	Reset parameters, frequency, channel, air speed, etc.
	Data overload	Divide transmission line or change higher performance module
	Module level chip broke	Change chip RS232、RS485
	Main module damage	Change new module
error rate Too high	User equipment damage	Use wire to get test done and change to wireless module after
	Similar frequency interference	Get away from the interference or change frequency
	Antenna system match fault	Change antenna system



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	Setting fault of serial port and air baud rate	Ensure device speed same with serial speed, and module with air baud rate
	Communication speed overload	Try lower the speed, especially air baud
	Large power ripple	Change to stable power
	Port line over length	Change to better cable or shorter ones

### 6. Attention

- (1) If the power supply within the required range, Special requirements to 3.3V power supply, the power supply voltage not exceed this voltage, Otherwise it will burnout the module
- (2) This module is not waterproof, lighting protection, pay attention to waterproof and lighting protection
- (3) Don't reverse connection the positive and negative of power supply, otherwise it will burnout module
- (4) The module should be installed in prevent static interference environment, the antenna part is best not to contact with metal objects.
- (5) When install the module, the antenna position shouldn't be too close to the MCU of the product to prevent interference.
- (6) When power supply, Confirm the ground wire of the module is connected with ground wire of your product.
- (7) In normal operation, please do not touch the module and antenna part, so as to achieve the best transmission effect.

### 7. Applications

Wireless access control checks on work attendance  
Wireless Power measurement and control  
Petrochemical wireless measurement and control  
Wireless measurement and control of oil field  
Wireless computer room monitoring etc.



## 8. FCC Statement

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 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.

**NOTE:** Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment.

### **RF exposure warning**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

### **Module statement:**

The module's FCC ID is not visible when installed in the host, or If the host is marketed so that end users do not have straight forward commonly used methods for access to remove the module so that the FCC ID of the module is visible; then an additional permanent label referring to the enclosed module: Contains Transmitter Module FCC ID: 2AQXP-LCR1-1276H or Contains FCC ID: 2AQXP-LCR1-1276H must be used.