



NF-02-PE(Si24R1) Specification

Version V1.1

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Document development/revision/revocation resume

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1. Product Overview

NF-02-PE (Si24R1) is a wireless, integrated 2.4G module. The module is embedded with the Si24R1 RF chip and power amplifier chip, with a transmitting power up to 20dBm; and transmission rate of up to 2Mbps, with a standard SPI communication interface, cost-effective. The module adopts 2.54mm standard pin interface, convenient assembly, and can be quickly applied to various terminal products.

NF-02-PE (Si24R1) is suitable for a variety of Internet of Things occasions, widely used in wireless mouse, wireless remote control, motion sensing equipment, active RFID,NFC, low power self-hoc network wireless sensor nodes, etc.

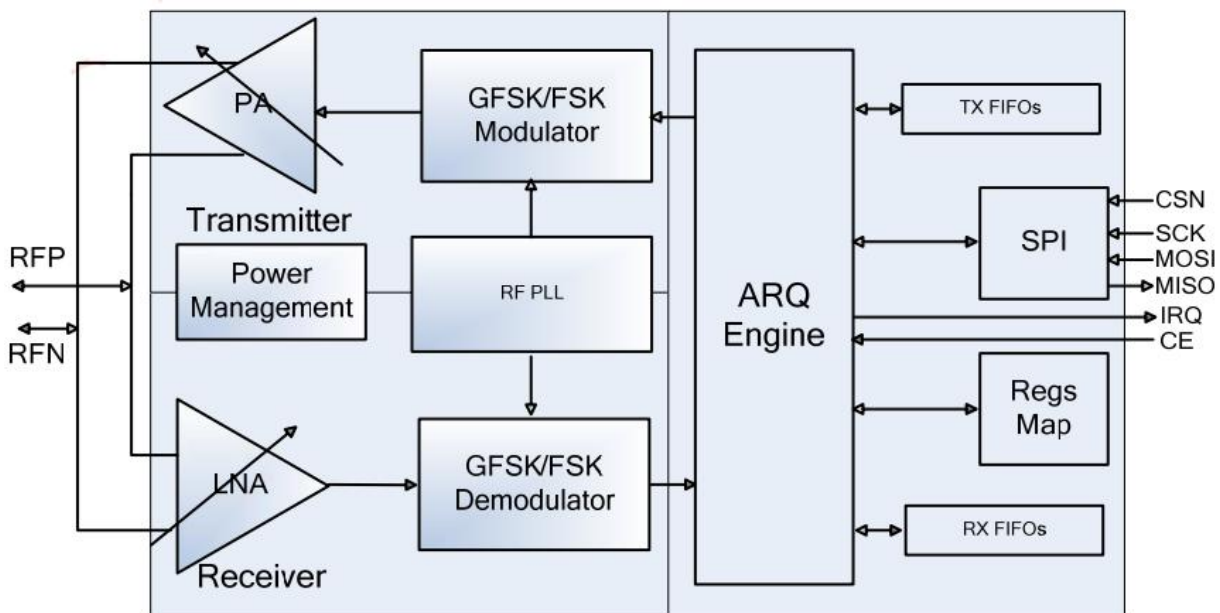


图 1 芯片架构图

1.1. Characteristics

- DIP-8 ultra-small size package, simple to use
- Using the GFSK / FSK modulation mode
- Support for the 2Mbps/1Mbps/250Kbps data rate
- Wide power supply voltage range: 2.0~3.6V
- Channel: 126 RF Channels
- Receive sensitivity: -96dBm@250kbps
- Max. emission power: 20dBm

- Four-wire SPI interface for up to 10Mbps
- Internal integrated intelligent ARQ base-band protocol engine
- Send and receiving data hardware interrupt output
- Support for 1bit RSSI output

1.2. Main parameters

Table 1 main parameter descriptions

Model Name	NF-02-PE (Si24R1)
Package	DIP-8
Size	40.8*15.3*19.0(±0.2)mm
Antenna	SMA external antenna
Frequency Range	2400~2525MHz
Modulation mode	GFSK/FSK
Emission power	Max 20dBm
Data Rate	Support 2Mbps/1Mbps/250Kbps
Channel	126 RF channels, each channel apart 1MHz
Test Distance	1000meters(Clear, no obstacle, and maximum emission power)
Operating Temperature	-40°C ~ 85°C
Store Temperature	-40 ~ 125°C,<90%RH
Receive sensitivity	-96dBm@250Kbps
Emission length	Individual Data Package 1~32 bytes, 3 class FIFO
Receive length	Individual Data Package 1~32 bytes, 3 class FIFO
Power supply range	Voltage supply 2.0V~3.6V, current supply>250mA
Standby current	26μA

Receive current	25mA(2Mbps)
Emission current	250mA(20dBm)
Support Interface	SPI
Interface Rate	SPI 最高速率 10Mbps

1.3. Electrical parameters

NF-02-PE (Si24R1) module is electrostatic sensitive devices and special precautions need to be taken when handling



Picture 2 ESD Anti-static diagram

1.4. Electrical characteristics

Table 2. Description of Electrical Characteristics and Parameters

Parameters		Conditions	Min	Typical values	Max	Unit
Voltage		VDD	2.0	3.3	3.6	V
I/O	V _{IL} /V _{IH}	-	-0.3/0.75VD D	-	0.25VDD/VDD+0. 3	V
	V _{OL} /V _{OH}	-	N/0.8VIO	-	0.1VIO/N	V

1.5. 2.4G RF Performance

Table 3: Description of Electrical Characteristics and Parameters

Description	Typical value	Unit
-------------	---------------	------

Operating frequency	2400-2525	MHz
Output power		
Maximum output power	20±2	dBm
Receive sensitivity		
2Mbps	-83±2	dBm
1Mbps	-87±2	dBm
250kbps	-96±2	dBm

2. Appearance and dimensions

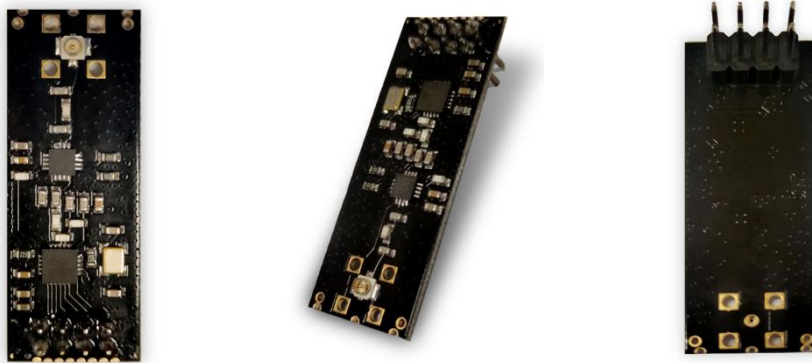


Figure 3 module diagram (pictures for reference only)

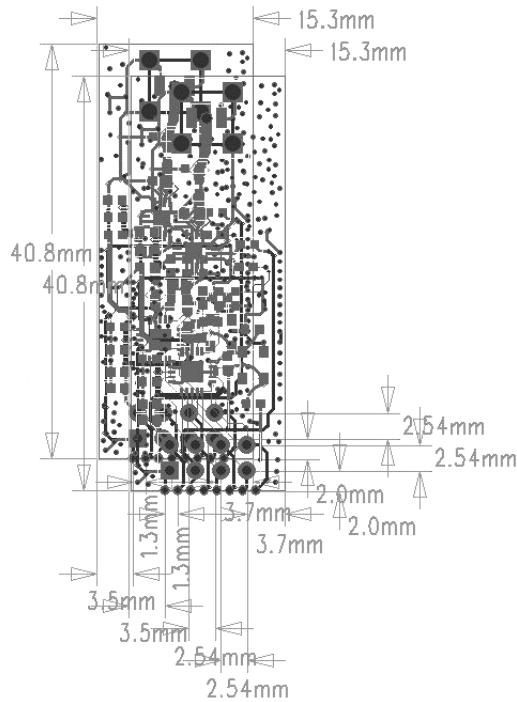


Figure 4 Module Size

3. Pin definition

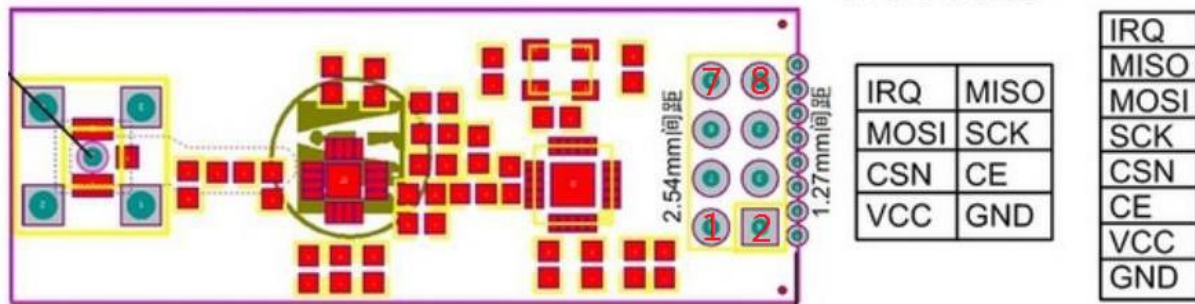


Figure 5 Pin definition diagram

Table 4 Pin Function Definition

Pin No.	Name	Function
1	VCC	Power supply, which must be between 2.0~3.6V
2	GND	Ground wire, connected to the power supply reference

		ground
3	CSN	Block select pin to start a SPI communication
4	CE	Module enable control pin, CE at low level in standby mode
5	MOSI	Module SPI data input pin
6	SCK	Module SPI bus clock
7	IRQ	Module interrupt signal output, low level effective
8	MISO	Module SPI data output pin

4. Application circuit

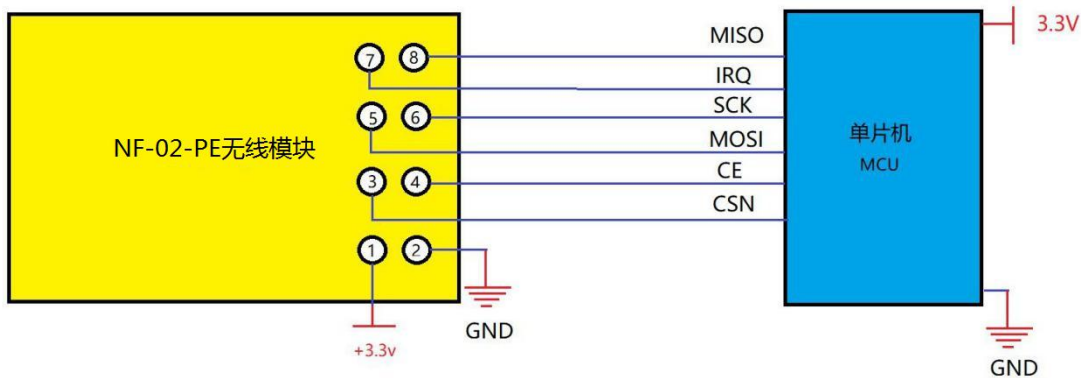


Figure 6 Application Circuit

4.1. Application Instructions

- It is recommended that the CE pin connect to the GPIO port of the MCU.
- IRQ is not connected to obtain the interrupt state of the STATUS register by SPI query. However, it is recommended to use the hardware external interrupt of the MCU, let the IRQ connect to the single chip computer external trigger pins, trigger the single chip computer interrupt.
- The RF chip model used by NF-02-PA (Si24R1) is to read and write the Si24R1, chip register according to the chip manual, see the Si24R1 chip manual or download sample STM32 and 51 drivers on the official website.
- Pay attention to good grounding, large area paving, small power ripple, increase filter capacitance and be as close to GND pins of module VCC as far as possible.

- Other model selection of 2.4G refer to this web:

<https://docs.ai-thinker.com/2.4g>

5. Design guidance

5.1. Notes

- High frequency analog devices have static sensitive characteristics, please avoid human contact with electronic components on the module.
- Ensure that the power supply must have a small ripple and avoid the large beating of the supply voltage value, the type π filter (ceramic capacitance // tan capacitor + inductance) is recommended.
- The module ground uses a single point ground mode, recommended 0 Euro resistance, or 0mH inductance, and the other circuits are referenced separated.
- Whether the antenna nearby is covered by a metal shell, some components will affect the performance of the antenna, such as relays, and also need to ensure that the antenna is exposed, preferably vertical upward.
- If there are other wireless modules in the same product, reasonable frequency planning and shielding measures are required to reduce the influence of harmonic interference and intermodulation interference.
- If there is present near the module circuit board, increase the linear distance between the module and the crystal as possible.

5.2. Power supply

- Recommended 3.3V voltage with peak current above 250mA.
- LDO power supply is recommended; if DC-DC recommends ripple control within 30mV.
- The DC-DC power supply circuit recommends reserving the position of the dynamic response capacitance to optimize the output ripple when the load changes greatly.
- The 3.3V power interface is recommended to add ESD devices.

5.3. FAQ

Table 5. Communication distance is very close, not reaching the ideal distance

No.	Reason	Description
01	obstacle	Due to 2.4G its physical characteristics and poor penetration, the communication distance will be greatly shorter
02	Interference source	Temperature, humidity and electromagnetic wave interference at the same frequency end will lead to an increase in the packet loss rate of communication
03	Antenna	The antenna uses a 50 ohm impedance walk line that causes signal attenuation with a metal object near the antenna or by placing the module in the shield cover
04	CE pin	Failure to keep transmitter at high level in program configuration causes reduced sensitivity when accepting response model
05	Emission power	With the register configuration, the higher the transmit power configuration, the farther the transmit
06	Emission power	If the configured emission rate is too high, the emission distance is relatively reduced
07	Low voltage	Power supply voltage less than 3.3v, causes insufficient power supply of the module and relatively affects the transmitting power of the module

Table 6 Heat damage e heating damage

No.	Reason	Description
01	Supply voltage	Check the power supply to ensure between 2.0~3.6V, cause over 3.6 V causes module damage.
02	Stability	Check the stability of the power supply, and the voltage cannot fluctuate too much
03	Antistatic protection	Ensure anti-static operation during power installation and use, and high-frequency devices have static sensitivity
04	Welding	Module cannot pass re-flow and peak welding or it will be damage

6. Package information

The package of NF-02-PE (Si24R1) is in anti-static bag.



Figure 7 Packaging Diagram

7. Contact us

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Official Forum: <http://bbs.ai-thinker.com>

Sample purchase: <https://ai-thinker.en.alibaba.com/>

Business cooperation: overseas@aithinker.com

Technical support: support@aithinker.com

Company Address: 410, Block C, Huafeng Smart Innovation Port,
Gushu 2nd Road, Xixiang, Baoan District, Shenzhen.

Tel : 0755-29162996

