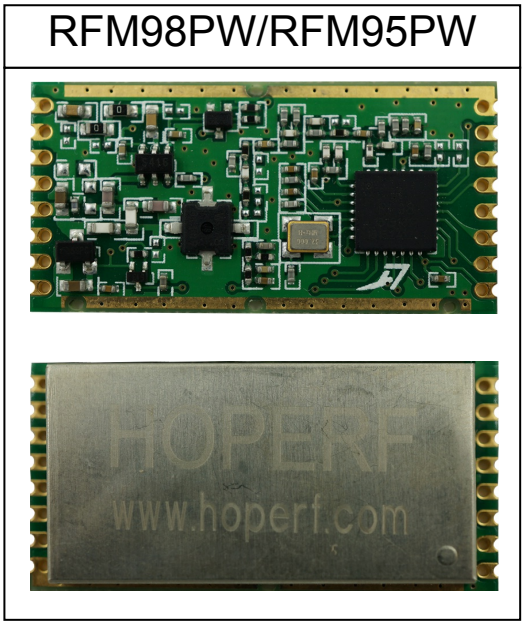
RFM98PW/RFM95PW

Enhanced Power Long Range Transceiver Module

（The purpose of this RFM98PW/RFM95PW spec covers mainly for the hardware and RF parameter info of the module, For software info please refer to RF98/RF96 chip datasheets and demo program of HopeDuino™ Development Kit）



1. General Introduction

RFM98PW/RFM95PW module series' design is based on the high performance LoRa™ modulation technique RF98/RF96 chip, It operate at 169/433/470MHz (RFM98PW) and 868/915MHz(RFM95PW) ISM band , The low receive sensitivity(–136dBm) coupled with Enhanced +30dBm output power ensures extended range and improved link performance.

2. Features:

- LoRa™ Modem.
- 166dB maximum link budget.
- +30 dBm output power @433/470MHz band; +27 dBm output power @169 /868/915 MHz band.
- Programmable bit rate up to 300 kbps.
- High sensitivity: down to -136dBm.
- Low RX current of 13mA.
- FSK, GFSK, MSK, GMSK, LoRa™ and OOK modulation.
- Built-in bit synchronizer for clock recovery.
- Automatic RF Sense and CAD with ultra-fast AFC.
- Packet engine up to 256 bytes with CRC.
- Built-in temperature sensor and low battery indicator.
- SMD Package (35.4x18X3.85mm)

3. Typical Application：

- Long Range system
- Meter Reading
- Wireless data collection
- Automobile security system
- Home automation and security system

4. Pin Definition：

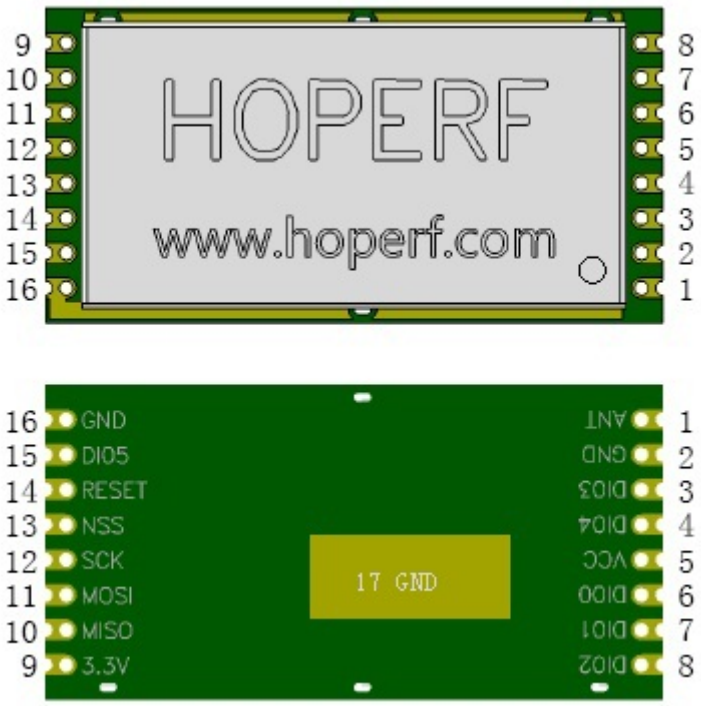


Figure 1. RFM98PW/RFM95PW Pin Definition

Number	Definition	Type	Function
1	ANT	AI/ AO	RF signal input/output.
2	GND	G	Power ground.
3	DIO3	I/O	Digital I/O, software configured.
4	DIO4	I/O	Digital I/O, software configured.
5	VCC	PI	Positive power supply, 5.0-6.4V.
6	DIO0	I/O	Digital I/O, software configured.
7	DIO1/DCLK	I/O	Digital I/O, software configured.
8	DIO2/DATA	I/O	Digital I/O, software configured.
9	3.3V	O	3.3V Voltage output. For MCU VCC.
10	MISO	O	SPI Data output.
11	MOSI	I	SPI Data input.
12	SCK	I	SPI Clock input.
13	NSS	I	SPI Chip select input.
14	RESET	I/O	Reset trigger input.
15	DIO5	I/O	Digital I/O, software configured.
16	GND	G	Power ground.
17	GND	G	Power ground ,This area is connected to the GND network of the main board for heat radiation.

5. Typical Application：

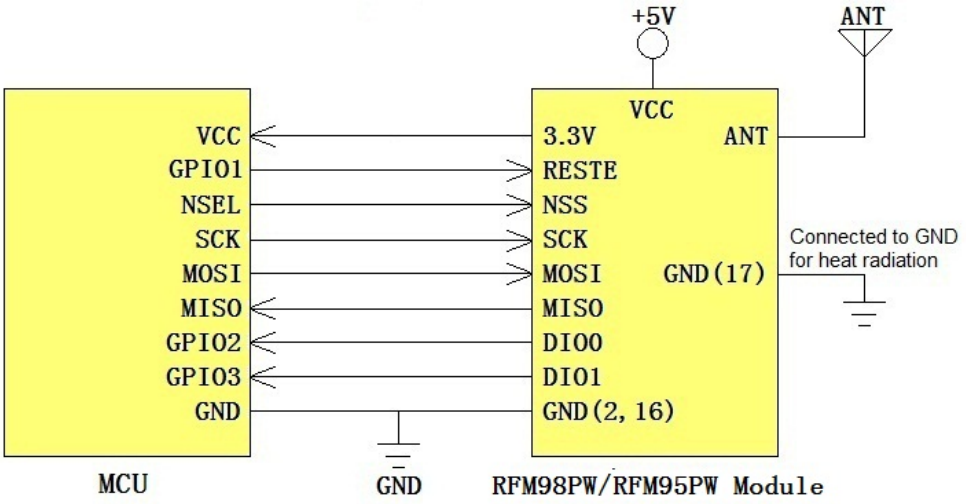


Figure 2. RFM98PW/RFM95PW Application

(For software info please refer to RF98/RF96 chip datasheets and demo program of HopeDuino™ Development Kit)

6. Electrical Parameter：

Maximum

parameter	minimum	maximum	Unit
Positive power supply	-0.3	+6	V
Voltage on Digital Control Inputs	-0.3	3.3 + 0.3	V
Voltage on Analog Inputs	-0.3	3.3 + 0.3	V
RX Input Power	-	+10	dBm
Storage temperature	-55	+125	℃
Soldering temperature(10s)	-	+260	℃

Recommended working range

parameter	minimum	maximum	Unit
Positive power supply	+5.0	+6.0	V
Working temperature	-20	+70	℃

DC characteristic

parameter	conditions	minimum	typical	maximum	Unit
TX Working current	169MHz band, P_{out} =+27dBm	-	300	400	mA
	433MHz band, P_{out} =+30dBm	-	650	700	
	470MHz band, P_{out} =+30dBm	-	650	700	
	868MHz band, P_{out} =+27dBm	-	650	700	
	915MHz band, P_{out} =+27dBm	-	650	700	
RX Working current	169MHz band,	-	13	15	mA
	433MHz band,	-	13	15	
	470MHz band,	-	13	15	
	868MHz band,	-	13	15	
	915MHz band,	-	13	15	
Sleep current	All band	-	5	12	uA

Transmitter AC characteristic

parameter	conditions	minimum	typical	maximum	Unit
TX frequency range	169 MHz band,	159	-	175	MHz
	433 MHz band,	410	-	450	
	470 MHz band,	450	-	490	
	868 MHz band,	862	-	888	
	915 MHz band,	895	-	935	
Bit rate, FSK Mode	Programmable	1.2	-	300	kbps
Bit rate, OOK Mode	Programmable	1.2	-	32.768	kbps
Bit rate, Long-Range Mode	From SF6, BW=500kHz to SF12, BW=125kHz	0.183	-	37.5	kbps
Frequency deviation, FSK	Programmable FDA + BRF/2 =< 250 kHz	0.6	-	200	KHz
Frequency synthesizer step	FSTEP = FXOSC/219	-	61.0	-	Hz
Output Power	169/868/915MHz band	-	27	-	dBm
	433/470MHz band	-	30	-	

Receiver AC characteristic

parameter	conditions	minimum	typical	maximum	Unit
RX Frequence Range	169 MHz band,	159	-	175	MHz
	433 MHz band,	410	-	450	
	470 MHz band,	450	-	490	
	868 MHz band,	862	-	888	
	915 MHz band,	895	-	935	
RX Sensitivity FSK Mode	FDA = 35 kHz, BR = 0.6 kb/s, All band	-	-117	-	dBm
RX Sensitivity OOK Mode	BR = 4.8 kb/s, All band	-	-117	-	dBm
RX Sensitivity Long-Range Mode	SF12, BW=125kHz, All band	-	–136	-	dBm
Single Side channel filter BW	Programmable	2.7	-	250	kHz

7. Mechanical Dimension

（All units in mm）

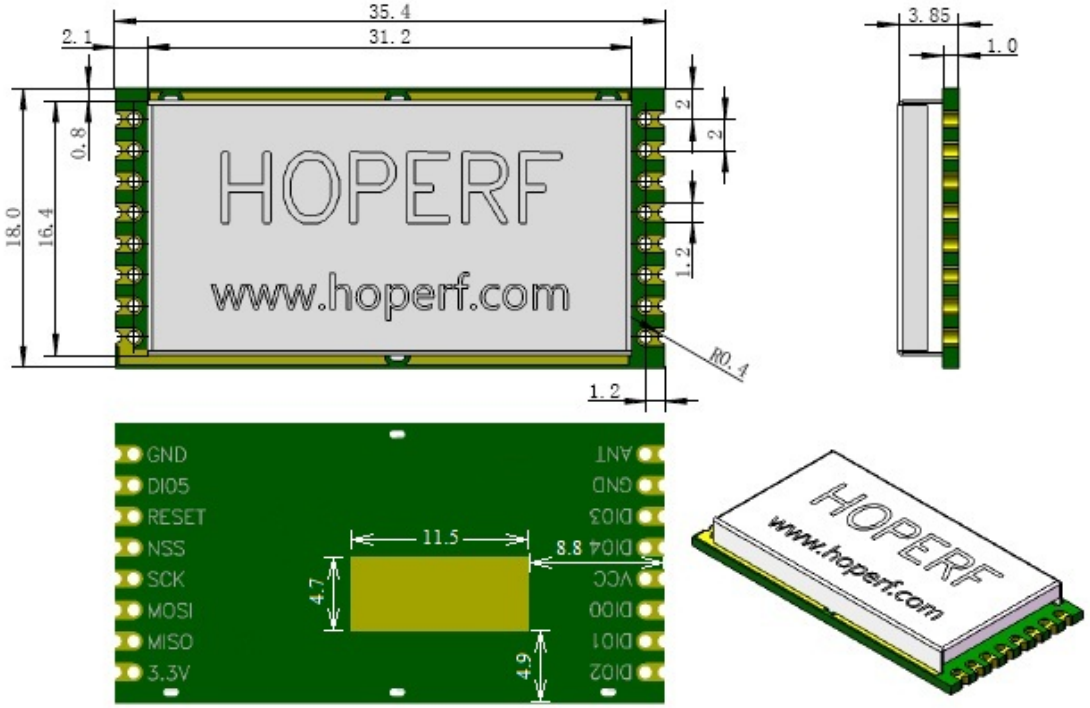


Figure3. RFM98PW/RFM95PW Mechanical Dimension

8. Order information

Model	Frequency band	Output power
RFM98PW-169S2	169MHZ	+27dBm
RFM98PW-433S2	433MHZ	+30dBm
RFM98PW-470S2	470MHZ	+30dBm
RFM95PW-868S2	868MHZ	+27dBm
RFM95PW-915S2	915MHZ	+27dBm

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