

DS02310**RHF2S209 LoRaWAN 8channel outdoor gateway product Specification**

V1.1

**Document information**

Info	Content
Keywords	<i>RisingHF, LoRaWAN, IOT, GW, specifications</i>
Abstract	This document describes the specifications of the high performance outdoor GW RHF2S209.

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1 RHF2S209 Gateway Introduction

RHF2S209 is a new generation LoRaWAN® gateway developed by RisingHF. The GW integrates 650MHz ARM Cortex-A53 CPU which run Linux OS. Semtech LoRaWAN® gateway chip SX1302 is imported into the gateway. SX1302 is a new generation chip with high performance excels in reducing current consumption and handling a higher amount of LoRa traffic.

The gateway uses 10/100M Ethernet or LTE (also 4G/3G/2G) as backhaul. An on-board GPS module could be used to generate a PPS signal for time synchronization. An internal web UI is used for quick configuration and maintenance, this web UI can be accessed via WIFI AP interface.

RHF2S209 is IP67 design for outdoor usage, can support LoRaWAN class A/B/C application. Gateway is powered by an accompanied AC-DC adapter, a backup rechargeable LiFePO4 battery is optional when order.

The gateway supports parallel 8 channels for LoRa demodulation. The output power of the transmitter can be up to maximum 26dBm, and the receiving sensitivity is as low as -138dBm@300bps. Under a specific traffic period and data length conditions, a single gateway can support tens of thousands of nodes.

1.1 Block diagram

The functional block diagram of the RHF2S209 LoRaWAN gateway is shown below.

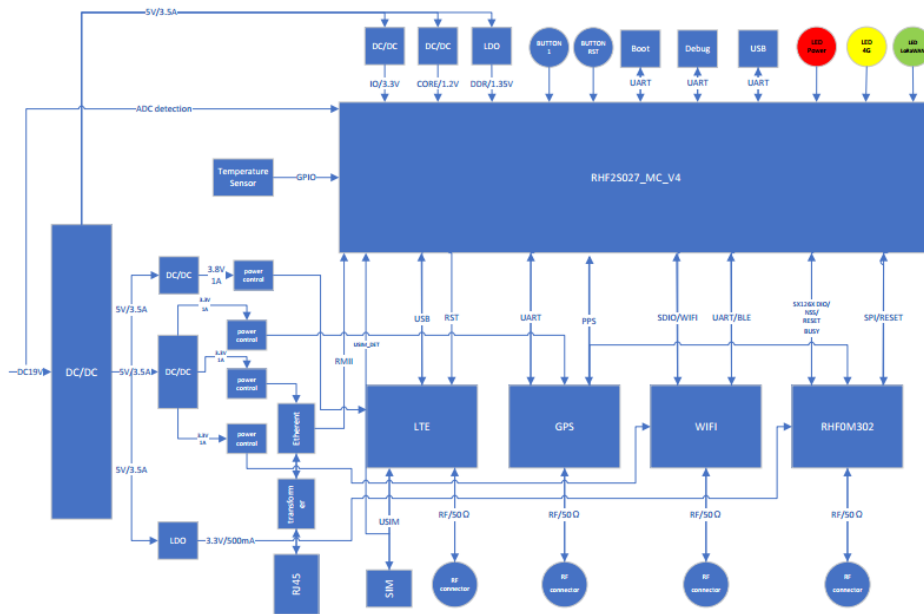


Figure 1 Functional block diagram of RHF2S209

1.2 Features and Applications

Features:

- ✓ LoRaWAN half-duplex communication;

- ✓ RHF2S209xx8 series: Uplink supports 8 parallel Multi-SF LoRa channels, 1 Single-SF LoRa channel, and 1 high-speed GFSK channel;;

- ✓ Transmitting power up to 26dBm, receiver sensitivity up to -138dBm@300bps;
 - ✓ Support LoRaWAN ClassA/B/C mode;
 - ✓ Can support 10/100M Ethernet or LTE (also 4G/3G/2G) as backhaul, and can seamlessly switch;
 - ✓ Industrial-grade equipment with high reliability and high protection level, with IP67 waterproof level, can easily realize outdoor or complex environment installation and network deployment;
 - ✓ Web UI Quick configuration and maintenance through Wi-Fi;
 - ✓ Power supply: support external industrial power supply and built-in lithium iron phosphate battery(battery is optional);
 - ✓ The built-in battery supports more than 5hr standby;
 - ✓ -40°C to +85°C;
 - ✓ 10kA surge impact;
- Applications:**
- ✓ M2M, IOT Internet of Things, Low Power Wide Area Network LPWAN
 - ✓ Wireless sensor network
 - ✓ Wireless water meter, electricity meter, gas meter, heat meter data collection
 - ✓ Industry 4.0, industrial equipment monitoring
 - ✓ Wireless remote monitoring
 - ✓ Smart home, smart building, smart community, smart city
 - ✓ Wireless alarm and security system
 - ✓ Environmental data monitoring

2 Product Specification

This chapter describe the technical specifications and performance of the RHF2S209 gateway; Unless otherwise specified, the condition in this chapter is room temperature, and gateway is normal powered by standard power adapter accompanied with gateway.

2.1 Technical Specifications overview

Table 1 RHF2S209 Technical Specifications overview

Item Group	project name	Functional description
System Configuration	kernel	Cortex-A7+Cortex-M4
	main frequency	650 MHz
	System	Linux
	RAM	512Mbytes DDR3L
	Flash	8Gbytes eMMC
communication	Wired Network (Backhaul)	10M/100Mbps
	Cellular Network (Backhaul)	GSM/3G/4G
	Networking method	LoRaWAN/LoRa
electrical properties	Power supply	External industrial power supply (default); Built-in lithium iron phosphate battery (only RHF2S209Bxx);
	Power adapter input	AC 220vV/50-60Hz
	Power adapter output	DC 19V
	Backup battery (optional)	9.6V 3200mAh LiFePo4

	Average power consumption	5W
	Peak power consumption	7.5W
sensor	Temperature Sensor	Monitor the ambient temperature inside the device
user interface (external interface)	LTE 4G Antenna	LTE network connection cloud server
	LoRaWAN antenna	LoRaWAN wireless data collection
	Ethernet interface	10/100m Ethernet interface
	GPS	GPS positioning and high-precision clock generation
	Wi-Fi/BT	Wi-Fi/BT wireless access
	DC	DC power input interface
user interface (internal interface)	Standard SIM card holder	Support standard SIM card big card (25mm×15mm×0.8mm)
	USB	USB boot loader image burning
	UART	UART debug serial port
	LED1 (Internal)	DC19V_input indicator
	LED6 (Internal)	DC input indicator
	LED4 (Internal)	10.5V_ charging indicator light
	LED5 (Internal)	Network operation indicator
	LED2 (Internal)	4G running indicator light
	LED3 (Internal)	LoRa running indicator light
Mechanical specification	size	217x 217x 71mm
	weight	1012g (RHF2S209Exx) 1422g (RHF2S209Bxx)
	installation method	holding poles or wall-mount
working environment	range of working temperature	-40 to +85°C
	storage temperature range	-40 to +85°C

2.1 Electronics and Electrical Specifications

2.1.1 LTE band

4G module (China, RHF2S209xxx-470):

LTE FDD: Band 1, Band 3, Band 5, Band 8, all bands with diversity

LTE TDD: Band 34, Band 38, Band 39, Band 40, Band 41, all bands with diversity

WCDMA: Band 1, Band 8, all bands with diversity

TD-SCDMA: Band 34, Band 39

GSM/GPRS/EDGE: 900MHz/1800MHz

4G module (European band, RHF2S209xxx-868):

LTE FDD: Band 1, Band 3, Band 5, Band 7, Band 8, Band 20, all bands with diversity

WCDMA: Band 1, Band 5, Band 8, all bands with diversity

GSM/GPRS/EDGE: 850MHz/900MHz/1800MHz

4G module (America frequency band, RHF2S209xxx-915):

LTE FDD: Band 2, Band 4, Band 5, Band 12, Band 13, Band 17, Band 66, Band 71, all bands with diversity;

WCDMA: Band 2, Band 4, Band 5, all bands with diversity.

2.1.2 Power supply specification

1. External industrial DC power supply (default)

Input voltage range: 12V to 24V DC.

The gateway is equipped with a 19V industrial-grade IP67 waterproof power supply adapter by default. The following are the performance parameters of the adapter.

Table 2 power supply adapter specification

item	Minimum	Nominal	Maximum
Input voltage	100Vac	220Vac	240Vac
Frequency	50Hz	50Hz/60Hz	60Hz
Output voltage	-5%	19VDc	+5%
Output current	--	1.5A	2A

2. Backup battery power supply (only RHF2S209Bxx)

RHF2S209Bxx has a built-in 9.6V 3200mAh LiFePo4 battery.

Table 3 DC backup battery parameters

Item	General Parameter	Remark
Rated Capacity	Typ. 3200mAh Min. 3150mAh	Standard charge and Standard discharge
Nominal Voltage	9.6V	
Charging time	5~6H	
Over-Current Discharge Protection	6±1A	
Short circuit protection	With protection	
Cell Dimension	70mm*80mm*27mm	
Weight	≈180g	
Operation Temperature Range	charge: 0~45°C	60±25%R.H. Bare Cell (单体电池储存湿度范围)
	discharge: -10~50°C	
Storage Temperature Range	-20°C ~ 75°C	60±25%R.H. at the shipment state

2.1.3 Power Consumption

Table 4 RHF2S209 overall power consumption

Item	type/W	Test Conditions
Static power	3	The LoRa transmission and reception of the device are turned off, and the 4G network is connected
average power consumption	5	4G networking, LoRaWAN is working
peak power consumption	7.5	All modules are working at full capacity

2.1.4 RF performance (LoRaWAN)

The performance of the whole machine is mainly measured by two indicators: conduction receiving sensitivity and conduction transmission power.

1) Conducted reception sensitivity

Test conditions: 32byte payload, PER=10%, room temperature +25°C.

Table 5 Conducted reception performance index

Part Number	Bandwidth/kHz	Spreading Factor	Sensitivity/dBm
RHF2S209XXX-470	125	12	-138
		7	-123
	250	12	-135
		7	-120
	500	12	-132
		7	-117
RHF2S209XXX-868	125	12	-138
		7	-123
	250	12	-135
		7	-120
	500	12	-132
		7	-117
RHF2S209XXX-915	125	12	-138
		7	-123
	250	12	-135
		7	-120
	500	12	-132
		7	-117

2) Conducted emission power

Test conditions: CW signal transmission, room temperature +25°C.

Table 6 Conducted emission performance index

Part Number	Parameter	Min	Typ	Max	Unit
RHF2S209XXX-470	Frequency Range (Tx)	470		510	MHz
	Frequency Range (Rx)	470		490	MHz
	Max Output power		25		dBm
	Output Power Variation	-1.5		1.5	dB

	TX Power Variation Temperature (-40 to 85°C)	-1.5		1.5	dB
	TX Frequency Variation Temperature (-40 to 85°C)	-3		3	ppm
RHF2S209XXX-868					
	Frequency Range (Rx/Tx)	859		871	MHz
	Max Output power		24		dBm
	Output Power Variation	-1.5		1.5	dB
	TX Power Variation Temperature (-40 to 85°C)	-1.5		1.5	dB
	TX Frequency Variation Temperature (-40 to 85°C)	-3		3	ppm
RHF2S209XXX-915					
	Frequency Range (Rx/Tx)	900		930	MHz
	Max Output power		26		dBm
	Output Power Variation	-1.5		1.5	dB
	TX Power Variation Temperature (-40 to 85°C)	-1.5		1.5	dB
	TX Frequency Variation Temperature (-40 to 85°C)	-3		3	ppm

2.1.5 LoRa Antenna performance

The gateway is equipped with a high-performance fiberglass antenna as standard, which is omnidirectional, high gain, and high efficiency.

Impedance 50Ω

VSWR<2.0

Gain Gain=2dBi@470MHz; Gain=2dBi@868/915MHz

Efficiency@470MHz>50%

Efficiency@868MHz/915MHz>70%

2.2 Reliability performance

2.2.1 Environmental test

Table 7 Environmental test requirements

Item	Test conditions	Standard	Result
low temperature work	Temperature: -40°C Operation mode: working with service connected Test duration: 12 h	JESD22-A1 GB/T 2423	good appearance; Good LoRaWAN RF performance; Other functions are normal;

high temperature work	Temperature: +75°C Operation mode: working with service connected Test duration: 12 h	JESD22-A1 GB/T 2423	good appearance; Good LoRaWAN RF performance; Other functions are normal;
cryogenic storage	Temperature: -40°C Operation mode: no power, no package Test duration: 24 h	JESD22-A1 GB/T 2423	good appearance; Good LoRaWAN RF performance; Other functions are normal;
high temperature storage	Temperature: +75°C Operation mode: no power, no package Test duration: 24 h	JESD22-A1 GB/T 2423	good appearance; Good LoRaWAN RF performance; Other functions are normal;

2.3 EMC performance

RHF2S209 is a high-reliability industrial-grade device. According to the IEC61000-4 standard, it has carried out electrostatic protection ESD test, fast burst anti-interference test, surge anti-interference test, voltage drop test, etc.

Table 8 reliability requirements

Item	Test standard	Test conditions
ESD	IEC 61000-4-2	Air Discharge:15kV Contact Discharge:8kV Positive/Negative
Radio Frequency Electromagnetic Field Immunity	IEC 61000-4-3	80MHz to 1000MHz and 1400MHz to 2700MHz; 3V/m;
Electrical Fast Transient/Burst Immunity	IEC 61000-4-4	AC power port:10kV; Positive/Negative
Surge Immunity	IEC 61000-4-5	Common mode: 6kV Differential mode: 3kV Positive/Negative

2.4 IP Ingress Protection rating

The outdoor equipment IP level of the entire machine equipment is detected according to the GB 4208-2008 to meet the IP67 protection level requirements.

2.5 Mechanical size

Mechanical size: 217*217*71 mm.

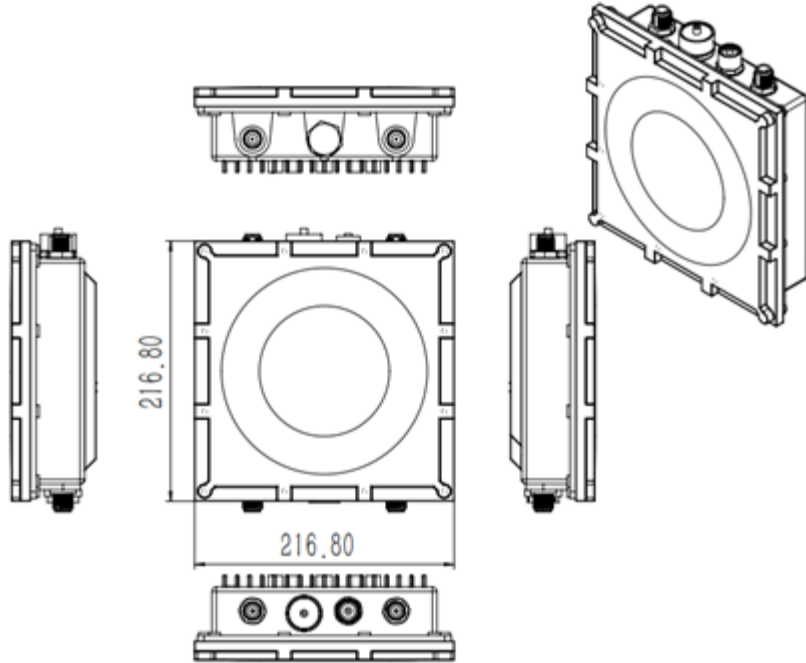


Figure 2 RHF2S209 host mechanical size chart

3 Packaging information

3.1.1 Packing list

Table 9 Packing list

Item Name	Specification	quantity
RHF2S209 gateway	RHF2S209	1
Industrial power supply	XED-RX190150GJ	1
LORA antenna	RXHF-ANTxxx-GF	1
GPS antenna	V1468-001-A-03	1
Wifi antenna	V1437-002-A-04	1
LTE antenna	V1437-002-A-05	1
Coaxial RF Surge Protector (Optional)	N-JK-G (JC3.640.150)	Optional part
Grounding cable (Optional)	1.5m	Optional part
Installation fixture	Including installation brackets, U-shaped holding hoop, screws, etc.	1
Wrench	Single wrench, material: 45#steel, galvanized, 10*70*1.8 (open 10mm)	1
Packaging box	Size 640*338*125mm	1

3.1.2 Packaging information

Package Size: 640*338*125 mm.

Packaging weight:

RHF2S209EXX series (no built -in battery) 5.5 kg;

RHF2S209BXX series (with built -in battery) 6 kg.

Net weight:

RHF2S209EXX series (no built -in battery) 4.5 kg;

RHF2S209BXX series (with built -in battery) 5 kg.



Figure 3 RHF2S209 outer packaging



Figure 4 RHF2S209 packaging inner lining

4 Order information

RHF2S209 contains two series of products. The RHF2S209EXX series does not contain built-in batteries. The RHF2S209BXX series contains built-in batteries. Please send emails to salesww@risinghf.com to consult more detailed product information.

Table 10 RHF2S209EXX series (no built-in battery)

order	model	Band@Uplink	Band@Downlink	Specifications
1	RHF2S209EH8-470	470MHz~490MHz	470MHz~510MHz	8channel/Half duplex, band 470MHz
2	RHF2S209EH8-868	859MHz~871MHz	859MHz~871MHz	8channel/Half duplex, band 868MHz
3	RHF2S209EH8-915	900MHz~930MHz	900MHz~930MHz	8channel/Half duplex, band 915MHz
4	RHF2S209EH8-923	900MHz~930MHz	900MHz~930MHz	8channel/Half duplex, band 923MHz, Equipped with European version 4G module

Table 11 RHF2S209BXX series (including built-in battery)

order	model	Band@Uplink	Band@Downlink	Specifications
1	RHF2S209BH8-470	470MHz~490MHz	470MHz~510MHz	8channel/Half duplex, band 470MHz, with Battery
2	RHF2S209BH8-868	859MHz~871MHz	859MHz~871MHz	8channel/Half duplex, band 868MHz, with Battery
3	RHF2S209BH8-915	900MHz~930MHz	900MHz~930MHz	8channel/Half duplex, band 915MHz, with Battery
4	RHF2S209BH8-923	900MHz~930MHz	900MHz~930MHz	8channel/Half duplex, band 923MHz, with Battery, Equipped with European version 4G module

Change history

V1.1 2023-08-28

+ Normative and Grammatical cleanup

V1.0 2023-03-02

+ First draft

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