DS02511

LoRaWAN® IoT Industrial Gateway RHF2S225 Product Specification

V1.1



Document information

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Keywords	*RisingHF, LoRaWAN®, IOT, Gateway,*
Abstract	This manual describes the technical specifications and features of the RHF2S225 LoRaWAN® gateway device with integrated Wi-Fi, developed by RisingHF.

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1. Introduction

This document describes the technical specifications and features of the industrial gateway device model RHF2S225.

The RHF2S225 LoRaWAN® gateway is an 8-channel intelligent industrial gateway device based on the LoRaWAN® protocol, developed by RisingHF (Shenzhen) Co., Ltd.

2. Overview of RHF2S225 LoRaWAN® Gateway

The RHF2S225 is an IoT gateway designed for LoRaWAN®-based LPWAN network deployments. It supports LoRaWAN® Class A and Class C protocols, as well as the IEEE 802.11 a/b/g/n standards, and can connect to cloud servers via 2.4 GHz Wi-Fi.

The gateway integrates a 1T1R 802.11n Wi-Fi module and adopts the high-integration MT7688AN SoC as the main controller, featuring a 580 MHz MIPS24KEc CPU, a 100 Mbps Ethernet port, one USB 2.0 interface, and an LTE module (available on some models). It also incorporates an SX1302 LoRa baseband processing chip, supporting 8 multi-SF channels (SF12 to SF7), 1 single-SF channel, and 1 high-speed GFSK channel. The maximum transmit power can reach 22 dBm, and the receiver sensitivity is up to －138 dBm @ 300 bps. Under specific transmission cycles and data length conditions, a single gateway can support access to tens of thousands of nodes.

With a compact appearance and high reliability, the RHF2S225 enables rapid deployment in various environments with ease.

2.1. Functional Block Diagram

The functional block diagram of the RHF2S225 LoRaWAN® gateway is shown below.

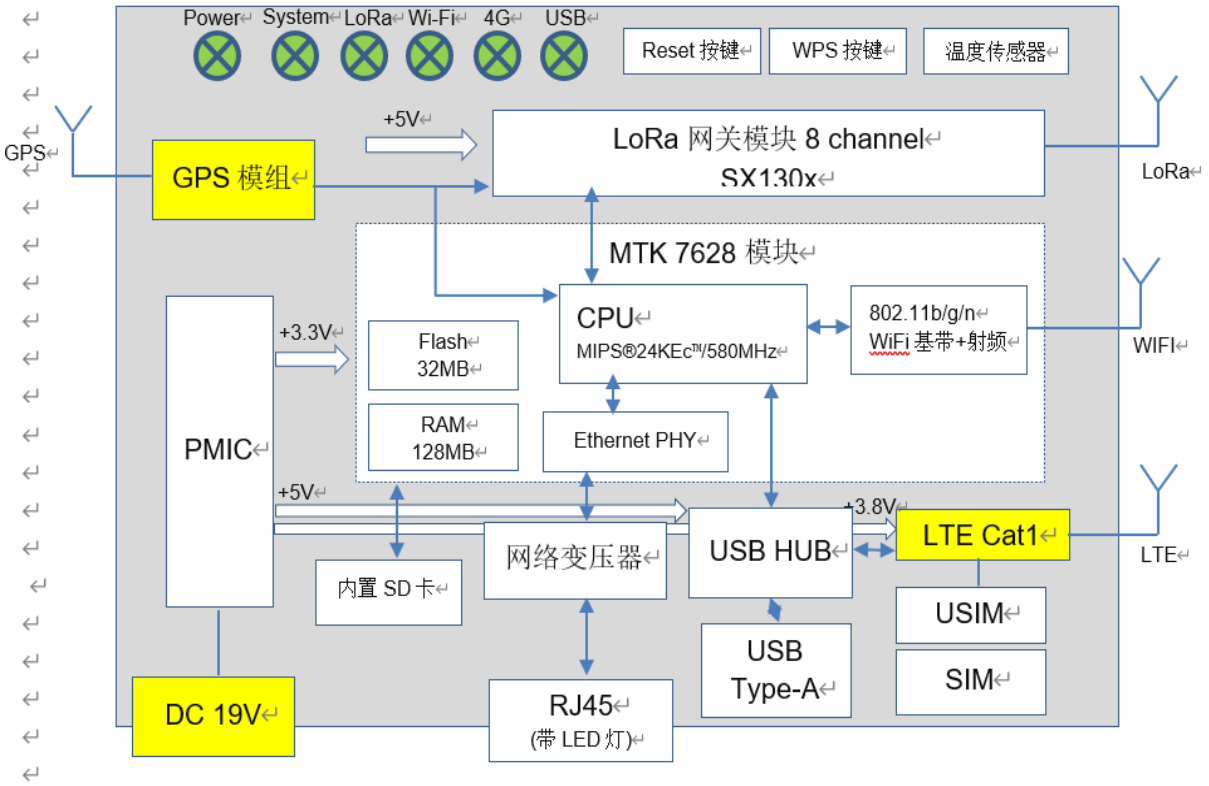


Figure 1 RHF2S225 Functional Block Diagram

2.2. Features and Application

Features：

- ✓ LoRaWAN® half-duplex/full-duplex communication modes；
- ✓ Uplink supports 8 parallel Multi-SF LoRa channels, 1 Single-SF LoRa channel, and 1 high-speed GFSK channel；
- ✓ Maximum transmit power up to 22 dBm, receiver sensitivity up to –138 dBm @ 300 bps；
- ✓ Supports LoRaWAN® Class A/C protocols；
- ✓ Supports 802.11 b/g/n wireless protocols；
- ✓ Supports 10/100M Ethernet and Wi-Fi for network access；
- ✓ Supports Ethernet cables within 100 meters；
- ✓ Supports LTE 4G (for certain models)；

Applications：

- ✓ MM2M, IoT applications, LPWAN (Low Power Wide Area Networks)
- ✓ Wireless sensor networks
- ✓ Data collection from wireless water meters, electricity meters, gas meters, and heat meters
- ✓ Industry 4.0 and industrial equipment monitoring
- ✓ Wireless remote monitoring
- ✓ Smart home, smart building, smart community, smart city
- ✓ Wireless alarm and security systems
- ✓ Environmental data monitoring

2.3. Technical Specification Overview

Table 1 RHF2S225 Technical Specification Overview

Item	Project Name	Function Description
System Configuration	Kerne	HLK-7628N
	Main Frequency	580MHZ
	RAM	1G-bit
	Flash	256M-bit
Communication Methods	10M/100Mbps Ethernet Access	Wired Internet access
	LTE 4G Access (some models)	Wireless Internet access
	2.4-2.4835G WIFI	Wireless Internet access
	470-510MHZ LoRa 859MHz~871MHz LoRa 900MHz~930MHz LoRa	LoRa device wireless access: 上行 470-490MHZ，下行 470-510MHZ 上行 859MHz~871MHz，下行 859MHz~871MHz 上行 900MHz~930MHz，下行 900MHz~930MHz
Wireless Coverage Range	WiFi	60meters
	LoRa	3 kilometers (urban environment)
Electrical Performance	Input Voltage	DC 19V
	Typical Average Power Consumption	<5W
	2.4 GHz WiFi Output Power	11n：16dBm 11g：16dBm 11b：19dBm
	2.4 GHz WiFi Receive Sensitivity	11n HT20 MCS7 150Mbps：-68dBm@10%PER 11g 54Mbps：-68dBm@10%PER 11b 11Mbps：-85dBm@8%PER
	LoRa Output Power	17dBm@470MHz Max：17dBm 14dBm@868MHz Max：20dBm 20dBm@915MHz Max：20dBm
	LoRa Receive Sensitivity	-138dBm@SF12,BW=125kHz
LED Indicators	LTE 4G LED (some models)	LTE 4G module working status indicator
	POWER LED	Power input indicator
	SYSTEM LED	System running status indicator
	WiFi LED	WiFi connection status indicator
	LoRa LED	LoRa connection status indicator
	USB LED	USB connection status indicator
	RJ45 LED	Wired Ethernet port connection indicator

External Interfaces	RJ45 Ethernet Port	WAN port, backhaul connection to internet
	WiFi Antenna	1 dBi external detachable antenna
	LoRa Antenna	2 dBi external detachable antenna
	LTE 4G Antenna (some models)	0.8 dBi external detachable antenna
	GPS Antenna	GPS positioning and high-precision clock generation
	DC Power Interface	19 V / 1.5 A power supply
Internal Interfaces	Standard SIM Card Slot	Supports standard SIM card (25 mm × 15 mm × 0.8 mm)
	USB	Local firmware upgrade and data download
	UART	UART debug serial port
Mechanical Specification	Dimensions	217x 217x 71 mm
	Weight	1012g
	Installation Method	Pole mount or wall mount
	Enclosure impact protection rating	IK08
Operating Environment	Operating Temperature	-40 to +85℃
	Storage Temperature	-40 to +85℃

3. Electrical Performance and Reliability Requirements

3.1. Electrical Performance

3.1.1. Power Supply

1. Powered by an external industrial DC power supply (default).
   Input voltage range: 12V to 24V DC.
   The gateway comes with a 19V industrial-grade IP67 waterproof power adapter by default. The specifications are shown below:

Table 2 AC Power Adapter Specifications

Specification	Minimum	Nominal	Maximum
Input Voltage	100Vac	220Vac	240Vac
Input Frequency	50Hz	50Hz/60Hz	60Hz
Output Voltage	-5%	19VDc	+5%
Output Current	--	1.5A	2A

3.1.2. Power Consumption

Table 3 RHF2S225 Device Power Consumption

ltem	ypical Value (W)	Test Condition
Standby Power	1.9W	LoRa TX and RX off, 4G connected

Average Power	4.3W	4G connected, LoRaWAN® working
Peak Power	5W	All modules under full load

3.1.3. RF Performance (LoRaWAN®)

The overall RF performance is evaluated using conducted RX sensitivity and TX power.

1）Conducted Receiving Sensitivity

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

Table 4 Conducted Receiving Sensitivity

Part Number	Bandwidth/kHz	Spreading Factor	Sensitivity/dBm
RHF2S225-470	125	12	-138
		7	-123
	250	12	-135
		7	-120
	500	12	-132
		7	-117
RHF2S225-868	125	12	-138
		7	-123
	250	12	-135
		7	-120
	500	12	-132
		7	-117
RHF2S225-915	125	12	-138
		7	-123
	250	12	-135
		7	-120
	500	12	-132
		7	-117

2）Conducted Transmit Power

Test condition: CW signal, ambient temperature +25°C.

Table 5 Conducted Transmit Performance

Part Number	Parameter	Min	Typ	Max	Unit
RHF2S225-470	Frequency Range（Tx）	470		510	MHz
	Frequency Range（Rx）	470		490	MHz
	Max Output power		17		dBm
	Output Power Variation	-1.5		1.5	dB
	TX Power Variation Temperature（-20 to 65℃）	-1		1	dB
	TX Frequency Variation Temperature（-20 to 65℃）	-3		3	ppm
	TX Frequency Variation Temperature（-20 to 65℃）	-3		3	ppm

RHF2S225-868	Frequency Range（Rx/Tx）	859		871	MHz
	Max Output power		20		dBm
	Output Power Variation	-1.5		1.5	dB
	TX Power Variation Temperature（-20 to 65℃）	-1.5		1.5	dB
	TX Frequency Variation Temperature（-20 to 65℃）	-3		3	ppm
RHF2S225-915	Frequency Range（Rx/Tx）	900		930	MHz
	Max Output power		20		dBm
	Output Power Variation	-1.5		1.5	dB
	TX Power Variation Temperature（-40 to 65℃）	-1.5		1.5	dB
	TX Frequency Variation Temperature（-40 to 65℃）	-3		3	ppm

3.1.4. Antenna Performance

The gateway is equipped with high-efficiency 50 Ω omnidirectional antennas.

Table 6 Antenna Performance Specifications

	WiFi	LoRa		LTE 4G	GPS
		470MHz	868MHz/915MHz		
VSWR	<2.0	<2.0	<2.0	<3.0	<2.0
Gain(dBi)	1	2	2	0.8	2
Efficiency	65%	70%	70%	70%	70%

3.1.5. LoRa Power Configuration Tables

1) CN470

Table 7 CN470 Power Table

Pwr_idx	PA	RF Power
1	3	-1.489
2	3	-0.394
3	3	0.278
4	3	1.499
5	3	2.293
6	3	3.307
7	3	4.425
8	3	5.425
9	3	6.469

10	3	7.392
11	3	8.318
12	3	9.27
13	3	10.306
14	3	11.223
15	3	12.168
16	3	13.298
17	3	14.448
18	3	15.74
19	3	16.906
20	3	16.845
21	3	16.784
22	3	16.784

2) EU868/IN865

Table 8 EU868/IN865 Power Table

Pwr_idx	PA	RF Power
1	3	1.289
2	3	2.403
3	3	3.073
4	3	4.272
5	3	5.026
6	3	6.004
7	3	7.117
8	3	8.088
9	3	9.091
10	3	9.966
11	3	10.83
12	3	11.713
13	3	12.654
14	3	13.465
15	3	14.208
16	3	14.985
17	3	15.731
18	3	16.709
19	3	17.598
20	3	18.318
21	3	18.898

22	3	19.366

3) US915/AU915/AS923

Table 9 US915/AU915/AS923 Power Table

Pwr_idx	PA	RF Power
1	3	-0.495
2	3	0.597
3	3	1.256
4	3	2.478
5	3	3.264
6	3	4.282
7	3	5.411
8	3	6.409
9	3	7.445
10	3	8.35
11	3	9.248
12	3	10.167
13	3	11.16
14	3	12.017
15	3	12.829
16	3	13.763
17	3	14.871
18	3	16.153
19	3	17.306
20	3	18.357
21	3	19.297
22	3	20.093

3.2. Reliability Requirements

3.2.1. Environmental Test Requirements

Table 10 Environmental Testing

ltem	Test condition	Standard	Result
Environmental Testing	Temperature: -40°C Operation mode: working with service connected Test duration: 12 h	JESD22-A1 GB/T 2423	Appearance good; LoRaWAN® RF OK; All functions normal
High Temp Operation	Temperature: +85°C Operation mode: working with service connected Test duration: 12 h	JESD22-A1 GB/T 2423	Appearance good; LoRaWAN® RF OK; All functions normal

Low Temp Storage	Temperature: -40°C Operation mode: no power, no package Test duration: 24 h	JESD22-A1 GB/T 2423	Appearance good; LoRaWAN® RF OK; All functions normal;
High Temp Storage	Temperature: +85°C Operation mode: no power, no package Test duration: 24 h	JESD22-A1 GB/T 2423	Appearance good; LoRaWAN® RF OK; All functions normal

3.2.2. Mechanical impact protection rating

RHF2S225 enclosure complies with the impact protection rating of IK08.

3.2.3. EMC and ESD Reliability Requirements

The RHF2S225 is a high-reliability industrial gateway. Tests were conducted according to IEC 61000-4 standards for ESD protection, EFT/Burst, and Surge immunity.

Table 11 Reliability Standards

Item	Standard	Test condition
ESD	IEC 61000-4-2	Air Discharge:15kV Contact Discharge:8kV Positive/Negative
EFT/Burst	IEC 61000-4-4	AC power port:1k(peak) 5/50ns Tr/Th 5KHZ Repetition Freq.
surge	IEC 61000-4-5	Common mode: 4kV Differential mode: 2kV Positive/Negative

4. Mechanical Dimensions, Packaging, and Ordering Information

4.1. Mechanical Dimensions

Mechanical Dimensions：217*217*71 mm。

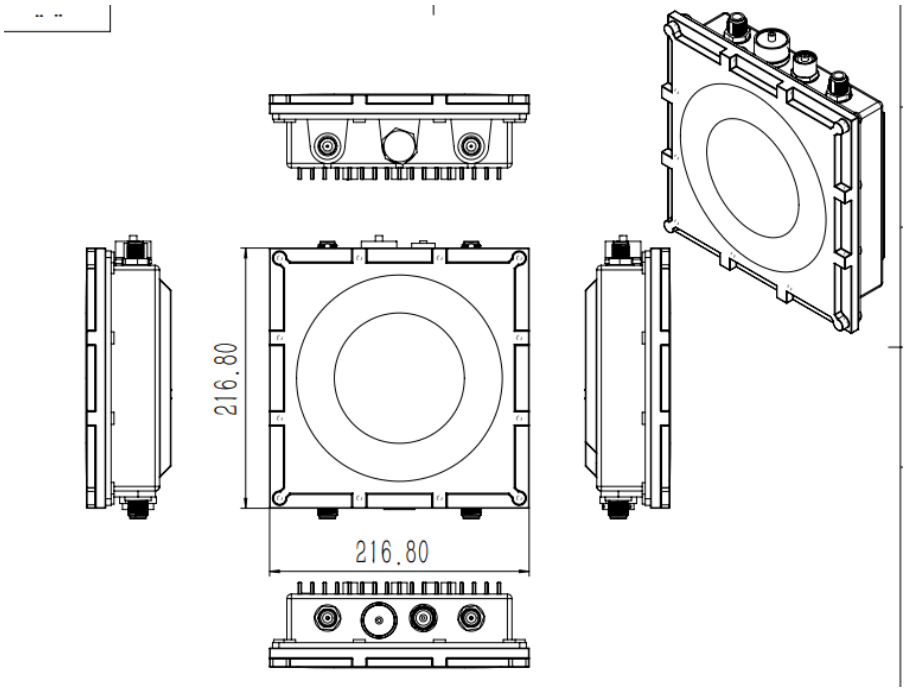


Figure 2 RHF2S225 Mechanical Drawing of RHF2S225

4.2. Packaging Information

4.2.1. Packing List

Table 12 Packing List

Item Name	Specification	Quantity
RHF2S225 Main Unit	RHF2S225	1
Industrial Power Supply	XED-RX190150GJ	1
LoRaWAN® Fiberglass Antenna	RXHF-ANTxxx-GF	1
GPS Fiberglass Antenna	V1468-001-A-03	1
Wi-Fi Fiberglass Antenna	V1437-002-A-04	1
LTE 4G Fiberglass Antenna	V1437-002-A-05	1
Lightning Arrester*	N-JK-G（JC3.640.150）	Optional part
Ground Cable*	1.5m	Optional part
Mounting Bracket Kit	Includes bracket, U-bolt, screws	1
Open-End Wrench	10 mm, 70 mm long, zinc-plated steel	1
Full Packaging Box	Dimensions: 640 × 338 × 125 mm	1

*Standard gateway products are not equipped with Lightning Arrester and Ground Cable. Lightning Arrester and Ground Cable are optional accessories.

4.2.2. Packaging Information

Packaging Dimension：640*338*125 mm.



Figure 3 External Packaging

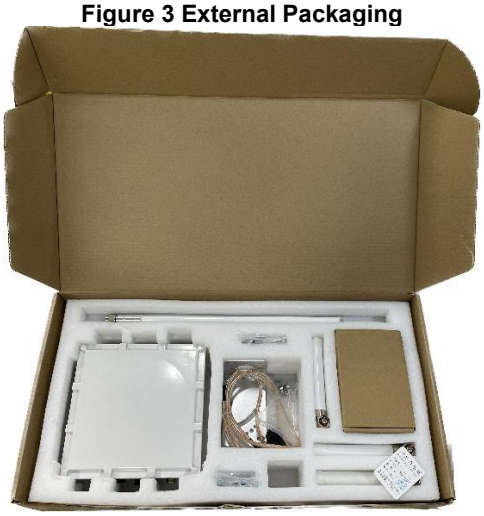


Figure 4 Internal Packaging

4.3. Ordering Information

The RHF2S225 has multiple product variants corresponding to different frequency bands per region. Please contact RisingHF sales representatives when placing orders.

Table 13 RHF2S225BH8 Series (with 4G)

Number	Product series	Models	Band@Uplink	Band@Downlink	Feature
1	RHF2S225BH8	RHF2S225BH8-470	470MHz~490MHz	470MHz~510MHz	8channel/Half duplex
2		RHF2S225BH8-868	859MHz~871MHz	859MHz~871MHz	8channel/Half duplex
3		RHF2S225BH8-915	900MHz~930MHz	900MHz~930MHz	8channel/Half duplex
4		RHF2S225BH8-923	900MHz~930MHz	900MHz~930MHz	8channel/Half duplex

Table 14 RHF2S225AH8 Series (without 4G)

Number	Product series	Models	Band@Uplink	Band@Downlink	Feature
1	RHF2S225AH8	RHF2S225AH8-470	470MHz~490MHz	470MHz~510MHz	8channel/Half duplex
2		RHF2S225AH8-868	859MHz~871MHz	859MHz~871MHz	8channel/Half duplex
3		RHF2S225AH8-915	900MHz~930MHz	900MHz~930MHz	8channel/Half duplex

Table 15 RHF2S225AF8/BF8 Series (Full Duplex)

Number	Product series	Models	Band@Uplink	Band@Downlink	Feature
1	RHF2S225AF8	RHF2S225AF8-470（不含 4G）	470MHz~490MHz	470MHz~510MHz	8channel/Full duplex
2	RHF2S225BF8	RHF2S225BF8-470（含 4G）	470MHz~490MHz	470MHz~510MHz	8channel/Full duplex

5. Radiation exposure warning

Warning：RF exposure information: The Maximum Permissible Exposure (MPE) level has been calculated based on a distance of 20cm between the device and the human body. To maintain compliance with RF exposure requirement, use product that maintain a 20cm distance between the device and human body.

Revision Version

V1.1 2026-09-21

+ Correct some descriptions

V1.0 2025-06-20

+ First Draft

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EU Declaration of Conformity (DoC)

Hereby we,

Name of manufacturer:	RisingHF Network (Shenzhen) Co.,LTD
Address:	Room 13D, FuSen Building, Huaxia 2nd Road, Guangming Street, Guangming District, Shenzhen, Guangdong, China
Zip code & City:	518106
Country:	China

declare that this DoC is issued under our sole responsibility and that this product:

Product description:	LoRaWAN® IoT Industrial Gateway
Type designation(s):	RHF2S225
Trademark:	RisingHF

is in conformity with the relevant Union harmonization legislation:
Radio Equipment directive: **2014 / 53 / EU**
RoHS Directive: 2011/65/EU
and other Union harmonization legislation where applicable:

with reference to the following standards applied:

IEC 62368-1: 2018
EN IEC 62368-1: 2020+A11: 2020

ETSI EN 301 489-1 V2.2.3 (2019-11)
ETSI EN 301 489-3 V2.3.2 (2023-01)
ETSI EN 301 489-17 V3.3.1 (2024-09)
ETSI EN 301 489-19 V2.2.1 (2022-09)
ETSI EN 301 489-52 V1.3.1 (2024-11)
EN 55032: 2015+A1: 2020
EN 55035: 2017+A11: 2020
EN IEC 61000-3-2: 2019+A2: 2024
EN 61000-3-3: 2013+A2:2021

ETSI EN 301 908-1 V15.2.1 (2023-01)
ETSI EN 301 908-13 V13.3.1 (2024-10)
ETSI EN 300 220-1 V3.1.1 (2017-02)
ETSI EN 300 220-2 V3.2.1 (2018-06)
ETSI EN 300 328 V2.2.2 (2019-07)
ETSI EN 303 413 V1.2.1 (2021-04)

EN IEC 62311: 2020
EN 50665: 2017

EN 18031-1:2024

Description of accessories and components, including software, which allow the radio equipment to operate as intended and covered by the DoC:

Hardware Version: V1.1
Software Version: rhf2s225-risinghf-v1.
……

Signed for and on behalf of:
Shenzhen 2026-09-21
Place and date of issue

Allen Cai, Manager,

