

### UM01747

#### LoRaWAN IOT Industrial GW RHF2S008P4G Specifications

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V0.3



#### Document information

Info	Content
<b>Keywords</b>	<i>RisingHF, LoRaWAN, IOT, GW, specifications</i>
<b>Abstract</b>	This document describes the specifications of the industrial GW RHF2S008P4G.

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### Features

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## 1 Preface

This document describe the technical specifications and features of the industrial gateway RHF2S008P4G

RHF2S008P4G LoRaWAN GW is an 8 channel industrial device designed by RisingHF, which is compatible with LoRaWAN protocol and PoE IEEE 802.3af/at.

## 2 RHF2S008P4G LoRaWAN Gateway description

RHF2S008P4G is an IOT gateway based on LoRaWAN and target to LPWAN network. It is an IEEE 802.3 af/at compatibility PD, which could be powered by PoE. Both Ethernet and LTE-4G are supported to connect to the cloud server. With an integrated GPS module, the GW could support LoRaWAN Class B protocol with the synchronous clock from GPS PPS signal.

This device integrate an high performance CPU ARM Cortex-A53 core, one pcs of baseband processor SX1301, that it could support 8 multi-SF channel (SF12 to SF7), 1 single-SF channel and 1 GFSK channel. Output power could achieve to 27dBm max. Sensitivity is as low as -141dBm@300bps. With specified payload length and transmit period, one GW could support 10k nodes.

RHF2S008P4G is a smart device but with high reliability, that it could work outdoor or in a complexity environment.

### 2.1 Functional Block

RHF2S008P4G LoRaWAN functional block is shown below.

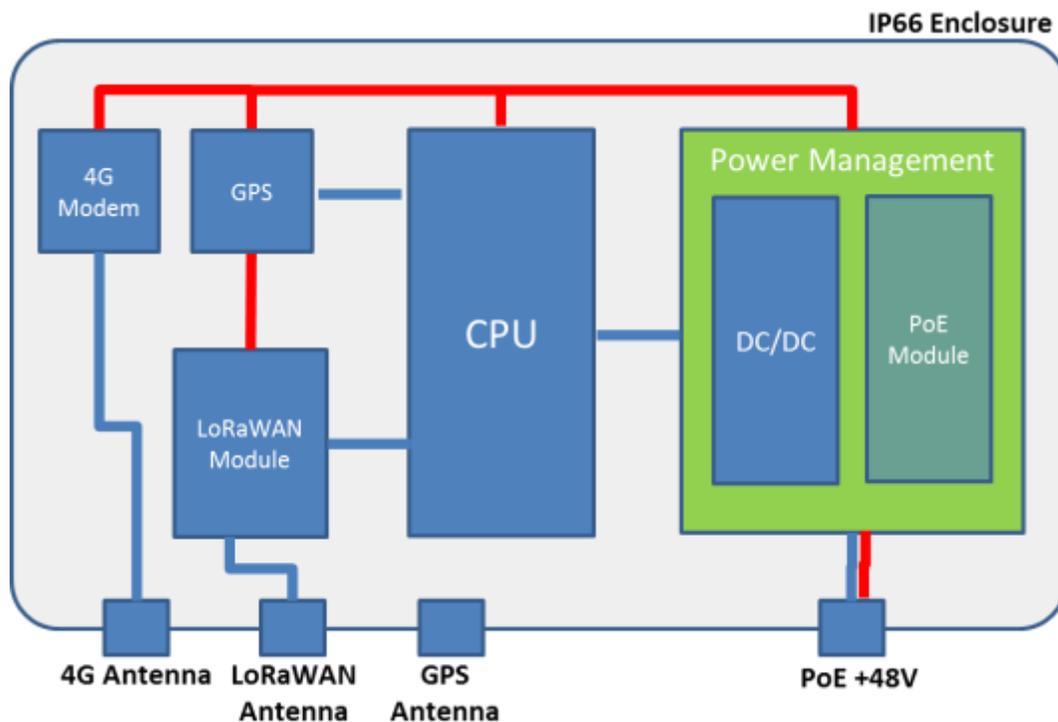


Figure 2-1 RHF2S008P4G functional block

### 2.2 Product features and application

**Features:**

- ✓ LoRaWAN half-duplex operation mode;
- ✓ Uplink include 8 multi-SF LoRa channel, 1 single-SF LoRa channel, and 1 GFSK channel;
- ✓ Output power achieve to 27dBm max, receiver sensitivity as low as -141dBm@300bps;
- ✓ Support LoRaWAN ClassA/B/C mode;
- ✓ Support PoE IEEE 802.3 af/at;
- ✓ Support 10/100M Ethernet connection and GPRS/3G/4G connection, switch automatically;
- ✓ Supply with 100m cable via PoE;
- ✓ High reliability industrial device, IP66 device, easy to setup LPWAN network outdoor

**Application:**

- ✓ M2M, IOT, and LPWAN
- ✓ Wireless sensor network
- ✓ AMR
- ✓ Industry 4.0, Industrial monitor
- ✓ Wireless remote control and monitor
- ✓ Smart Home, Smart building, Smart community and Smart city;
- ✓ Wireless alarm and security environment monitor

### 2.3 Specifications

Table 2-1 RHF2S008 Specifications

Item Group	Item	Description
<b>System Configuration</b>	Core	ARM Cortex-A53
	Main Frequency	1.2GHz
	RAM	1Gbytes
	Flash	4Gbytes eMMC
<b>Communication</b>	Wired Network	Ethernet 10M/100Mbps
	Mobile Cellular	GSM/3G/4G Wireless connection
	LoRaWAN	Long Range Wireless Communication
<b>Electrical Specification</b>	Power supply input	PoE +48 Input IEEE 802.3 af/at
	Average Power Consumption	5W
	LoRa Output Power	type: 14dBm@868MHz; 17dBm@470MHz Max: 27dBm
	LoRa Sensitivity	-141dBm@SF12,BW=125kHz
<b>Sensor</b>	Temperature	Monitor device internal temperature
<b>User Interface (External)</b>	Mobile Cellular 4G Antenna	Connect gateway with internet
	LoRaWAN Antenna	LoRaWAN transceiver, IoT data collection
	Ethernet	Connect gateway with internet
	GPS	GPS function
	Power supply	Power supply input
<b>User Interface</b>	Micro SIM Card Slot	Support Micro SIM Card

<b>(External)</b>	USB	USB bootloader (Device Firmware Upgrade)
	UART	UART Terminal for debugging
	LED100 (Internal)	System indicator
	LED200 (Internal)	Ethernet full/half duplex indicator
	LED201 (Internal)	Ethernet link status indicator
	LED202 (Internal)C	Ethernet data speed indicator
	LED203 (Internal)	4G modem
<b>Dimensions Installation</b>	Dimensions	145 x 95 x 40 mm
	Weight	715g
	Installation	Derrick installation, Fixed on the wall
<b>Operating Range</b>	Operational temperature range	-40 to +75°C
	Memory temperature range	-40 to +85°C

### 2.3.1 Hardware

CPU: ARM Cortex-A53

Main Frequency: 1.2GHz

Memory: 1Gbytes RAM, 4GB eMMC

Hardware Watchdog

Internal Temperature Sensor

PoE module;

GPS module;

LoRaWAN Module:

*8 125kHz LoRaWAN receiver channel*

*1 configurable bandwidth(125kHz/250kHz/500kHz) LoRa channel*

*1 GFSK channel*

4G Modem:

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

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

*DC-HSPA+/HSPA+/HSPA/UMTS: Band 1, Band 5, Band 8, Band 9, all bands with diversity*

*TD-SCDMA: Band 34, Band 39*

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

*FDD LTE: Band 1, Band 2, Band 3, Band 4, Band 5, Band 7, Band 8, Band 20, all bands with diversity*

*WCDMA/HSDPA/HSUPA/HSPA+: Band 1, Band 2, Band 5, Band 8, all bands with diversity*

*GSM/GPRS/EDGE: 850 MHz/900 MHz/1800 MHz/1900 MHz*

### 2.3.2 Software

➤ Based on Linux Kernel

- Version: 4.1.19
- SPI Driver
- I2C Driver
- USB Host/Device Driver
- LoRaWAN module Driver
- 4G Modem Driver ( Supports GSM/GPRS/3G/4G communication)
- Ethernet driver
- GPS driver to support synchronization
- DMA Driver
- Power Management Driver
- Temperature Sensor Driver
- Watch dog

**Bootloader:**

- Support image programming
- Support USB downloading
- Support USB booting

### **3 Reference standards and specifications**

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RF Test based on ETSI EN300 220-1 V2.4.1 (2012-05) ; ETSI EN300 220-2 V2.4.1 (2012-05) ;  
EMC Test based on ETSI EN 301 489-1 V1.9.2 (2011-09); ETSI EN301 489-3 V1.6.1 (2013-08) ;  
ETSI EN301 489-17 V2.2.1 (2012-09) ;

IEC 61000-4-2;

IEC 61000-4-3;

IEC 61000-4-4;

IEC 61000-4-5;

IEC 61000-4-6;

IEC 61000-4-11。

Safety test based on EN60950-1:2006 +A11: 2009 +A1: 2010 +A12: 2011+A2:2013

IP level test based on GB 4208-2008

Environment test based on below:

JESD22-A1 ;

GB/T 2423.1-2001 Low temperature

GB/T 2423.2-2001 High temperature

## 4 Global electrical specifications and reliability

### 4.1 Electrical specifications

#### 4.1.1 Power Supply

RHF2S008P4G is a PD device which is compatible with PoE IEEE 802.3af/at standard, that support up to 100m cable for remote power supply and communications.

Table 4-1 PoE Requirement

Item	802.3af (PoE)	802.3at (PoE plus)
Classification	0~3	0~4
Max current support	350mA	600mA
PSE output voltage	44~57V DC	50~57V DC
PSE output power	≤15.4W	≤30W
PD Input voltage	36~57V DC	42.5~57V DC
PD maximum power	12.95W	25.5W
Cable requirement	Unstructured	CAT-5e or better
Cable length requirement	<100m	<100m
Related cable pair	2 (1/2, 3/6 or 4/5, 7/8)	2 (1/2, 3/6 or 4/5, 7/8)

#### 4.1.2 Consumption

Table 4-2 RHF2S008 total consumption

Item	Value typ/W	Test condition
Standby	3	No Tx and Rx in LoRaWAN, 4G connected
Average	5	LoRaWAN work with 4G connected
Peak	15	All module work with full load

#### 4.1.3 RF Specifications (LoRaWAN)

Conducted Receiver sensitivity and Transmitter output power would be used to evaluate the performance here.

1) Sensitivity

Test condition: 32byte payload, PER=10%, +25°C.

Table 4-3 Conducted Receiver sensitivity

Part Number	Bandwidth/kHz	Spreading Factor	Sensitivity/dBm
RHF2S008P4G-434	125	12	-140
		7	-126
	250	12	-137
		7	-123

	500	12	-134
		7	-120
RHF2S008P4G-470	125	12	-140
		7	-125
	250	12	-136
		7	-122
	500	12	-133
		7	-119
RHF2S008P4G-780	125	12	-139
		7	-125
	250	12	-136
		7	-122
	500	12	-133
		7	-119
RHF2S008P4G-868	125	12	-139
		7	-125
	250	12	-136
		7	-122
	500	12	-133
		7	-119
RHF2S008P4G-915	125	12	-139
		7	-125
	250	12	-136
		7	-122
	500	12	-133
		7	-119

### 2) Output power

Test condition: CW signal, +25°C.

Table 4-4 Output power

Part Number	Parameter	Min	Typ	Max	Unit
RHF2S008P4G-434	Frequency Range (Rx/Tx)	430		437	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

<b>RHF2S008P4G-470</b>	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
<b>RHF2S008P4G-780</b>	Frequency Range (Rx/Tx)	779		787	MHz
	Max Output power		26		dBm
	Output Power Variation	-1.5		1.5	dB
	TX Power Variation Temperature	-1.5		1.5	dB
	TX Frequency Variation Temperature	-3		3	ppm
<b>RHF2S008P4G-868</b>	Frequency Range (Rx/Tx)	859		871	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
<b>RHF2S008P4G-915</b>	Frequency Range (Rx/Tx)	900		930	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

### 4.1.4 Antenna performance

High performance, high efficiency fibre-glass epoxy antenna is used for RHF2S008P4G GW.

Resistance 50 Ω

VSWR<2.0

Gain=2dBi@434/470MHz; Gain=3dBi@868/915MHz

Efficiency@434MHz/470MHz>50%

Efficiency @868MHz/915MHz>70%

### 4.2 Reliability

#### 4.2.1 Environment test

**Table 4-5 Environment test requirement**

Item	Test condition	Standard	Results
Low temperature operation	Temperature: - 40°C Operation mode: working with service connected Test duration: 12 h	JESD22-A1 GB/T 2423	Appearance ok; LoRaWAN RF performance ok; Function ok;
High temperature operation	Temperature: +75°C Operation mode: working with service connected Test duration: 12 h	JESD22-A1 GB/T 2423	Appearance ok; LoRaWAN RF performance ok; Function ok;
Low temperature Storage	Temperature: - 40°C Operation mode: no power, no package Test duration: 24 h	JESD22-A1 GB/T 2423	Appearance ok; LoRaWAN RF performance ok; Function ok;
High temperature Storage	Temperature: +75°C Operation mode: no power, no package Test duration: 24 h	JESD22-A1 GB/T 2423	Appearance ok; LoRaWAN RF performance ok; Function ok;

#### 4.2.2 EMC and ESD

RHF2S008P4G is an high reliability industrial device, and ESD, Radio Frequency Electromagnetic Field Immunity, Electrical Fast Transient/Burst Immunity and Surge Immunity are operated on it based on IEC61000-4 standard.

**Table 4-6 Reliability test requirement**

Item	Standard	Test condition
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:1kV; Positive/Negative
Surge Immunity	IEC 61000-4-5	Common mode: 4kV Differential mode: 3kV Positive/Negative

#### 4.2.3 IP level for outdoor use

Referred to GB 4208-2008, the level is IP66.

## 5 Mechanical size and package information

### 5.1 Mechanical size

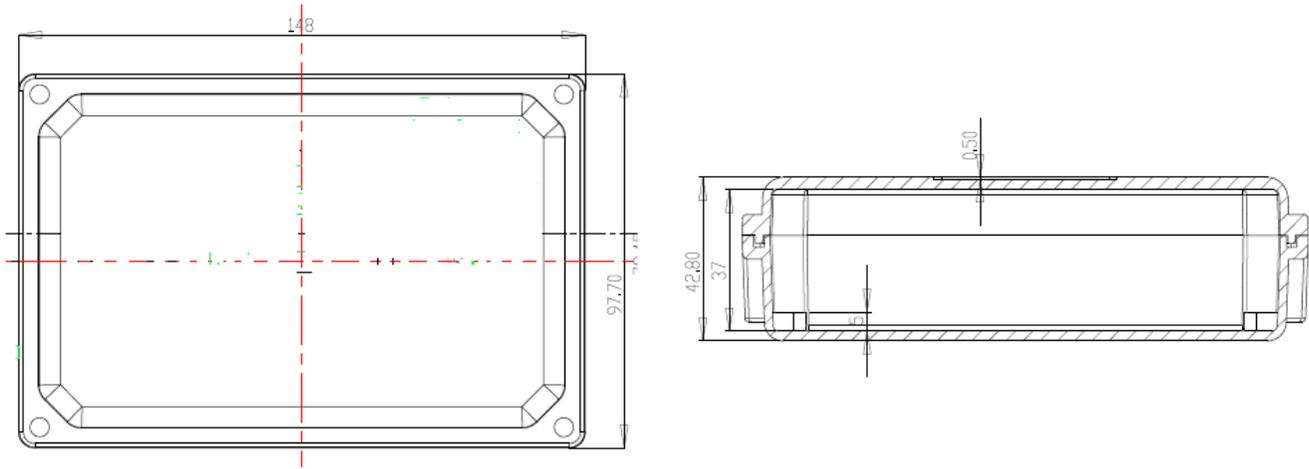


Figure 5-1 RHF2S008P4G mechanical size

### 5.2 Package information

#### 5.2.1 Package list

Table 5-1 package list

Material	PN	Qty
RHF2S008P4G	RHF2S008P4G-xxx	1
PoE injector	PoE30G-AT	1
LoRaWAN Antenna	RXHF-ANTxxx-GF	1
Fixed collar for LoRaWAN antenna	-	1
Screw for collar	M3x6	4
4G Antenna	RXHF-ANT4G	1
GPS Antenna (N-type, 70cm)	RXHF-ANTGPS	1
Wire for Ground	1.5m length	2
Fixture	-	1
Screw to fix GW (Inner hexagonal M5)	Inner hexagonal M6x8	4
Screw to fix the auxiliary fixture	M5x10	4
Screw for ground	M5x10	2
Surge protector	N-JK-G-Y-6	1
RF cable (connect the antenna to GW)	N (Male) --KSR200 (80cm) --N (Female)	1
Box for package	50x26x12 cm	1

### 5.2.2 Package information



Figure 5-2 RHF2S008P4G package

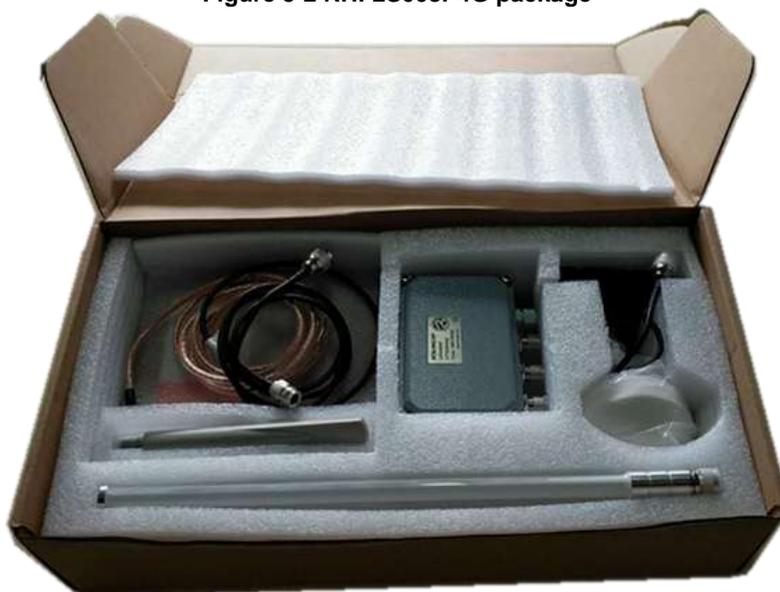


Figure 5-3 package inside

## 6 Order information

RHF2S008P4G include several part number, different part number would be used in different band and area, please contact with [sales@risinghf.com](mailto:sales@risinghf.com) for detailed information.

Table 6-1 order information

PN	descriptions
RHF2S008P4G-434	430-470MHz
RHF2S008P4G-470	Uplink 470-490MHz; Downlink 470-510MHz
RHF2S008P4G-780	779-787MHz
RHF2S008P4G-868	859-871MHz
RHF2S008P4G-915	900-930MHz

### **Modifications**

V0.3 2017-04-08

- + Update with some error modifications

V0.2 2017-04-08

- + Update with reliability requirement

- + Update with some package information

V0.1 2017-03-01

- + Create draft.

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