

DS01828**RHF2S208 Product Specifications**

V1.3

**Document information**

Info	Content
Keywords	<i>RisingHF, LoRaWAN, IOT, GW, specifications, full-duplex</i>
Abstract	This document describes the specifications of the high performance outdoor GW RHF2S0208.

Catalog

Catalog	2
Features	3
Tables.....	4
1 Preface	1
2 RHF2S208 LoRaWAN Gateway description	1
2.1 Functional Block.....	1
2.2 Product features and application	2
2.3 Specifications	2
2.3.1 Hardware	2
2.3.2 Software	2
3 Reference standards and specifications.....	3
4 Global electrical specifications and reliability	3
4.1 Electrical specifications	3
4.1.1 Power Supply.....	3
4.1.2 Consumption.....	6
4.1.3 RF Specifications (LoRaWAN)	7
4.1.4 Antenna performance	9
4.2 Reliability.....	9
4.2.1 Environment test.....	9
4.2.2 EMC and ESD	9
4.2.3 IP level for outdoor use	10
5 Mechanical size and package information.....	10
5.1 Mechanical size.....	10
5.2 Package information.....	10
5.2.1 Package list	10
5.2.2 Package information	11
6 Order information.....	12
Modifications.....	13

Features

Figure 2-1 RHF2S208 functional block	2
Figure 5-1 RHF2S208 mechanical size.....	10
Figure 5-2 RHF2S208 package	11
Figure 5-3 package inside.....	11

Tables

Table 2-1 RHF2S208 Specifications	2
Table 4-1 AC Input Voltage Limitations	4
Table 4-2 AC Input Frequency Limitations	4
Table 4-3 DC Output voltage regulation limits	4
Table 4-4 DC output current limits.....	4
Table 4-5 Internal battery specifications.....	4
Table 4-6 PoE Requirement.....	6
Table 4-7 RHF2S208 total consumption	6
Table 4-8 Conducted Receiver sensitivity	7
Table 4-9 Output power	8
Table 4-10 Environment test requirement	9
Table 4-11 Reliability test requirement.....	9
Table 5-1 package list.....	10
Table 6-1 RHF2S208Exx series (NO battery integrated).....	12
Table 6-2 RHF2S208Bxx series (internal battery integrated)	12

1 Preface

This document describe the technical specifications and features of the high performance outdoor gateway RHF2S208.

RHF2S208 LoRaWAN GW is a new generation LoRaWAN gateway designed by RisingHF, which has some new features, Half-duplex or Full-duplex alternated, 8 channel or 16 channel alternated, internal battery backup available, and so on.

2 RHF2S208 LoRaWAN Gateway description

RHF2S208 is an new generation telecommunication level IOT gateway based on LoRaWAN and target to LPWAN network, which could support half-duplex/full-duplex mode, 8 channel/16channel for particular part number. With an high reliability IP67 level water-proof industrial adapter, the gateway could be installed outdoor easily with maintenance-free. It is an IEEE 802.3 af/at compatibility PD, which also 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. Thanks to the industrial WiFi module, customer could login into the gateway in field, which make it easy when engineer do installation and check status of the device in field.

This device integrate an high performance CPU ARM Cortex-A53 core, one or two pcs of baseband processor SX1301, that it could support 8 multi-SF channels (RHF2S208xx8 series) or 16 multi-SF channels (RHF2S208xxF series), 1 or 2 single-SF channel and 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 more than 10k nodes.

2.1 Functional Block

RHF2S208 LoRaWAN functional block is shown below.

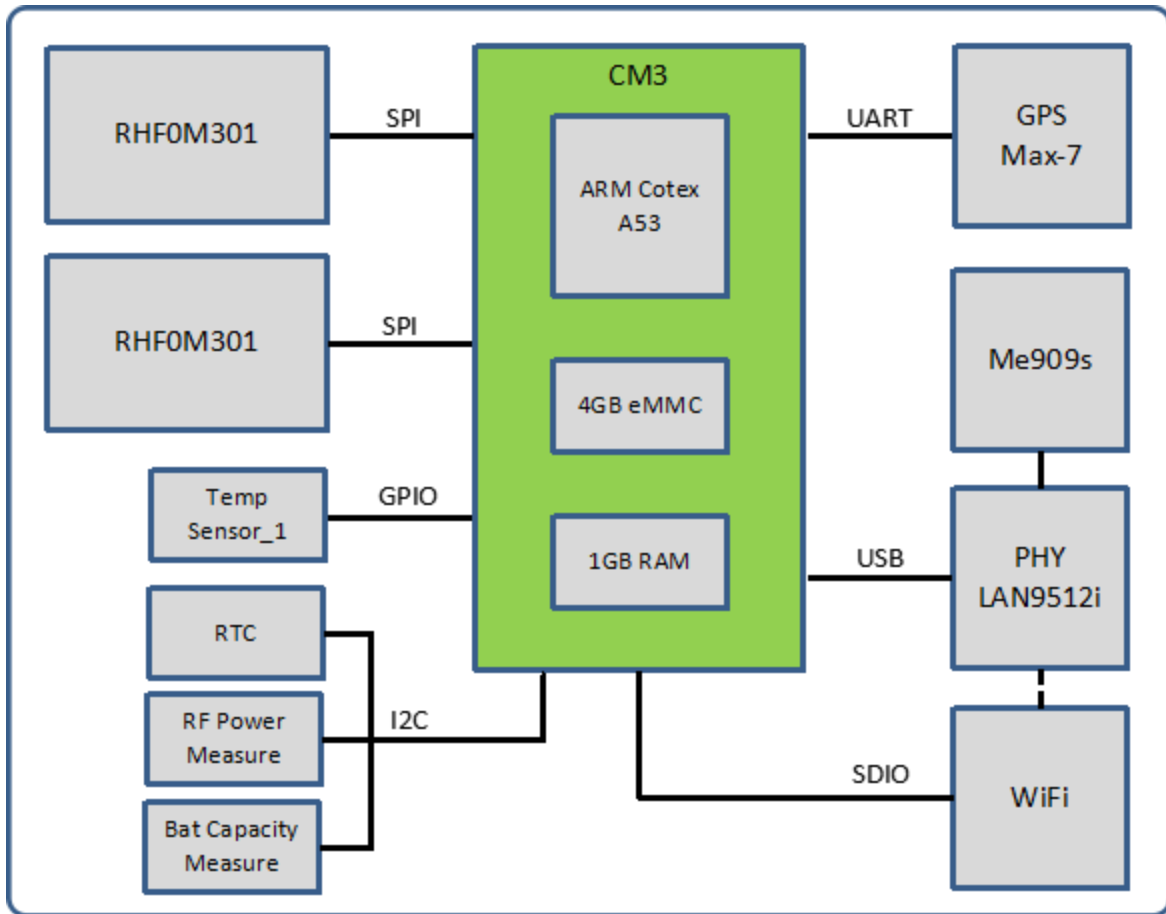


Figure 2-1 RHF2S208 functional block

2.2 Product features and application

Features:

- ✓ LoRaWAN half-duplex or full-duplex operation mode available;
- ✓ RHF2S208xx8 series: Uplink include 8 multi-SF LoRa channel, 1 single-SF LoRa channel, and 1 GFSK channel;
- ✓ RHF2S208xxF series: Uplink include 16 multi-SF LoRa channel, 2 single-SF LoRa channel, and 2 GFSK channel; (No Release yet)
- ✓ 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, IP67 device, easy to setup LPWAN network outdoor
- ✓ Quick configuration and maintenance through WiFi;
- ✓ Power supply: DC jack, PoE and internal LiFePO4 battery
- ✓ More than 4hr duration time with backup battery
- ✓ -40°C to +75°C ;
- ✓ 10kA surge protection
- ✓ Water proof level: IP67

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 RHF2S208 Specifications

Item Group	Item	Description
System Configuration	Core	ARM Cortex-A53
	Main Frequency	1.2GHz
	RAM	1Gbytes
	Flash	4Gbytes eMMC
Communication	Wired Network	Ethernet 10M/100Mbps
	Mobile Cellular	GSM/3G/4G Wireless connection
	LoRaWAN	Long Range Wireless Communication
Electrical Specification	Power supply input	External DC Jack (default); PoE +48 Input compatible with IEEE 802.3 af/at; Internal battery back up available (RHF2S208Bxx only);
	Average Power Consumption	5.5W
	LoRa Output Power	type: 14dBm@868MHz; 17dBm@470MHz Max: 27dBm
	LoRa Sensitivity	-141dBm@SF12,BW=125kHz
Sensor	Temperature	Monitor device internal temperature
User Interface (External)	Mobile Cellular 4G Antenna	Connect gateway with internet
	LoRaWAN Antenna	LoRaWAN transceiver, IoT data collection
	Ethernet	Connect gateway with internet
	GPS	GPS function
	WiFi	WiFi accessing
	USB	USB interface
	Power supply	Power supply input
User Interface (Internal)	Standard SIM Card Slot	Support Standard SIM Card (25mm × 15mm × 0.8mm)
	USB	USB bootloader (Device Firmware Upgrade)
	UART	UART Terminal for debugging
	LED400 (Internal)	System indicator
	LED600 (Internal)	Ethernet full/half duplex indicator
	LED601 (Internal)	Ethernet link status indicator

	LED602 (Internal)	Ethernet data speed indicator
	LED206 (Internal)	Charging indicator
	LED207 (Internal)	Charged indicator
	LED500 (Internal)	4G modem
Dimensions Installation	Dimensions	210x 200x 85 mm
	Weight	2100g (RHF2S208Exx) 2510g (RHF2S208Bxx)
	Installation	Derrick installation, Fixed on the wall
Operating Range	Operational temperature range	-40 to +75°C
	Storage 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

RTC

Internal Temperature Sensor

PoE module;

GPS module;

WiFi module;

Internal battery back up;

LoRaWAN Module x1/x2;

4G Modem (For China version, RHF2S208xxx-434, RHF2S208xxx-470):

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

4G Modem (For International version, RHF2S208xxx-868, RHF2S208xxx-915):

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: 4.14.34-v7+
- 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
- WiFi accessing driver;
- DMA Driver
- Power and charging Management Driver
- Temperature Sensor Driver
- Watch dog
- RTC;

Bootloader:

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

3 Reference standards and specifications

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

1. External DC power supply (default)

Input voltage range: 12V to 24V DC.

A 19V output DC adapter is a standard configuration part with the GW. The industrial adapter is IP67 level. Below is the key parameters and specifications of the adapter.

Table 4-1 AC Input Voltage Limitations

最小值 Minimum	额定值 Nominal	最大值 Maximum
100Vac	220Vac	240Vac

Table 4-2 AC Input Frequency Limitations

最小值 Minimum	额定值 Nominal	最大值 Maximum
50Hz	50Hz/60Hz	60Hz

Table 4-3 DC Output voltage regulation limits

Parameter 参数	Line Regulation 线性调整	Load regulation 负载调整	Cross regulation 交叉调整
V1:19V	N/A	±5%	N/A

Table 4-4 DC output current limits

Parameter 参数	Min Current 最小电流	Rate Current 标称电流	Max Current 最大电流	Unit 单位
V1: 19V	1.5	1.5	2.5	A

2. Internal battery backup (only available for RHF2S208Bxx Series)
9.6V 3200mAh LiFePo4 battery.

Table 4-5 Internal battery specifications

No. (序号)	Item (项目)	General Parameter (常规参数)	Remark (备注)
1	Rated Capacity (额定容量)	标称容量(Typ.) 3200mAh	Standard charge and Standard discharge(标准 充放电)
		最小容量(Min.) 3150mAh	
2	Nominal Voltage (标称电压)	9.6V	
3	End of Charge Voltage (充电最高电压)	10.95V	
4	Charge mode 充电方式	CC, CV	

5	Charging current 充电电流	0.2C	充电器充电电流 Charger charging current
6	Charging cut-off current 充电截止电流	0.02C	
7	Charging time 充电时间	5~6H	
8	Over-Charge Voltage Protection (cell) 充电单体电池保护	3.9V	
9	Max continuous charge current 最大持续充电电流	3A	
10	Maximum Continuous Discharging Current 持续最大工作电流	3A	
11	Discharge of Peak current 放电峰值电流	-----	
12	Over-discharge Voltage Protection (cell) 放电单体电池保护	2.0V	
13	Over-Current Discharge Protection 过流保护	6±1A	
14	Short circuit protection 短路保护	有保护 With protection	
15	Short circuit protection Release 短路保护恢复	Cut off Load 断开负载	
16	Cell Dimension (尺寸)	Length(长)MAX: mm	
		Width(宽)MAX: mm	
		Height(高)MAX:mm	
17	Weight (重量)	≈260g	
18	Operation Temperature Range (工作温度范围)	Charge (充电) : 0~45°C	60±25%R.H. Bare Cell (单体电池储存湿度范围)
		Discharge (放电) : - 10~60°C	

19	Storage Temperature Range (储存温度范围)	1 month (一个月) : -20°C ~ 45°C 3 month (三个月) : -20°C ~ 45°C 1 year (一年) : -20°C ~ 20°C	60±25%R.H. at the shipment state (出货状态时的湿度范围)
20	Cycle Life (循环寿命)	1. Charge:0.2c to10.95V 2.Constant voltage to 0.02c Rest time : 10 min 3. Discharge: 0.2c to 6.0V 4. Rest Time between Charge and Discharge: 10min 5. Temperature:25±5°C 1.充电:0.2c 充至 10.95V 2.恒压至 0.02c,搁置 10min 3.放电:0.2c 放至 6.0V 4.搁置:10min 5.温度:25±5°C	Higher than 70% of the Initial Capacities of the Cells 1000 次≥初始容量 70%

3. PoE injector

RHF2S208 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 4-6 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 4-7 RHF2S208 total consumption

Item	Value typ/W	Test condition
Standby	3	No Tx and Rx in LoraWAN,4G connected
Average	5.5	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 4-8 Conducted Receiver sensitivity

Part Number	Bandwidth/kHz	Spreading Factor	Sensitivity/dBm
RHF2S208xxx-434	125	12	-140
		7	-126
	250	12	-137
		7	-123
	500	12	-134
		7	-120
RHF2S208xxx-470	125	12	-140
		7	-125
	250	12	-136
		7	-122
	500	12	-133
		7	-119
RHF2S208xxx-780	125	12	-139
		7	-125
	250	12	-136
		7	-122
	500	12	-133
		7	-119
RHF2S208xxx-868	125	12	-139
		7	-125
	250	12	-136
		7	-122
	500	12	-133
		7	-119
RHF2S208xxx-915	125	12	-139
		7	-125
	250	12	-136
		7	-122
	500	12	-133
		7	-119

		7	-119
--	--	---	------

2) Output power

Test condition: CW signal, +25°C.

Table 4-9 Output power

Part Number	Parameter	Min	Typ	Max	Unit
RHF2S208xxx-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
RHF2S208xxx-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
RHF2S208xxx-780	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
RHF2S208xxx-868	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
RHF2S208xxx-915	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 RHF2S208 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 4-10 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

RHF2S208 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 4-11 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:10kV; Positive/Negative
Surge Immunity	IEC 61000-4-5	Common mode: 6kV Differential mode: 3kV Positive/Negative

4.2.3 IP level for outdoor use

Referred to GB 4208-2008, the level is IP67.

5 Mechanical size and package information

5.1 Mechanical size

The outline size is 210*200*85 mm.

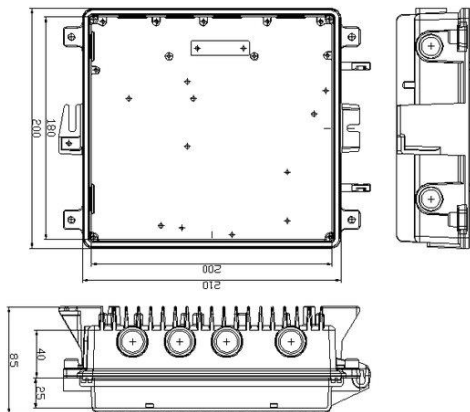


Figure 5-1 RHF2S208 mechanical size

5.2 Package information

5.2.1 Package list

Table 5-1 package list

Material	PN	Qty
Main unit	RHF2S208xxx-xxx	1
Industrial AC/DC Adapter	RCL-X190150C	1
LoRaWAN Antenna	M1G. 0042-R0A	1
GPS Antenna	V1468-001-A-03	1
WiFi Antenna	V1437-002-A-04	1
4G Antenna	V1437-002-A-05	1
hexagon bar wrench	5mm, long bar length=73.3MM, short bar	1

	length=22mm, for inner hexagon screw M6	
Screw to fix GW (Inner hexagonal M5)	Inner hexagonal M6x8	4
Screw to fix the adapter	M3x8	4
Screw for ground	M5x10	1
Surge protector	N-JK-G-Y-6	1
Grounding wire	1.5m	1
Mounting bracket	256x135x92 mm	1
Box for package	50x26x12 cm	1

5.2.2 Package information

Package Size: 650*340*125 mm.

Weight with package:

RHF2S208Exx-xxx (No battery) 5.5 kg;

RHF2S208Exx-xxx (No battery) 6 kg.

Weight without package:

RHF2S208Exx-xxx (Battery Inside) 4.5 kg;

RHF2S208Exx-xxx (Battery Inside) 5 kg.



Figure 5-2 RHF2S208 package



Figure 5-3 package inside

6 Order information

RHF2S208 have two series, one is without internal battery and another one is with internal battery, which both include several part number, different part number would be used in different band and area, please contact with sales@risinghf.com for detailed information.

Table 6-1 RHF2S208Exx series (NO battery integrated)

Num	Series	Part Number	Band@Uplink	Band@Downlink	specifications
1	RHF2S208EH8	RHF2S208EH8-434	430MHz~437MHz	430MHz~437MHz	8channel/Half duplex
2	RHF2S208EH8	RHF2S208EH8-470	470MHz~490MHz	470MHz~510MHz	8channel/Half duplex
3	RHF2S208EH8	RHF2S208EH8-868	859MHz~871MHz	859MHz~871MHz	8channel/Half duplex
4	RHF2S208EH8	RHF2S208EH8-915	900MHz~930MHz	900MHz~930MHz	8channel/Half duplex
5	RHF2S208EF8	RHF2S208EF8-470	470MHz~490MHz	500MHz~510MHz	8channel/Full duplex
6	RHF2S208EF8	RHF2S208EF8-AL1	470. 2MHz~476. 6MHz	483. 8MHz~490. 2MHz	8channel/Full duplex

Table 6-2 RHF2S208Bxx series (internal battery integrated)

Num	Series	Part Number	Band@Uplink	Band@Downlink	specifications
1	RHF2S208BH8	RHF2S208BH8-434	430MHz~437MHz	430MHz~437MHz	8channel/Half duplex Battery Inside
2	RHF2S208BH8	RHF2S208BH8-470	470MHz~490MHz	470MHz~510MHz	8channel/Half duplex Battery Inside
3	RHF2S208BH8	RHF2S208BH8-868	859MHz~871MHz	859MHz~871MHz	8channel/Half duplex Battery Inside
4	RHF2S208BH8	RHF2S208BH8-915	900MHz~930MHz	900MHz~930MHz	8channel/Half duplex Battery Inside
5	RHF2S208BF8	RHF2S208BF8-470	470MHz~490MHz	500MHz~510MHz	8channel/Full duplex Battery Inside
6	RHF2S208BF8	RHF2S208BF8-AL1	470. 2MHz~476. 6MHz	483. 8MHz~490. 2MHz	8channel/Full duplex Battery Inside

Modifications

V1.3 2020-05-21

+ Update package information.

V1.2 2019-07-15

+ Update package weight information.

V1.1 2018-09-28

+ Update package information.

V1.0 2018-07-20

+ Create draft.

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