DS01603

RHF0M301 Datasheet

V1.3

Document information

Info	Content
Keywords	*RisingHF, LoRa Gateway, Module*
Abstract	This document shows a product description including performance and interfaces of the concentrator module RHF0M301-xxx.

Content

1 Introduction

RHF0M301 is a high performance LoRa/LoRaWAN module based on Semtech SX1301. The SX1301 digital baseband chip is a massive digital signal processing engine specifically designed to offer breakthrough gateway capabilities in the ISM bands worldwide. RHF0M301 integrate the core chip SX1301 with high performance RF front end module include high efficiency PA and low noise figure LNA. SPI interface is provided to customer to access into the registers of the module. With this high integration and small size module, customer could easily to set up their own multi-channel GW.

1.1 Key Product Features

- **Ultra small size 40 x 63 mm**
- **LoRa long range module technology**
- **SX1301 solution**
- **Various Frequency Band**
  - ✓ 434/470/780/868/915MHz
- **High speed SPI - 10MHz**
- **Ultra long range communication**
  - ✓ 15Km line of sight
  - ✓ 3~5Km urban enviroment
- **Multi LoRa Spreading Factor**
- **Maximum 10 channels**
  - ✓ 8 x Multi SF channels (SF7 to SF12 with 125kHz Bandwidth)
  - ✓ 1 x FSK channel
  - ✓ 1 x LoRa channel
- **Dynamic data-rate adaptation (ADR)**
- **Sensitivity down to -140 dBm**
- **CE/FCC/IC certificated**
- **Supply customized development support**

1.2 Applications

- **Smart city**
- **Smart Metering (Water, Electric, Gas meter)**
- **Security Sensors Network**
- **Agricultural Monitoring**
- **Internet of Things (IoT)**
- **Industrial Automation Control**
- **Remote Control**
- **Wireless Sensors**
- **M2M**
- **Wireless Alarm**
- **. . .**

1.3 General descriptions

RHF0M301 module is based on Semtech v1.0 LoRaWAN concentrator reference design. A RF switch is used to achieve half duplex mode. Figure 1-1 show a simple block diagram of the module.

- ✓ Power supply: +5V type
- ✓ SPI: 22R is in serial internal
- ✓ GPIO: 910R is in serial internal
- ✓ PPS: connect to it directly, no need to serial any resistor or parallel any capacitors
- ✓ Reset: pull down with 10k resistor internal, a RC filter(R=22R, C=10nF) is strongly suggested between the module and host MCU.

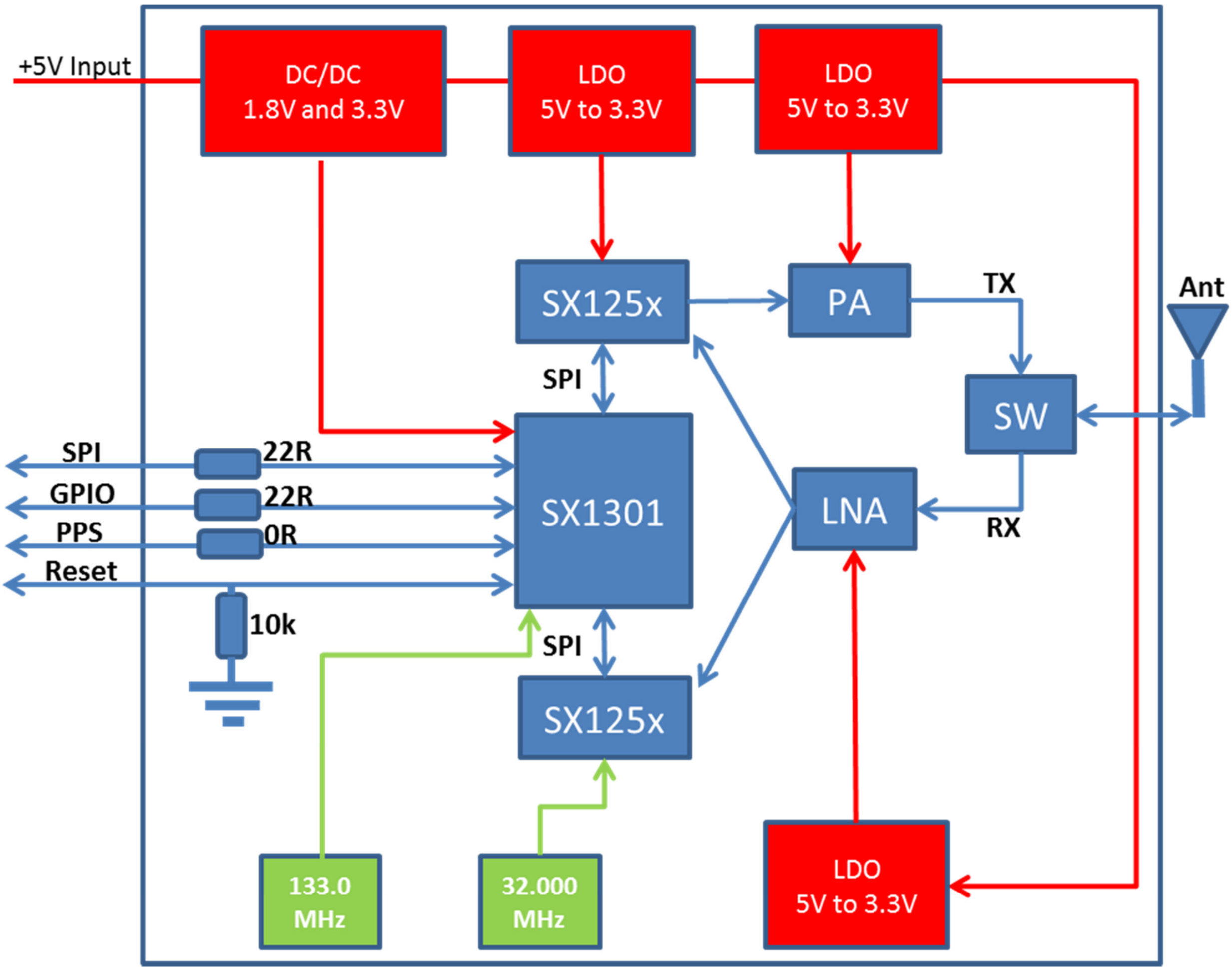

Figure 1-1 RHF0M301 simple block diagram

1.4 Part Number (ordering information)

Table 1-1 ordering information

Part Number	Feature	Status
RHF0M301-434	430 ~ 437MHz	Released
RHF0M301-470	470 ~ 490MHz	Released
RHF0M301-470B	Uplink 470 ~ 490MHz, Downlink 470 ~ 510MHz	Not Released

RHF0M301-780	779 ~ 787MHz	Released
RHF0M301-868	859 ~ 871MHz	Released
RHF0M301-915	900 ~ 930MHz	Released

2 Electrical Characteristics

2.1 Pins Definition

Table 2-1 Pin definition and description

Pin	Definition	Type	Description
1	VCC5V	Power (VCC)	+5V Input
2	VCC5V	Power (VCC)	+5V Input
3	GND	Power (GND)	Ground
4	GND	Power (GND)	Ground
5	NC		No connection
6	NC		No connection
7	NC		No connection
8	SX1301_GPIO4	Input/Output	GPIO4 from SX1301
9	SX1301_GPIO2	Input/Output	GPIO2 from SX1302
10	SX1301_GPIO3	Input/Output	GPIO3 from SX1303
11	SX1301_GPIO0	Input/Output	GPIO0 from SX1304
12	SX1301_GPIO1	Input/Output	GPIO1 from SX1305
13	NC		No connection
14	Reset	Input	Reset signal input to reset SX1301
15	MISO	Output	MISO of SPI
16	SCK	Input	SCK of SPI
17	CSN	Input	CSN of SPI
18	MOSI	Input	MOSI of SPI
19	NC		No connection
20	NC		No connection
21	GND	Power (GND)	Ground
22	GND	Power (GND)	Ground
23	GND	Power (GND)	Ground
24	GPS_PPS	Input	PPS signal input from GPS module

2.2 Absolute Maximum Ratings

Table 2-2 Absolute maximum ratings

Item	MIN	TYP	MAX	Unit
Operating Temperature	-40	+25	+85	°C
RF Input			-13	dBm
Supply Voltage	-0.3	+5	+6	V
Supply Current	1.5			A

Note: The maximum current is about 660mA with max output power with 50R match. But peak current would be about 1A if the output port is mismatching (antenna is mismatch for example).

2.3 Power consumption

Table 2-3 Power consumption of RHF0M301

Status	Current/	Unit
Normal, 8 Rx CH ON, PA ON	340	mA
Normal, 8 Rx CH ON, PA ON (Uplink) Average	590	mA
Normal, 8 Rx CH ON, PA ON (Uplink), Peak	660	mA
Normal, Standby mode	40	mA
Test mode, 8 Rx CH ON	340	mA
Test Mode, TX continuous, MAX Output power	395	mA

Note: All the test data above is based on the RF port is matching with 50R impedance, RHF0M301-434 used, 25°C Temperature.
(1) 5V DC supply
(2) RF port is matched with 50Ω load
(3) RHF0M301-434 used, 25°C Temperature

2.4 SPI Timing specifications

Table 2-4 SPI timing specifications

Parameter	Conditions	Min	Typ	Max	Unit
Logic low input threshold	“0” logic input			0.4	V
Logic high input threshold	“1” logic input	2.9		3.3	V
Logic low output level	“0” logic output, 2 mA sink			0.4	V
Logic high output level	“1” logic output, 2 mA source	2.9		3.3	V
SCK frequency				10	MHz
SCK high time		50			ns
SCK low time		50			ns
SCK rise time			5		ns
SCK fall time			5		ns
MOSI setup time	From MOSI change to SCK rising edge.	10			ns
MOSI hold time	From SCK rising edge to MOSI change	20			ns
CSN setup time	From CSN falling edge to SCK rising edge	10			ns
CSN hold time	From SCK falling edge to CSN rising edge	40			ns
NSS high time between SPI accesses		40			ns

2.5 RF Characteristics

2.5.1 Transmitter

Table 2-5 RF transmitter characteristics

Part Number	Parameter	Min	Typ	Max	Unit
RHF0M301-434	Frequency Range（Rx/Tx）	430		437	MHz
	Max Output power		24.5		dBm
	Output Power Variation	-1.5		1.5	dB

	TX Power Variation Temperature（-40 to 85℃）	-1.5		1.5	dB
	TX Frequency Variation Temperature（-40 to 85℃）	-3		3	ppm
RHF0M301-470	Frequency Range（Rx/Tx）	470		490	MHz
	Max Output power		25		dBm
	Output Power Variation	-1.5		1.5	dB
	TX Power Variation Temperature（-40 to 85℃）	-1.5		1.5	dB
	TX Frequency Variation Temperature（-40 to 85℃）	-3		3	ppm
RHF0M301-470B	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℃）	-1.5		1.5	dB
	TX Frequency Variation Temperature（-40 to 85℃）	-3		3	ppm
RHF0M301-780	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
RHF0M301-868	Frequency Range（Rx/Tx）	859		871	MHz
	Max Output power		24.5		dBm
	Output Power Variation	-1.5		1.5	dB
	TX Power Variation Temperature（-40 to 85℃）	-1.5		1.5	dB
	TX Frequency Variation Temperature（-40 to 85℃）	-3		3	ppm
RHF0M301-915	Frequency Range（Rx/Tx）	900		930	MHz
	Max Output power		24.5		dBm
	Output Power Variation	-1.5		1.5	dB

	TX Power Variation Temperature （-40 to 85℃）	-1.5		1.5	dB
	TX Frequency Variation Temperature （-40 to 85℃）	-3		3	ppm

2.5.2 Receiver

Sensitivities are given for 32 bytes payload, 10% PER.

Table 2-6 Receiver sensitivity

Part Number	Bandwidth/kHz	Spreading Factor	Sensitivity/dBm
RHF0M301-434	125	12	-140
		7	-126
	250	12	-137
		7	-123
	500	12	-134
		7	-120
RHF0M301-470 RHF0M301-470B	125	12	-139
		7	-125
	250	12	-136
		7	-122
	500	12	-133
		7	-119
RHF0M301-780	125	12	-139
		7	-125
	250	12	-136
		7	-122
	500	12	-133
		7	-119
RHF0M301-868	125	12	-139
		7	-125
	250	12	-136
		7	-122
	500	12	-133
		7	-119
RHF0M301-915	125	12	-139
		7	-125
	250	12	-136
		7	-122
	500	12	-133
		7	-119

2.5.3 Frequency response

2.5.3.1 RHF0M301-434

Available band: 430MHz to 437MHz

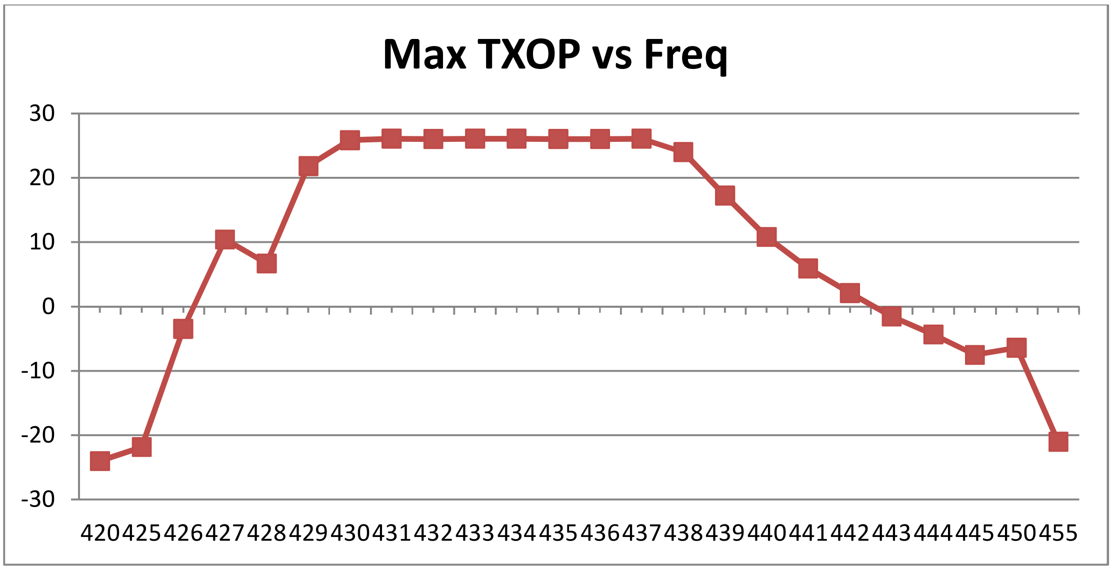

Figure 2-1 Txop vs Freq for RHF0M301-434

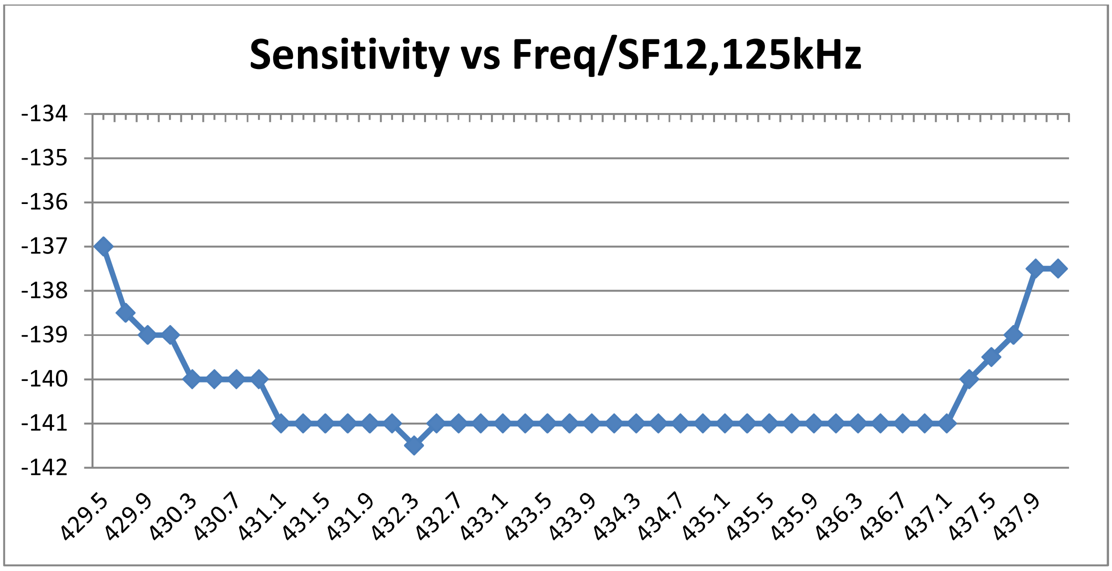

Figure 2-2 Sensitivity vs Freq for RHF0M301-434

2.5.3.2 RHF0M301-470/RHF0M301-470B

For RHF0M301-470 (the previous version):
Available band: 470MHz to 490MHz

For RHF0M301-470B(new version):
Available band: 470MHz to 490MHz (uplink); 470MHz to 510MHz (downlink);

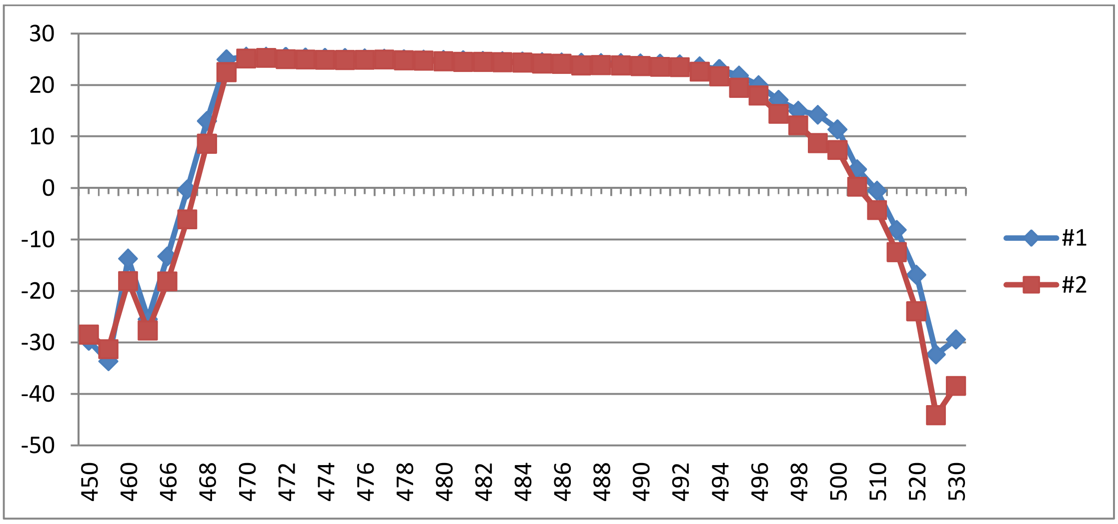

Figure 2-3 Txop vs Freq for RHF0M301-470

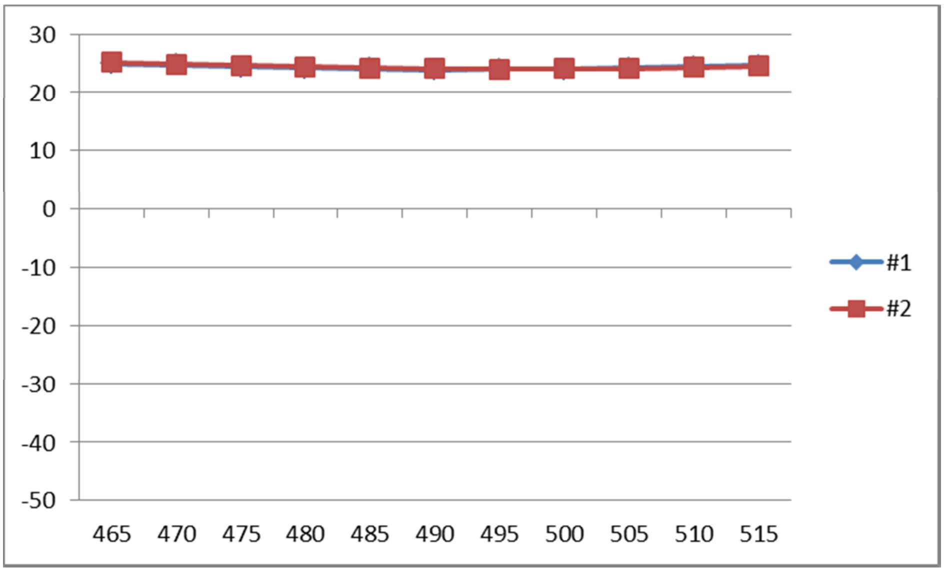

Figure 2-4 Txop vs Freq for RHF0M301-470B

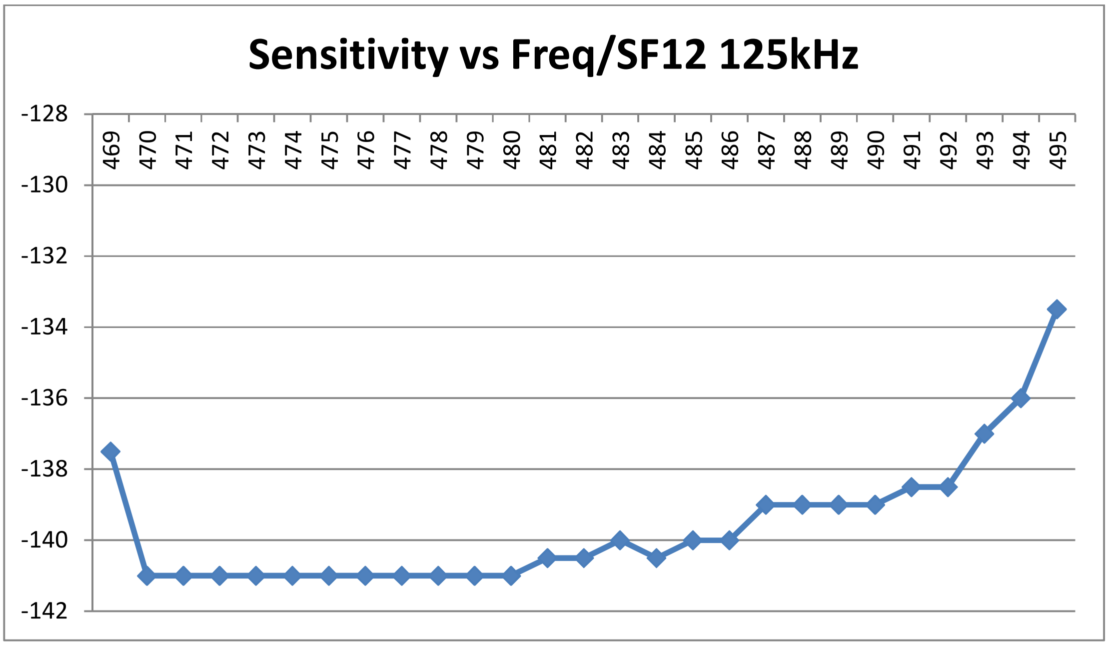

Figure 2-5 Sensitivity vs Freq for RHF0M301-470 and RHF0M301-470B

2.5.3.3 RHF0M301-780

Available band: 779MHz to 787MHz

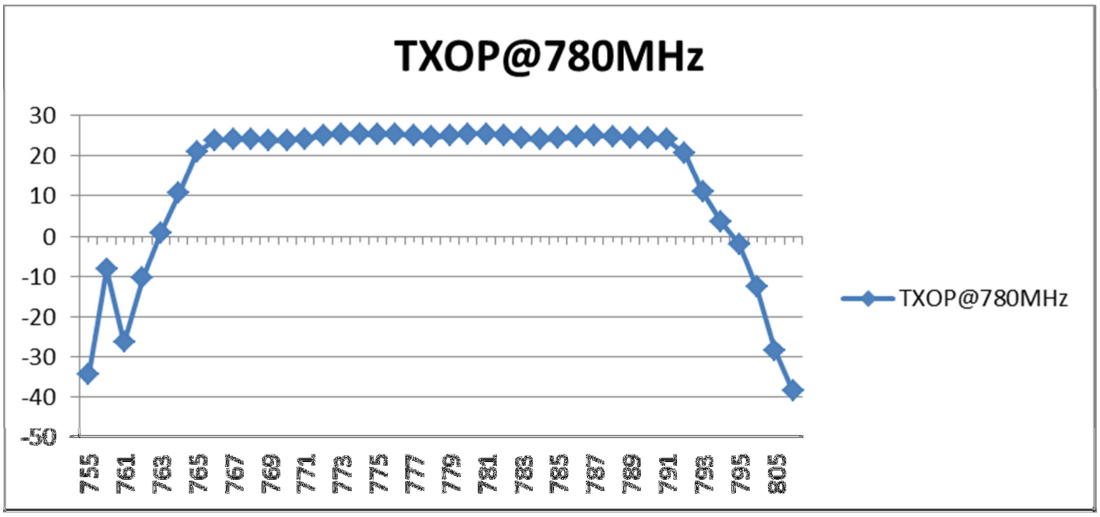

Figure 2-6 Txop vs Freq for RHF0M301-780

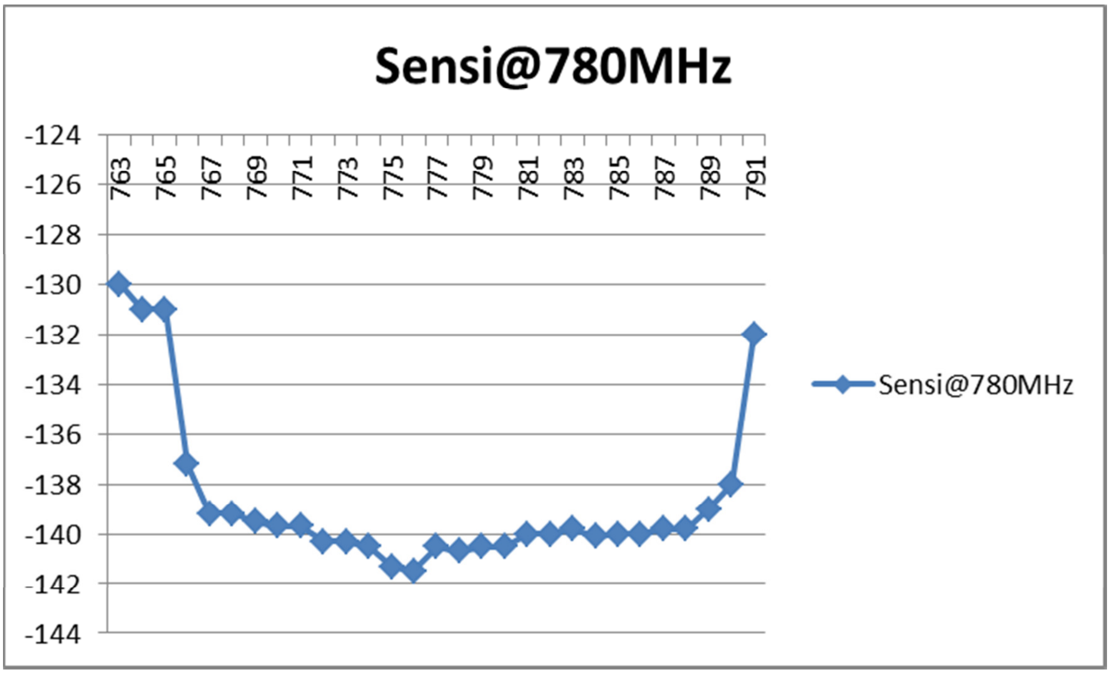

Figure 2-7 Sensitivity vs Freq for RHF0M301-780

2.5.3.4 RHF0M301-868

Available band: 859MHz to 871MHz

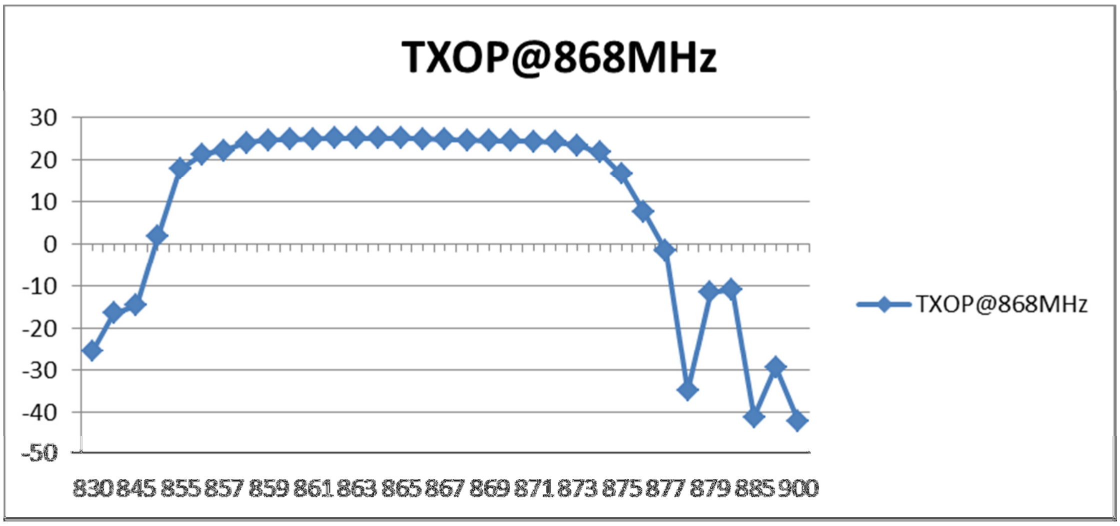

Figure 2-8 Txop vs Freq for RHF0M301-868

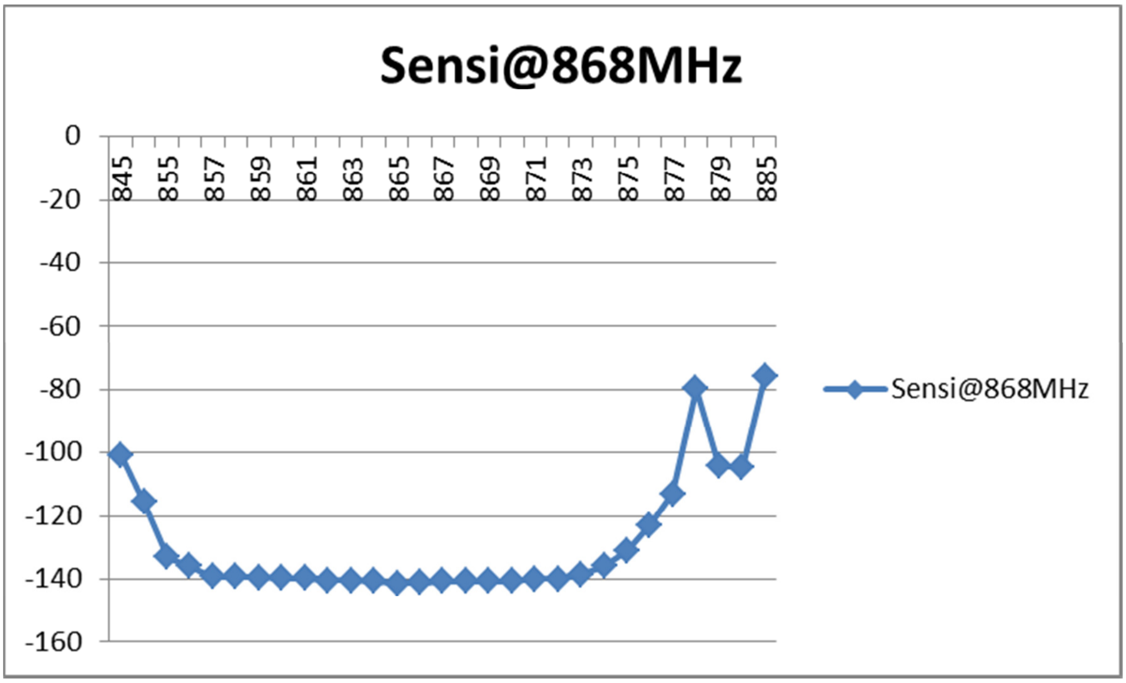

Figure 2-9 Sensitivity vs Freq for RHF0M301-868

2.5.3.5 RHF0M301-915

Available band: 900MHz to 930MHz

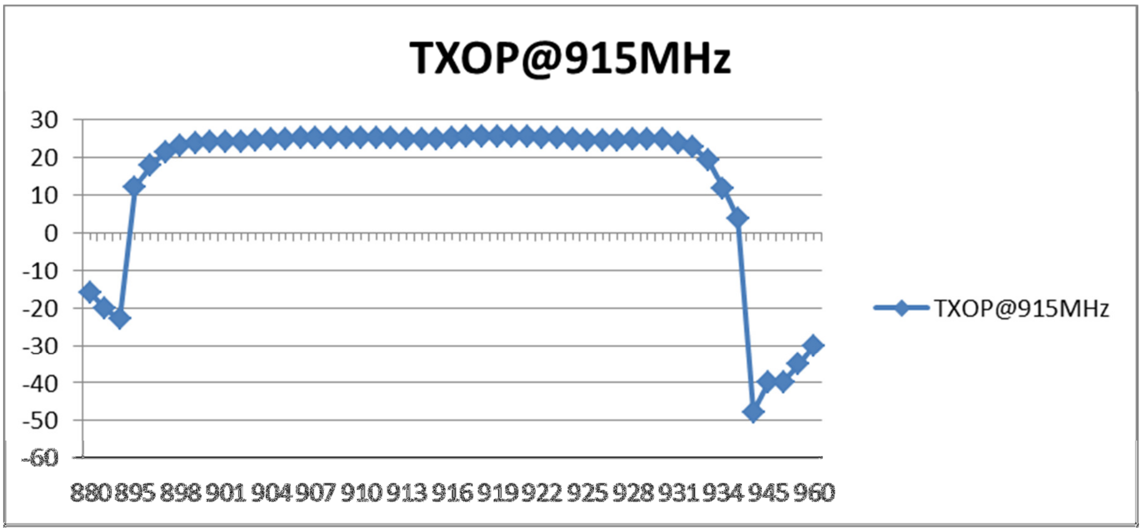

Figure 2-10 Txop vs Freq for RHF0M301-915

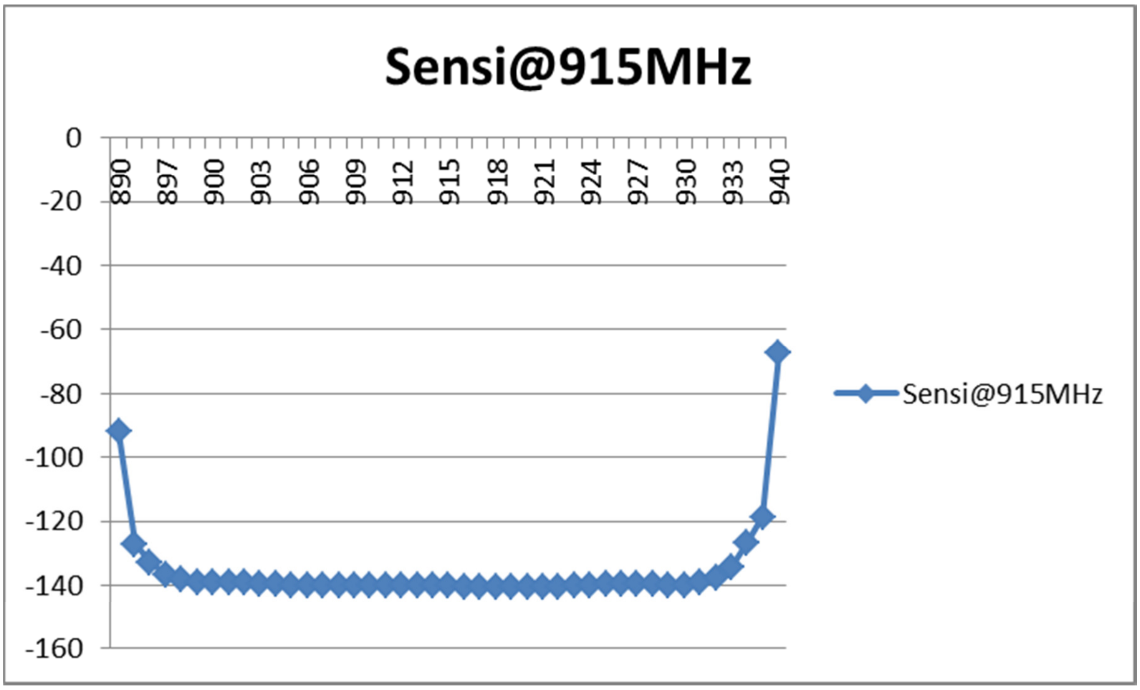

Figure 2-11 Sensitivity vs Freq for RHF0M301-915

2.5.4 CW interferer rejection

PACKET: CHAN:0 BW:0 SF:7 CR:1 PPM:0 PL(16): 2E 5C 0F 86 56 2D 36 E7 AD 78 E9 1B BF BC 90 2F
TEST : CW interferer rejection
SETUP : Wanted level: -122 dBm, PER: 50%, max errors: 10, max packets: 20, resolution: 1 dB
Test Band: 434MHz
RESULT:

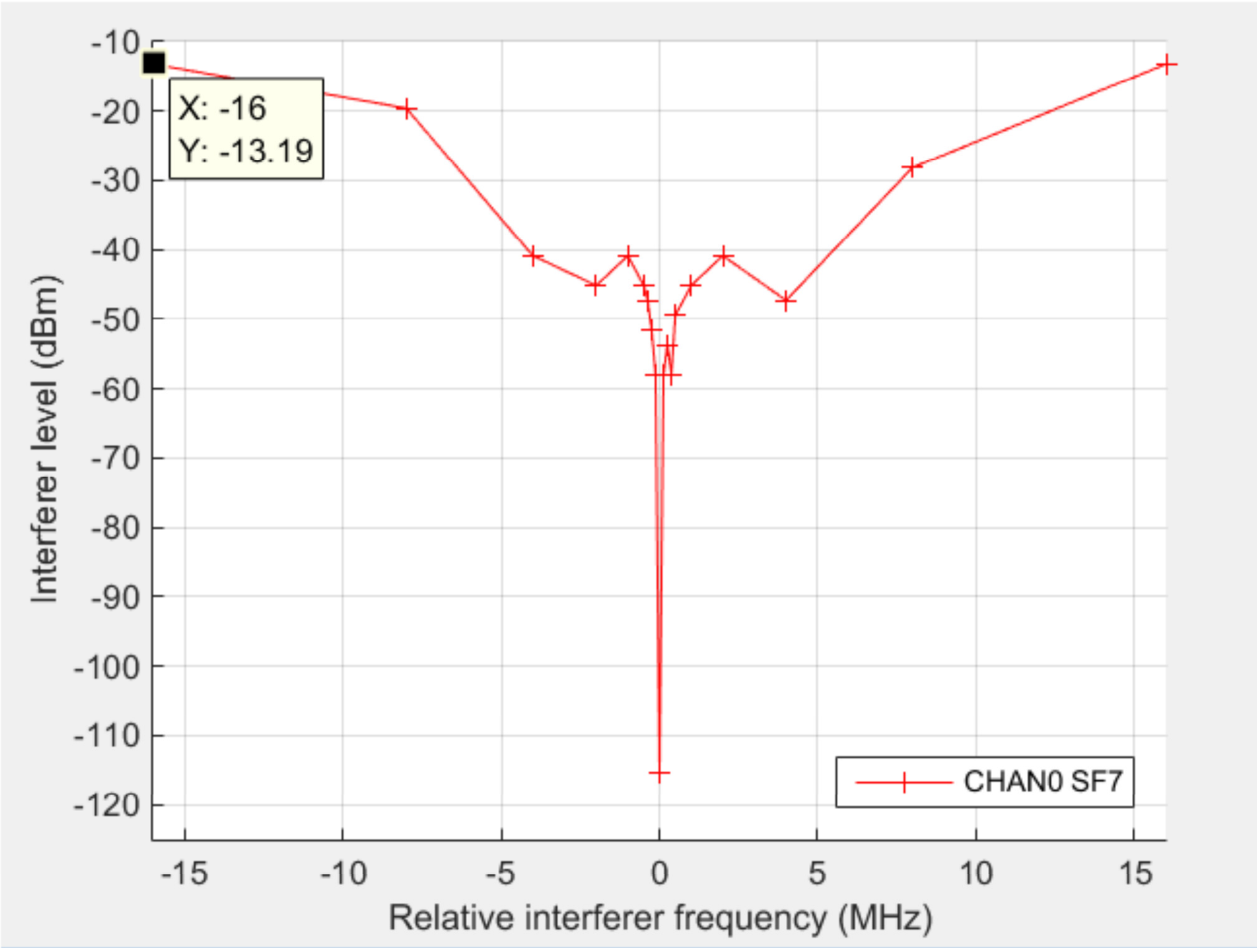

Figure 2-12 Rx CW blocking immunity

3 Application

3.1 Semtech HAL

This part will give the output power table for each band. Users should refer to these tables to configure their GW on server side.

3.1.1 RHF0M301-434

RSSI Offset: -176

Table 3-1 RHF0M301-434 TX Power Table:

TXLUT Index	RF POWER/dBm	DAC	DIG	MIX	PA
0	-1	3	0	10	0
1	1	3	3	15	0
2	2	3	0	15	0
3	4	3	3	10	1
4	7	3	3	12	1
5	8	3	3	13	1
6	10	3	0	13	1
7	13	3	0	8	2
8	14	3	3	12	2
9	17	3	0	10	2
10	18	3	0	11	2
11	19	3	0	12	2
12	20	3	0	13	2
13	21	3	0	15	2
14	23	3	3	11	3
15	24	3	0	9	3

```
// RHF0M301-434
"tx_lut_0":  { "rf_power": -1, "dig_gain": 0, "mix_gain": 10, "pa_gain": 0 },
"tx_lut_1":  { "rf_power": 1,  "dig_gain": 3, "mix_gain": 15, "pa_gain": 0 },
"tx_lut_2":  { "rf_power": 2,  "dig_gain": 0, "mix_gain": 15, "pa_gain": 0 },
"tx_lut_3":  { "rf_power": 4,  "dig_gain": 3, "mix_gain": 10, "pa_gain": 1 },
"tx_lut_4":  { "rf_power": 7,  "dig_gain": 3, "mix_gain": 12, "pa_gain": 1 },
"tx_lut_5":  { "rf_power": 8,  "dig_gain": 3, "mix_gain": 13, "pa_gain": 1 },
"tx_lut_6":  { "rf_power": 10, "dig_gain": 0, "mix_gain": 13, "pa_gain": 1 },
"tx_lut_7":  { "rf_power": 13, "dig_gain": 0, "mix_gain": 8,  "pa_gain": 2 },
"tx_lut_8":  { "rf_power": 14, "dig_gain": 3, "mix_gain": 12, "pa_gain": 2 },
"tx_lut_9":  { "rf_power": 17, "dig_gain": 0, "mix_gain": 10, "pa_gain": 2 },
"tx_lut_10": { "rf_power": 18, "dig_gain": 0, "mix_gain": 11, "pa_gain": 2 },
"tx_lut_11": { "rf_power": 19, "dig_gain": 0, "mix_gain": 12, "pa_gain": 2 },
"tx_lut_12": { "rf_power": 20, "dig_gain": 0, "mix_gain": 13, "pa_gain": 2 },
"tx_lut_13": { "rf_power": 21, "dig_gain": 0, "mix_gain": 15, "pa_gain": 2 },
"tx_lut_14": { "rf_power": 23, "dig_gain": 3, "mix_gain": 11, "pa_gain": 3 },
"tx_lut_15": { "rf_power": 24, "dig_gain": 0, "mix_gain": 9,  "pa_gain": 3 }
```

3.1.2 RHF0M301-470/RHF0M301-470B

RSSI Offset: -176

Table 3-2 RHF0M301-470/RHF0M301-470B TX Power Table:

TXLUT Index	RF POWER/dBm	DAC	DIG	MIX	PA
0	-2	3	3	8	0
1	1	3	3	10	0
2	3	3	3	12	0
3	4	3	3	15	0
4	5	3	0	15	0
5	8	3	3	8	1
6	10	3	0	8	1
7	14	3	0	13	1
8	15	3	3	8	2
9	17	3	3	9	2
10	19	3	0	8	2
11	20	3	0	9	2
12	21	3	0	10	2
13	23	3	0	14	2
14	24	3	3	10	3
15	25	3	0	9	3

```
// RHF0M301-470 and RHF0M301-470B
"tx_lut_0":  { "rf_power": -2, "dig_gain": 3, "mix_gain": 8,  "pa_gain": 0 },
"tx_lut_1":  { "rf_power": 1,  "dig_gain": 3, "mix_gain": 10, "pa_gain": 0 },
"tx_lut_2":  { "rf_power": 3,  "dig_gain": 3, "mix_gain": 12, "pa_gain": 0 },
"tx_lut_3":  { "rf_power": 4,  "dig_gain": 3, "mix_gain": 15, "pa_gain": 0 },
"tx_lut_4":  { "rf_power": 5,  "dig_gain": 0, "mix_gain": 15, "pa_gain": 0 },
"tx_lut_5":  { "rf_power": 8,  "dig_gain": 3, "mix_gain": 8,  "pa_gain": 1 },
"tx_lut_6":  { "rf_power": 10, "dig_gain": 0, "mix_gain": 8,  "pa_gain": 1 },
"tx_lut_7":  { "rf_power": 14, "dig_gain": 0, "mix_gain": 13, "pa_gain": 1 },
"tx_lut_8":  { "rf_power": 15, "dig_gain": 3, "mix_gain": 8,  "pa_gain": 2 },
"tx_lut_9":  { "rf_power": 17, "dig_gain": 3, "mix_gain": 9,  "pa_gain": 2 },
"tx_lut_10": { "rf_power": 19, "dig_gain": 0, "mix_gain": 8,  "pa_gain": 2 },
"tx_lut_11": { "rf_power": 20, "dig_gain": 0, "mix_gain": 9,  "pa_gain": 2 },
"tx_lut_12": { "rf_power": 21, "dig_gain": 0, "mix_gain": 10, "pa_gain": 2 },
"tx_lut_13": { "rf_power": 23, "dig_gain": 0, "mix_gain": 14, "pa_gain": 2 },
"tx_lut_14": { "rf_power": 24, "dig_gain": 3, "mix_gain": 10, "pa_gain": 3 },
"tx_lut_15": { "rf_power": 25, "dig_gain": 0, "mix_gain": 9,  "pa_gain": 3 }
```

3.1.3 RHF0M301-780

RSSI Offset: -168

Table 3-3 RHF0M301-780 TX Power Table:

TXLUT Index	RF POWER/dBm	DAC	DIG	MIX	PA
0	0	3	3	12	1
1	2	3	0	10	1
2	4	3	3	10	2
3	5	3	0	8	2
4	6	3	0	13	1
5	9	3	0	10	2
6	11	3	3	9	3
7	14	3	0	8	3
8	16	3	0	14	2
9	18	3	0	10	3
10	20	3	3	14	3
11	21	3	3	15	3
12	22	3	0	12	3
13	24	3	0	13	3
14	25	3	0	14	3
15	26	3	0	15	3

```
// RHF0M301-780
"tx_lut_0":  { "rf_power": 0,  "dig_gain": 3, "mix_gain": 12, "pa_gain": 0 },
"tx_lut_1":  { "rf_power": 2,  "dig_gain": 0, "mix_gain": 10, "pa_gain": 0 },
"tx_lut_2":  { "rf_power": 4,  "dig_gain": 3, "mix_gain": 10, "pa_gain": 0 },
"tx_lut_3":  { "rf_power": 5,  "dig_gain": 0, "mix_gain": 8,  "pa_gain": 0 },
"tx_lut_4":  { "rf_power": 6,  "dig_gain": 0, "mix_gain": 13, "pa_gain": 0 },
"tx_lut_5":  { "rf_power": 9,  "dig_gain": 0, "mix_gain": 10, "pa_gain": 1 },
"tx_lut_6":  { "rf_power": 11, "dig_gain": 3, "mix_gain": 9,  "pa_gain": 1 },
"tx_lut_7":  { "rf_power": 14, "dig_gain": 0, "mix_gain": 8,  "pa_gain": 1 },
"tx_lut_8":  { "rf_power": 16, "dig_gain": 0, "mix_gain": 14, "pa_gain": 2 },
"tx_lut_9":  { "rf_power": 18, "dig_gain": 0, "mix_gain": 10, "pa_gain": 2 },
"tx_lut_10": { "rf_power": 20, "dig_gain": 3, "mix_gain": 14, "pa_gain": 2 },
"tx_lut_11": { "rf_power": 21, "dig_gain": 3, "mix_gain": 15, "pa_gain": 2 },
"tx_lut_12": { "rf_power": 22, "dig_gain": 0, "mix_gain": 12, "pa_gain": 2 },
"tx_lut_13": { "rf_power": 24, "dig_gain": 0, "mix_gain": 13, "pa_gain": 2 },
"tx_lut_14": { "rf_power": 25, "dig_gain": 0, "mix_gain": 14, "pa_gain": 3 },
"tx_lut_15": { "rf_power": 26, "dig_gain": 0, "mix_gain": 15, "pa_gain": 3 }
```

3.1.4 RHF0M301-868

RSSI Offset: -166

Table 3-4 RHF0M301-868 TX Power Table:

TXLUT Index	RF POWER/dBm	DAC	DIG	MIX	PA
0	-1	3	0	8	1
1	2	3	0	10	1
2	5	3	0	12	1
3	6	3	0	8	2
4	8	3	0	9	2
5	9	3	0	10	2
6	11	3	0	11	2
7	12	3	0	12	2
8	14	3	0	13	2
9	15	3	0	8	3
10	17	3	0	9	3
11	18	3	0	10	3
12	20	3	0	11	3
13	22	3	0	12	3
14	23	3	0	13	3
15	24	3	0	15	3

```
// RHF0M301-868
"tx_lut_0":  { "rf_power": -1, "dig_gain": 0, "mix_gain": 8,  "pa_gain": 1 },
"tx_lut_1":  { "rf_power": 2,  "dig_gain": 0, "mix_gain": 10, "pa_gain": 1 },
"tx_lut_2":  { "rf_power": 5,  "dig_gain": 0, "mix_gain": 12, "pa_gain": 1 },
"tx_lut_3":  { "rf_power": 6,  "dig_gain": 0, "mix_gain": 8,  "pa_gain": 2 },
"tx_lut_4":  { "rf_power": 8,  "dig_gain": 0, "mix_gain": 9,  "pa_gain": 2 },
"tx_lut_5":  { "rf_power": 9,  "dig_gain": 0, "mix_gain": 10, "pa_gain": 2 },
"tx_lut_6":  { "rf_power": 11, "dig_gain": 0, "mix_gain": 11, "pa_gain": 2 },
"tx_lut_7":  { "rf_power": 12, "dig_gain": 0, "mix_gain": 12, "pa_gain": 2 },
"tx_lut_8":  { "rf_power": 14, "dig_gain": 0, "mix_gain": 13, "pa_gain": 2 },
"tx_lut_9":  { "rf_power": 15, "dig_gain": 0, "mix_gain": 8,  "pa_gain": 3 },
"tx_lut_10": { "rf_power": 17, "dig_gain": 0, "mix_gain": 9,  "pa_gain": 3 },
"tx_lut_11": { "rf_power": 18, "dig_gain": 0, "mix_gain": 10, "pa_gain": 3 },
"tx_lut_12": { "rf_power": 20, "dig_gain": 0, "mix_gain": 11, "pa_gain": 3 },
"tx_lut_13": { "rf_power": 22, "dig_gain": 0, "mix_gain": 12, "pa_gain": 3 },
"tx_lut_14": { "rf_power": 23, "dig_gain": 0, "mix_gain": 13, "pa_gain": 3 },
"tx_lut_15": { "rf_power": 25, "dig_gain": 0, "mix_gain": 15, "pa_gain": 3 }
```

3.1.5 RHF0M301-915

RSSI Offset: -166

Table 3-5 RHF0M301-915 TX Power Table:

TXLUT Index	RF POWER/dBm	DAC	DIG	MIX	PA
0	-2	3	0	15	0
1	1	3	0	8	1
2	4	3	0	10	1
3	6	3	0	12	1
4	7	3	0	13	1
5	8	3	0	8	2
6	10	3	0	9	2
7	11	3	0	10	2
8	13	3	0	11	2
9	14	3	0	12	2
10	15	3	0	15	2
11	17	3	0	8	3
12	19	3	0	9	3
13	20	3	0	10	3
14	22	3	0	12	3
15	24	3	0	14	3

```
// RHF0M301-915
"tx_lut_0":  { "rf_power": -2, "dig_gain": 0, "mix_gain": 15, "pa_gain": 0 },
"tx_lut_1":  { "rf_power": 1,  "dig_gain": 0, "mix_gain": 8,  "pa_gain": 1 },
"tx_lut_2":  { "rf_power": 4,  "dig_gain": 0, "mix_gain": 10, "pa_gain": 1 },
"tx_lut_3":  { "rf_power": 6,  "dig_gain": 0, "mix_gain": 12, "pa_gain": 1 },
"tx_lut_4":  { "rf_power": 7,  "dig_gain": 0, "mix_gain": 13, "pa_gain": 1 },
"tx_lut_5":  { "rf_power": 8,  "dig_gain": 0, "mix_gain": 8,  "pa_gain": 2 },
"tx_lut_6":  { "rf_power": 10, "dig_gain": 0, "mix_gain": 9,  "pa_gain": 2 },
"tx_lut_7":  { "rf_power": 11, "dig_gain": 0, "mix_gain": 10, "pa_gain": 2 },
"tx_lut_8":  { "rf_power": 13, "dig_gain": 0, "mix_gain": 11, "pa_gain": 2 },
"tx_lut_9":  { "rf_power": 14, "dig_gain": 0, "mix_gain": 12, "pa_gain": 2 },
"tx_lut_10": { "rf_power": 15, "dig_gain": 0, "mix_gain": 15, "pa_gain": 2 },
"tx_lut_11": { "rf_power": 17, "dig_gain": 0, "mix_gain": 8,  "pa_gain": 3 },
"tx_lut_12": { "rf_power": 19, "dig_gain": 0, "mix_gain": 9,  "pa_gain": 3 },
"tx_lut_13": { "rf_power": 20, "dig_gain": 0, "mix_gain": 10, "pa_gain": 3 },
"tx_lut_14": { "rf_power": 22, "dig_gain": 0, "mix_gain": 12, "pa_gain": 3 },
"tx_lut_15": { "rf_power": 24, "dig_gain": 0, "mix_gain": 14, "pa_gain": 3 }
```

3.2 Reset sequence

Each time when powering up the RHF0M301 module, reset operation is compulsive. The input reset signal should be more than 1ms delay after VCC+5V stable.

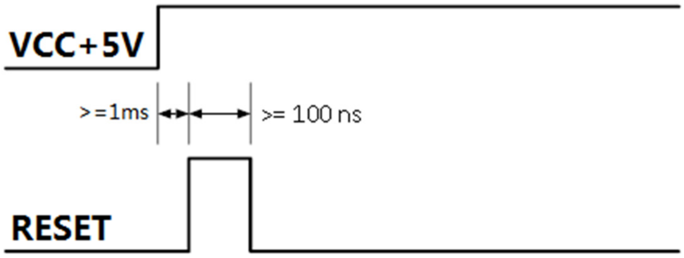

Figure 3-1 Reset sequence

3.3 PPS selection

There are two choices for customer to input PPS signal: pin24 of 2.54mm pitch HDR2x12 connector, or J100.

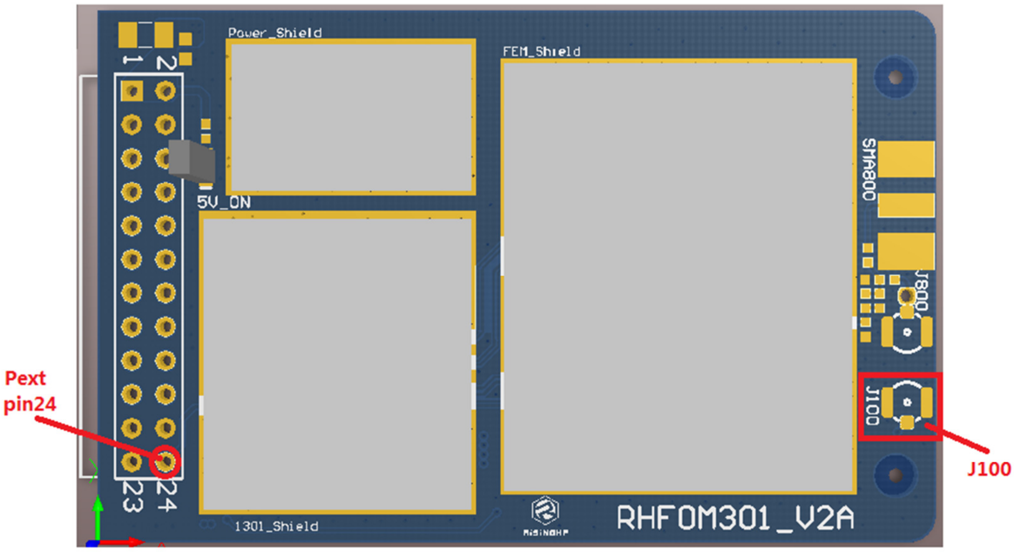

Figure 3-2 PPS connection alternative

Note: The previous version (the production you got before 2016/12/30), the pps signal connection should be input into from J100. As the pin24 of Pext is NC.

3.4 Reference Design

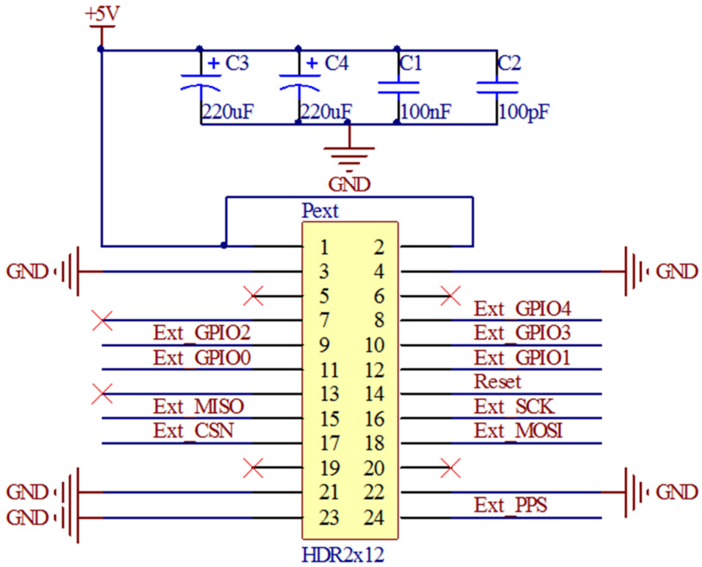

Figure 3-3 Recommended Connection

Note:

1) *220uF//220uF//100nF//100pF is strongly suggested to put as close as to the input pin (Pin1 and Pin2) of the module when you layout!*
2) A RC filter (R=22R, C=10nF) is strongly suggested to be added for Reset connection.

3.5 Dimension

Figure 3-4 Mechanical size of RHF0M301 (Top View)

Figure 3-5 Mechanical size of RHF0M301 (Side View)

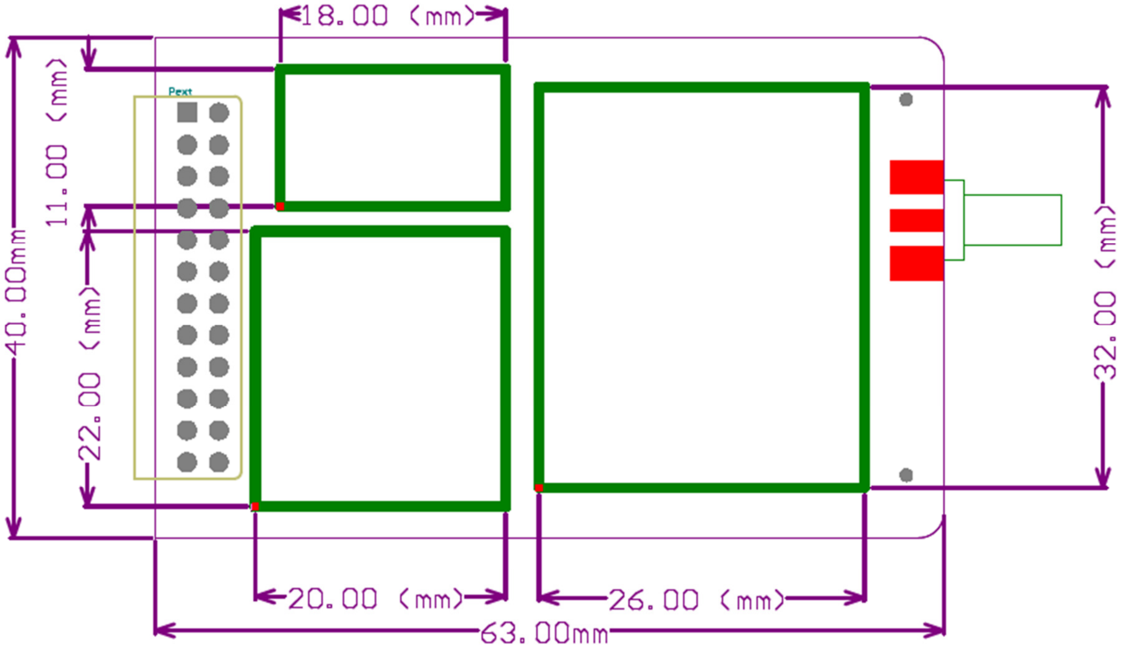

Figure 3-6 Mechanical size of enclosure on board

3.6 Package information

3.6.1 Real product photo show

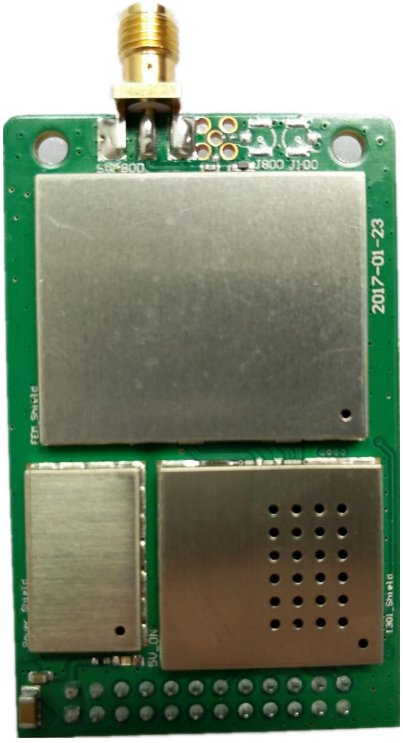

Figure 3-7 Top View of RHF0M301

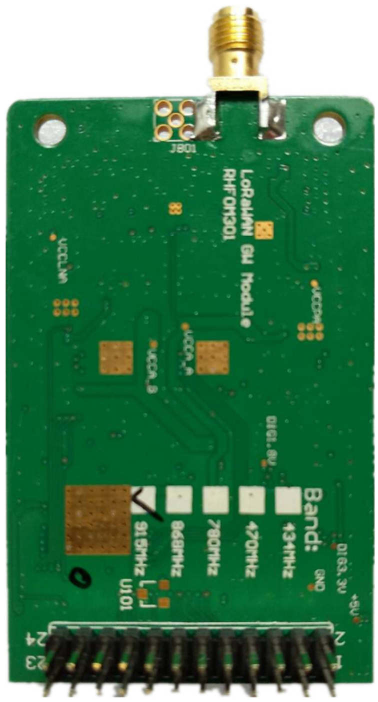

Figure 3-8 Bottom View of RHF0M301

3.6.2 Silk screen on the product

Figure 3-9 Silk screen on the Shield

3.6.3 Package information

There will be a label with "RHF0M301-xxx" on the top side of the box. Box size is 150x90x42mm.
--RHF0M301-434 is the 434MHz band production.
--RHF0M301-470 is the 470MHz band production.
--RHF0M301-780 is the 780MHz band production.
--RHF0M301-868 is the 868MHz band production.
--RHF0M301-915 is the 915MHz band (902MHz to 928MHz) production.

Figure 3-10 Box for packaging

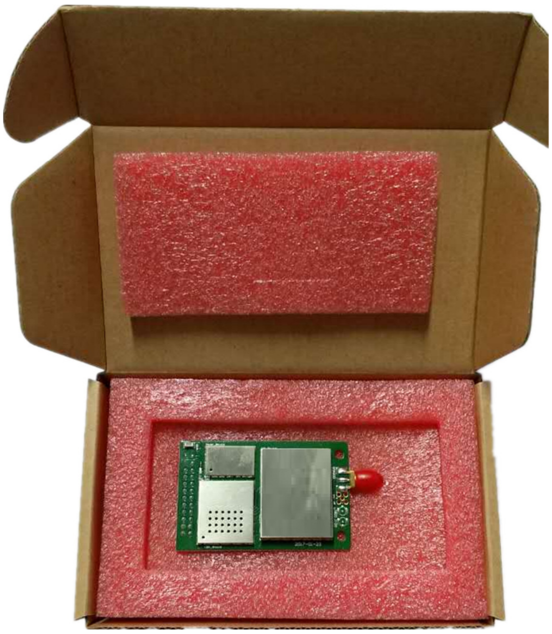

Figure 3-11 Package of the module (2 pcs in one box)

Revision

V1.3 2017-06-01
- + update the latest HW information

V1.2 2016-12-02
- + update with package information

V1.1 2016-11-18
- + update with new specifications and block diagram

V1.0 2016-09-12
- + Creation

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