

RAK813 BLE+LoRa

Datasheet V1.0

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1. General Description

The RAK813 module is a combination of the BLE and LoRa of the relay node module, the Bluetooth BLE device is compact and portable, low power consumption to provide long-distance wireless communication capabilities, BLE terminal equipment and Bluetooth RAK813 module to establish a connection, the data transmission to the remote transmitter through the RAK813 module of LoRa LoRa receiver or gateway. At the same time, the RAK813 module itself supports a variety of Digital interfaces, such as GPIO,UART, I2C, SPI and so on, and the sensors can also be directly connected to the RAK813 module through these digital interfaces.

Based on the global leading Nordic Semiconductor Corporation's nRF52832 (BLE) and Semtech's SX127x (LoRa) chipset, the RAK813 module provides a perfect combination of ultra low power and ultra long distance. The RAK813 module uses TCXO as the LoRa clock source, so at different temperatures (such as indoor and outdoor) LoRa module of radio frequency close to the maximum, can effectively improve the decoding rate, so as to enhance the communication quality; at the same time the good anti-aging properties, so that different life (pre deployment and post deployment) frequency LoRa module the partial minimum, so as to ensure the success rate of communication; at the transmitter of LoRa (TX) increased the low-pass filter in the receiver (RX) increased the band-pass filter to ensure the module performance in the complicated electromagnetic environment.

RAK813 supports a variety of protocols, including the latest BLE and LoRaWAN, and provides multiple bands of products for selection, including 433MHz, 470MHz, 868MHz, 915MHz, Please see the Order Information if you want to know the specific model and the frequency range that it supports.

2. Features & Applications

Features

- Long Range LoraWAN operating in the 433MHz, 470MHz, 863 MHz or 928 MHz frequency bands
 - FCC Frequency range 902MHz~928MHz
 - CE Frequency range 863MHz~870MHz
 - MIC Frequency range 920MHz~928MHz
 - KCC Frequency range 920MHz~923MHz
- Support Lora Point to Point communication in all the band
- Small size and low power, sleep current down to 2uA
- High Receiver Sensitivity: LoRa down to -146 dBm , BLE down to -96dBm
- TX Power: LoRa adjustable up to +14 dBm high efficiency PA, max PA boost up to 20dbm, BLE -20 to +4 dBm in 4 dB steps
- Building in both TX and RX filter
- Building in TCXO for high frequency stability
- FSK, GFSK, and LoRa Technology modulation
- IIP3 = -11 dBm
- Up to 15 km coverage at suburban and up to 5 km coverage at urban area

Applications

- Water conservancy / Agriculture / Environment monitoring
- Parking / Parking system
- Street lightning/Smart cities
- Asset / Personnel positioning
- Smoke alarm / Thermal sensation
- Industrial monitoring and control
- Other remote, battery powered applications

3. System Block Diagram

The block diagram of module is depicted in the figure below.

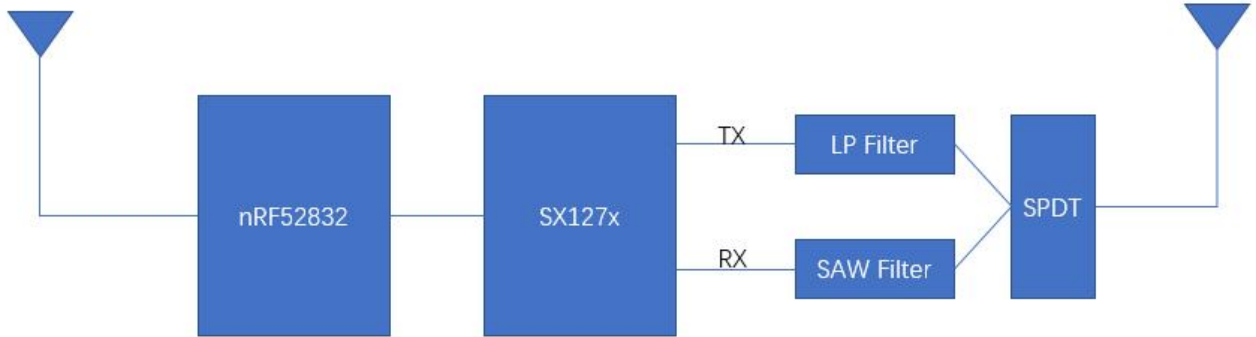


Figure 3-1 Hardware block Diagram

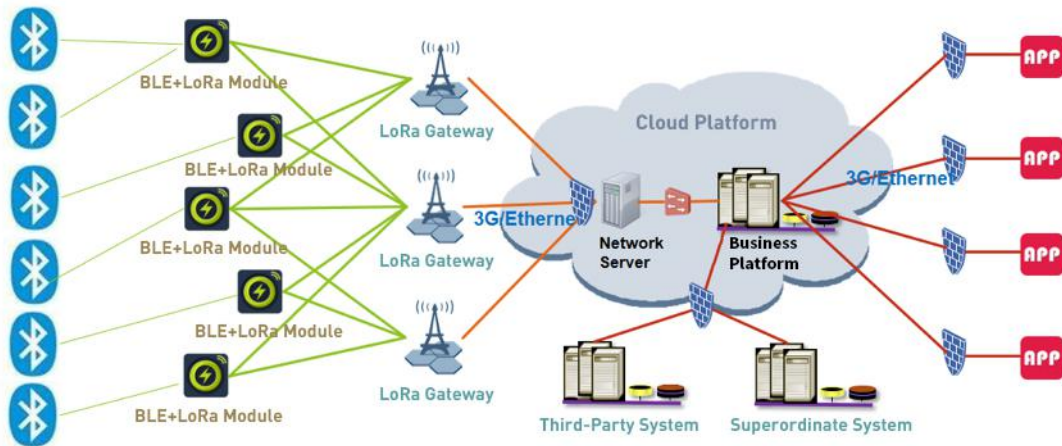


Figure 3-2 System Diagram

4. Hardware Description

4.1 Pin Outline

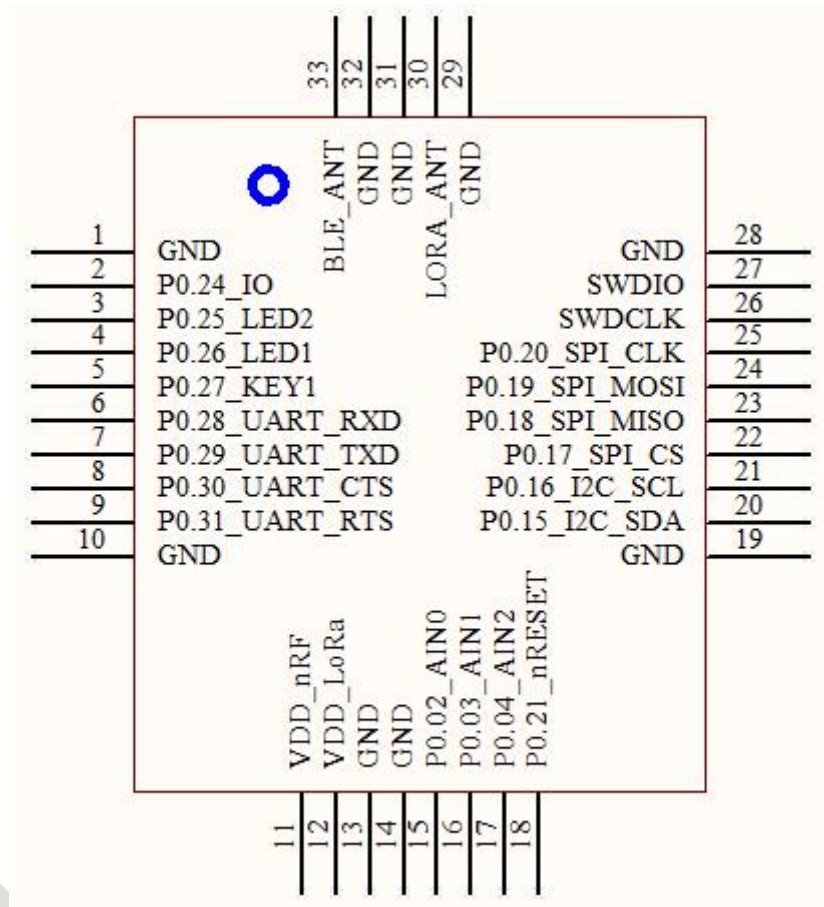


Figure 4-1 Module Pin outline

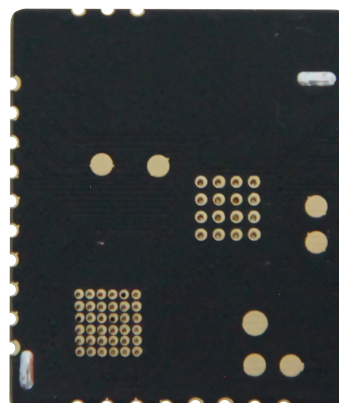
4.2 Pin Definition

Table 4-1: Pin Definition

NO	Name	Type	Description
1	GND	—	Ground connections
2	P0.24_IO	I/O	GPIO port
3	P0.25_LED2	I/O	GPIO port/LED
4	P0.26_LED1	I/O	GPIO port/LED
5	P0.27_KEY1	I/O	GPIO port/KEY
6	P0.28_UART_RXD	O	UART Interface
7	P0.29_UART_TXD	I	UART Interface
8	P0.30_UART_CTS	O	UART Interface
9	P0.31_UART_RTS	I	UART Interface

10	GND	—	Ground connections
11	VDD_nRF	P	BLE power voltage source input
12	VDD_LoRa	P	LoRa power voltage source input
13	GND	I/O	Ground connections
14	GND	I/O	Ground connections
15	P0.02_AIN0	I/O	GPIO port/ADC input
16	P0.03_AIN1	I/O	GPIO port/ADC input
17	P0.04_AIN2	I/O	GPIO port/ADC input
18	P0.21_nRESET	I	Reset trigger input
19	GND	—	Ground connections
20	P0.15_I2C_SDA	I/O	GPIO port/I2C
21	P0.16_I2C_SCL	I/O	GPIO port/I2C
22	P0.17_SPI_CS	I/O	GPIO port/SPI
23	P0.18_SPI_MISO	I/O	GPIO port/SPI
24	P0.19_SPI_MOSI	I/O	GPIO port/SPI
25	P0.20_SPI_CLK	I/O	GPIO port/SPI
26	SWDCLK	I/O	Debug port
27	SWDIO	I/O	Debug port
28	GND	—	Ground connections
29	GND	—	Ground connections
30	LORA_ANT	—	RF I/O port
31	GND	—	Ground connections
32	GND	—	Ground connections
33	BLE_ANT	I/O	RF I/O port

4.3 Product Picture



4.4 Physical Dimensions

(Unit: mm)

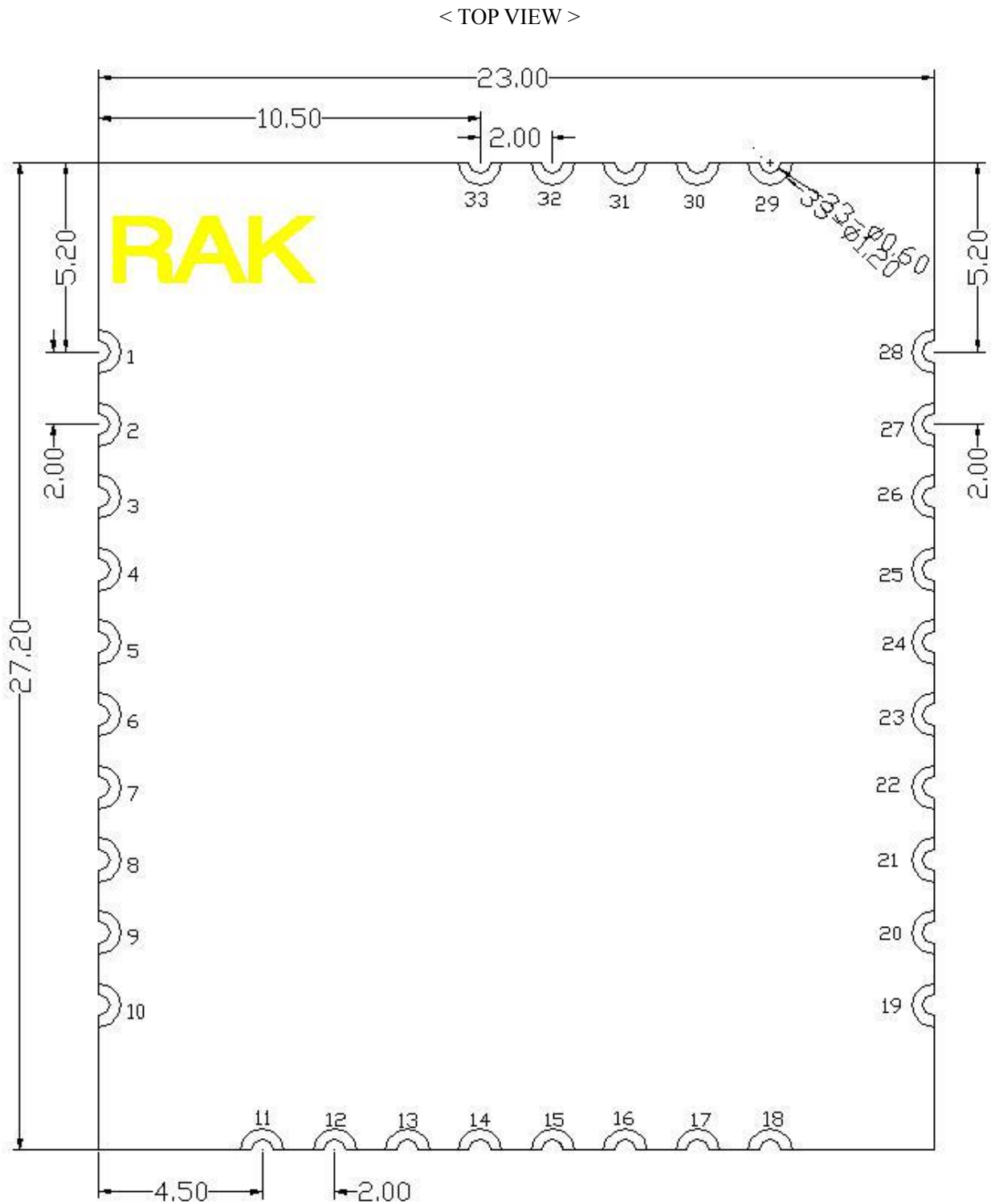


Figure 4-2 Module dimensions

5. General Specification

5.1 General Specification

Model Name	RAK813
Dimension	L x W x H: 27.2 x 23 x 1.7 mm
Interface	UART, SPI, I2C, GPIOs
Operating temperature	-40°C to 85°C
Storage temperature	-40°C to 85°C

5.2 Recommended Operating Rating

	Min.	Typ.	Max.	Unit
VCC	3.15	3.3	3.45	V

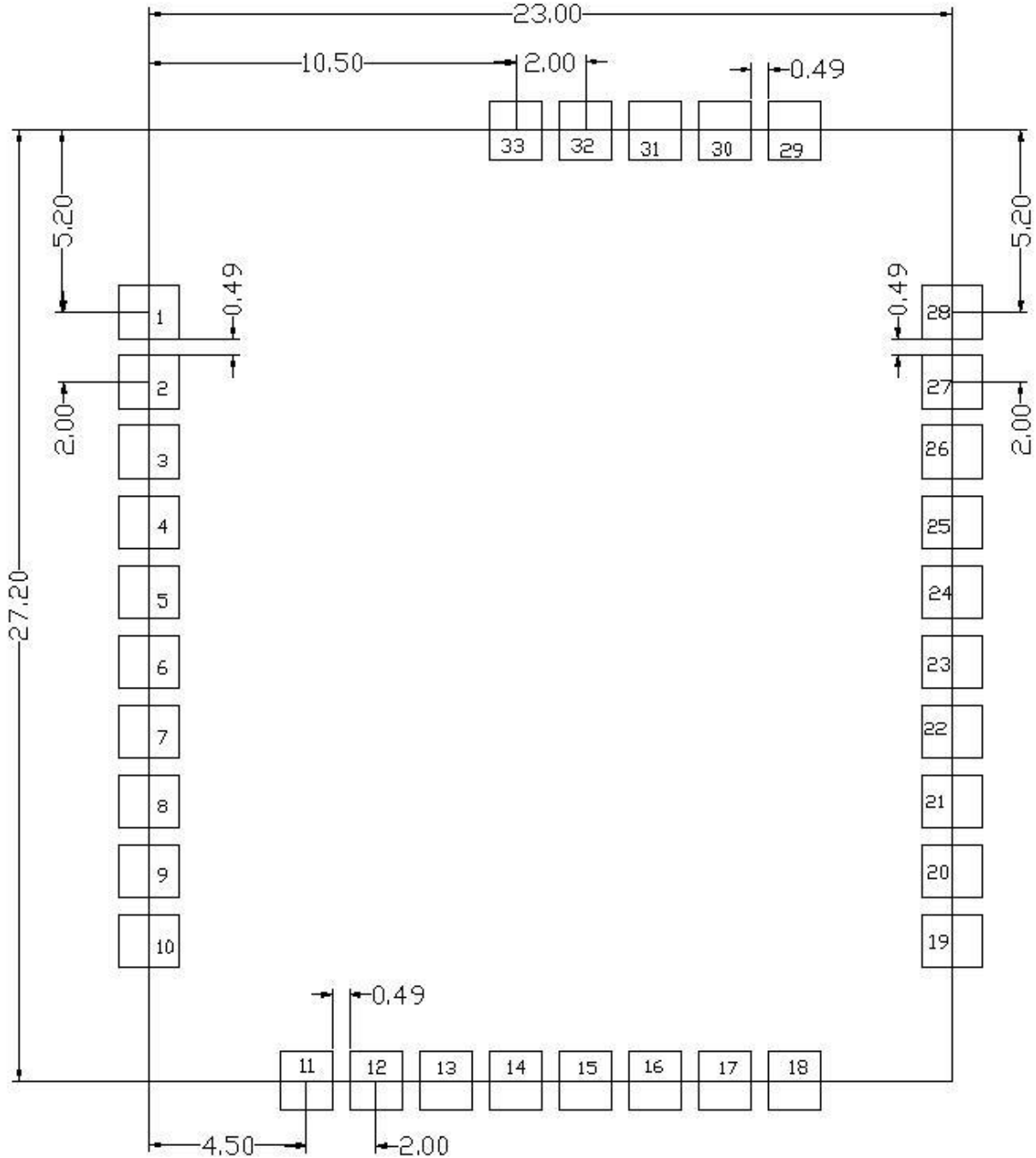
5.3 Specification

Feature	Description				
Frequency Band	LoRa 433/470/868/915 MHz, BLE 2.4GHz				
Host Interface	UART, SPI, I2C				
Characteristics	Condition	Min	TYP	MAX	UNIT
LoRa Transmit	TX Power		14	20	dBm
LoRa RX Sensitivity	RSSI	-130	-		dBm
	SNR	-15			dB
BLE Transmit	TX Power		0	4	dBm
BLE RX Sensitivity	Sensitivity	-97			dBm
Current Consumption	TX mode	30 (14dBm)			mA
	RX mode	5.5			mA
	Sleep mode	7.2			uA

6. Layout Recommendation

(Unit: mm)

< TOP VIEW >

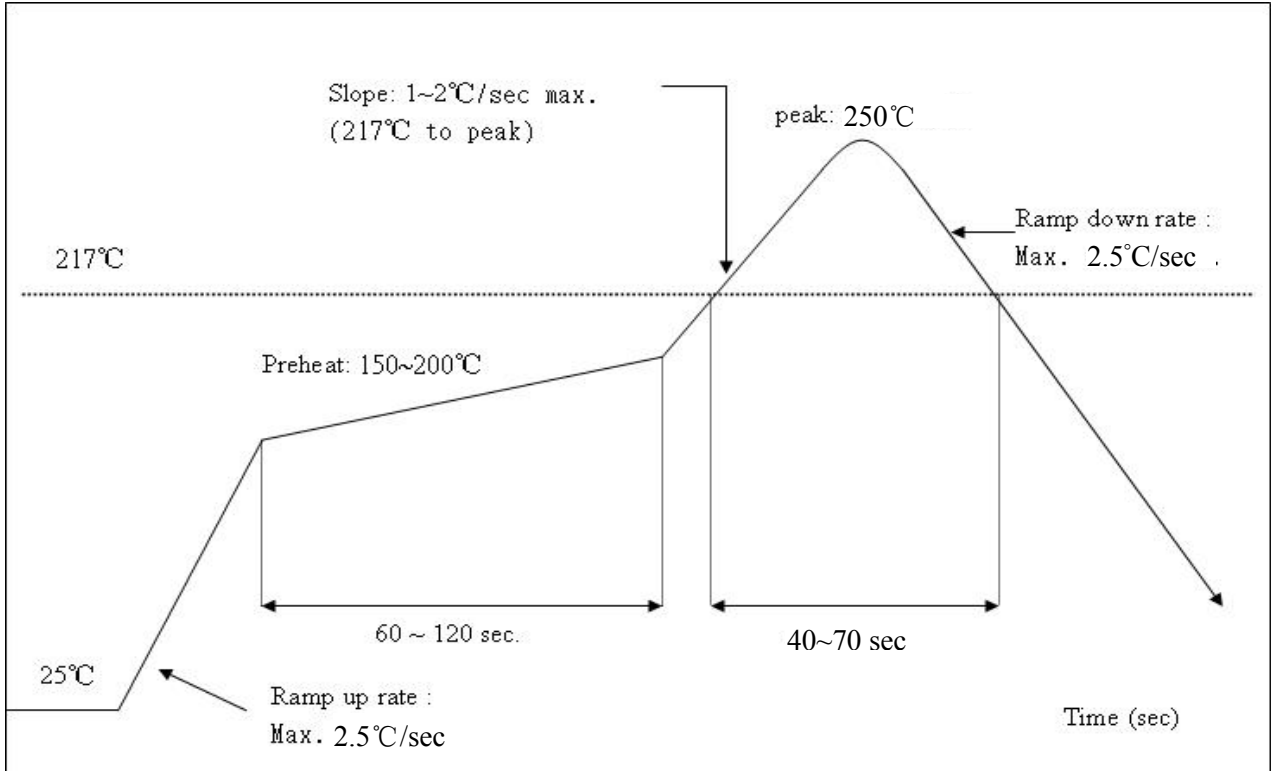


7. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <math><250^{\circ}\text{C}</math>

Number of Times : ≤ 2 times



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8. Order Information

Order Information		
Model Name	Operation Frequency	Output Power
RAK813-HF	865-870MHz/902~928MHZ	5-20dBm
RAK813-LF	433-435MHz/470~510MHZ	5-20dBm

RAKwireless

9. Contact information

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10. Change Note

Version	Date	Change
V1.0	2017-10-28	Draft

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