RAK811 Lora Module

Datasheet V1.2

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1. General Description

RAK811 Low-Power Long Range LoRa Technology Transceiver module, provides an easy to use, small size, low-power solution for long range wireless data transmission.

First, The RAK811 module complies with the latest LoRaWAN Class A & C protocol specifications, it is simple to access LWPA IOT platforms, such Actility etc. Second, it also support Lora Point to Point communications, this function can help customers implement their own private long range Lora network fast.

Module integrates semtech SX1276 and stm32L, offer user an serials At commands with UART Interface .It is easy to accomplish their applications, such as simple long range sensor data applications with external host MCU, low-power feature is suitable for battery applications.

This compact module is a total solution which developing of LORA-wan protocol techniques. The module’ s applications as following:

1. Automated Meters Reading
2. Home and Building Automation
3. Wireless Alarm and Security Systems
4. Industrial Monitoring and Control
5. Long Range Irrigation Systems

2. Features

- Long Range LoraWAN operating in the 868 MHz or 915 MHz frequency bands
- Lora Point to Point communication in the 860MHz-1020MHz frequency
- Small size and low power
- High Receiver Sensitivity: down to -146 dBm
- TX Power: adjustable up to +14 dBm high efficiency PA, max PA boost up to 20dbm
- 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

3. System Block Diagram

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

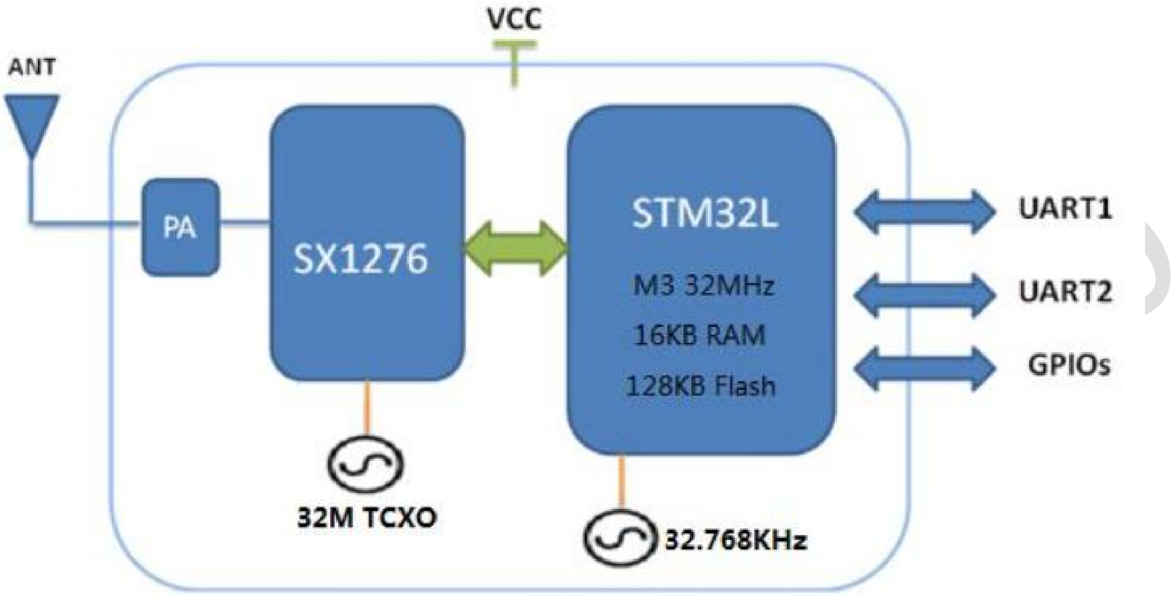

VCC
ANT
PA
SX1276
STM32L
M3 32MHz
16KB RAM
128KB Flash
UART1
UART2
GPIOs
32M TCXO
32.768KHz

Figure 3-1 System Diagram

4. Hardware Description

4.1 Pin Outline

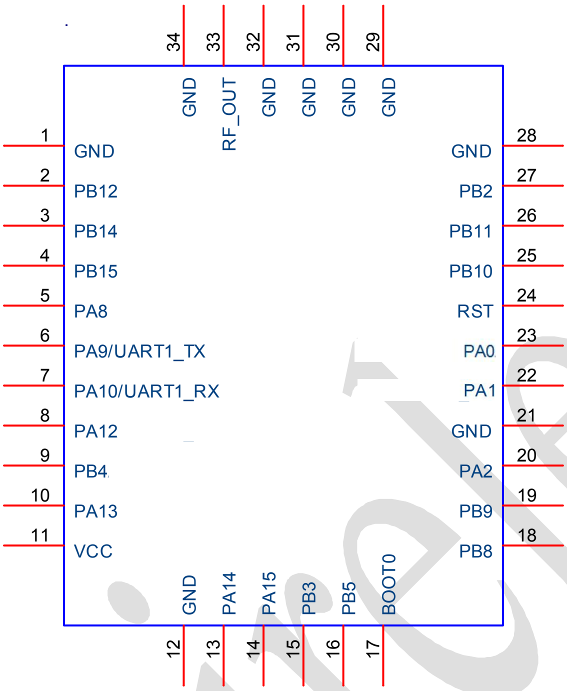

34
33
32
31
30
29
GND
RF_OUT
GND
GND
GND
GND
1
GND
2
PB12
3
PB14
4
PB15
5
PA8
6
PA9/UART1_TX
7
PA10/UART1_RX
8
PA12
9
PB4
10
PA13
11
VCC
28
GND
27
PB2
26
PB11
25
PB10
24
RST
23
PA0
22
PA1
21
GND
20
PA2
19
PB9
18
PB8
GND
PA14
PA15
PB3
PB5
BOOT0
12
13
14
15
16
17

Figure 4-1 Module Pin outline

4.2 Pin definition

Table 4-1: Pin Definition

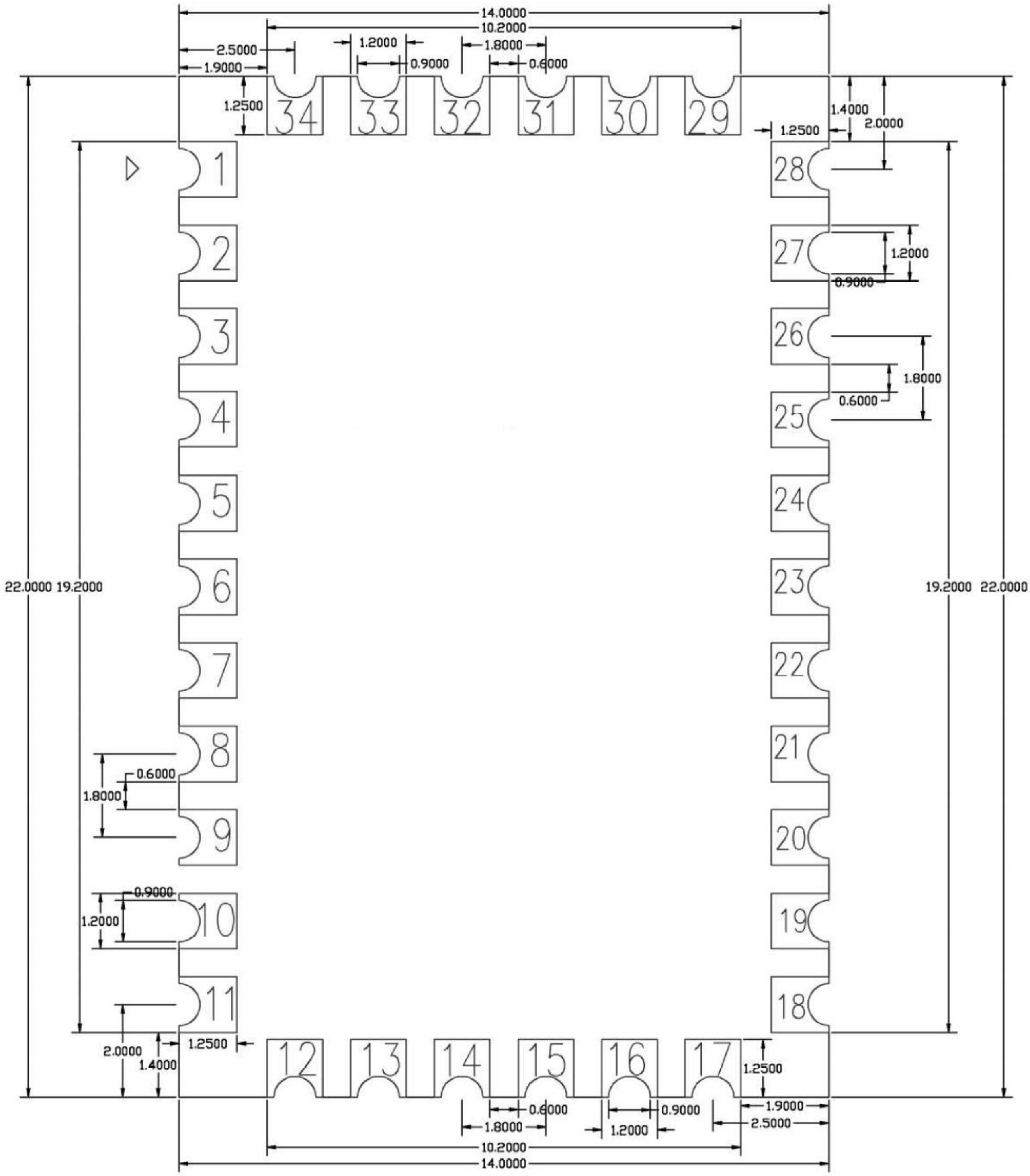
NO	Name	Type	Description
1	GND	—	Ground connections
2	PB12	I/O	B part for GPIO port
3	PB14	I/O	B part for GPIO port
4	PB15	I/O	B part for GPIO port
5	PA8	I/O	A part for GPIO port
6	PA9/UART1_TX	O	UART1 Interface
7	PA10/UART1_RX	I	UART1 Interface
8	PA12	O	A part for GPIO port
9	PB4	I	B part for GPIO port
10	PA13	I/O	A part for GPIO port
11	VCC	P	Main power voltage source input
12	GND	—	Ground connections

13	PA14	I/O	A part for GPIO port
14	PA15	I/O	A part for GPIO port
15	PB3	I/O	B part for GPIO port
16	PB5	I/O	B part for GPIO port
17	BOOT0	I	Boot mode GPIO enable pin,high active
18	PB8	I/O	B part for GPIO port
19	PB9	I/O	B part for GPIO port
20	PA2	I/O	A part for GPIO port
21	GND	—	Ground connections
22	PA1	I	A part for GPIO port
23	PA0	O	A part for GPIO port
24	RST	I	Reset trigger input,low active
25	PB10	I/O	B part for GPIO port
26	PB11	I/O	B part for GPIO port
27	PB2	I/O	B part for GPIO port
28	GND	—	Ground connections
29	GND	—	Ground connections
30	GND	—	Ground connections
31	GND	—	Ground connections
32	GND	—	Ground connections
33	RF_OUT	I/O	RF I/O port
34	GND	—	Ground connections

4.3 Physical Dimensions

(Unit: mm)

< TOP VIEW >


14.0000
10.2000
2.5000
1.9000
1.2000
0.9000
1.8000
0.6000
1.2500
1.4000
2.0000
22.0000
19.2000
34
33
32
31
30
29
1
2
3
4
5
6
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8
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22
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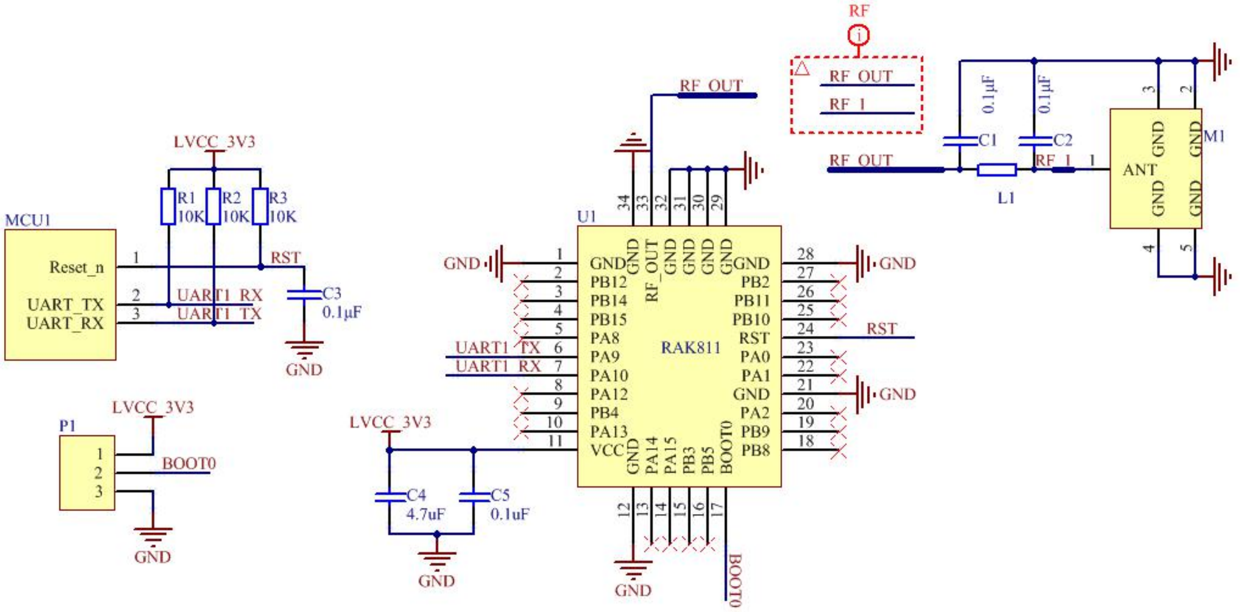
27
28

Figure 4-2 Module dimensions

5. Reference design


MCU1
Reset_n
UART_TX
UART_RX
LVCC_3V3
R1 10K
R2 10K
R3 10K
RST
UART1_RX
UART1_TX
C3 0.1µF
GND
P1
BOOT0
U1
RAK811
GND
PB12
PB14
PB15
PA8
PA9
PA10
PA12
PB4
PA13
VCC
RF_OUT
PB2
PB11
PB10
PA0
PA1
PA2
PB9
PB8
PA14
PA15
PB3
PB5
C4 4.7uF
C5 0.1uF
RF
RF_1
L1
C1 0.1µF
C2 0.1µF
M1
ANT

rakwire

6. General Specification

6.1 General specification

Model Name	RAK811
Dimension	L x W x H: 22 x 14 x 1.7 mm
Interface	UART1, GPIOs
Operating temperature	-40°C to 85°C
Storage temperature	-40°C to 85°C

6.2 Recommended Operating Rating

	Min.	**Typ.**	**Max.**	**Unit**
Operating Temperature	-40	25	85	deg.C
VCC	3.15	3.3	3.45	V

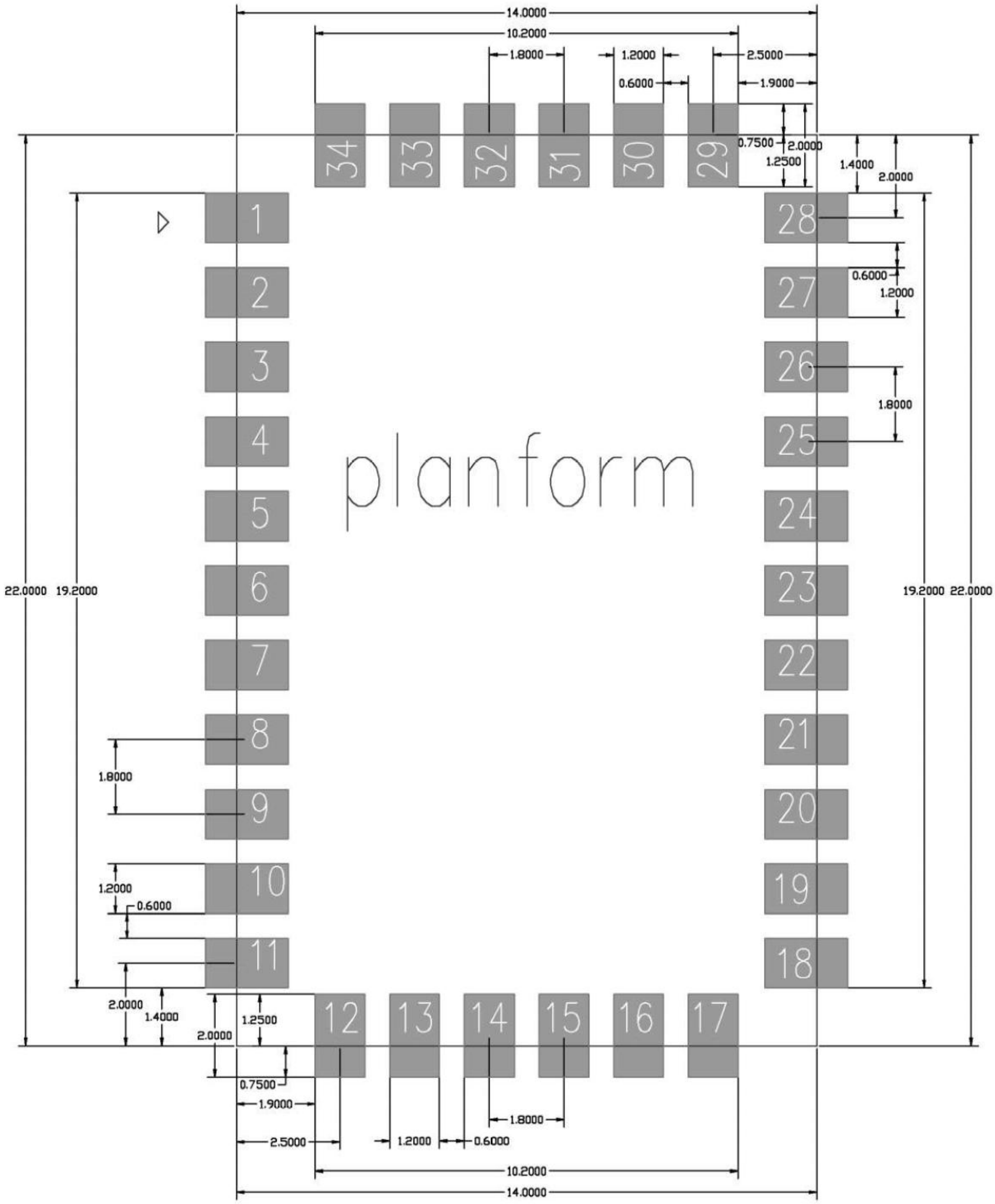
6.3 Specification

Feature	**Description**				
General Specification					
Frequency Band	868/915 MHz				
Host Interface	UART				
Characteristics	**Condition**	**Min**	**TYP**	**MAX**	**UNIT**
Transmit	TX Power		14	20	dBm
RX Sensitivity	RSSI	-130	-		dBm
	SNR	-15			dB
Current Consumption	TX mode	30 (14dBm)			mA
	RX mode	5.5			mA
	Sleep mode	7.2			uA

7. Layout Recommendation

(Unit: mm)

< TOP VIEW >


14.0000
10.2000
1.8000
1.2000
2.5000
0.6000
1.9000
0.7500
2.0000
1.2500
1.4000
2.0000
0.6000
1.2000
1.8000
22.0000
19.2000
19.2000
22.0000
1.8000
1.2000
0.6000
2.0000
1.4000
2.0000
1.2500
0.7500
1.9000
2.5000
1.2000
0.6000
1.8000
10.2000
14.0000
34
33
32
31
30
29
1
2
3
4
5
6
7
8
9
10
11
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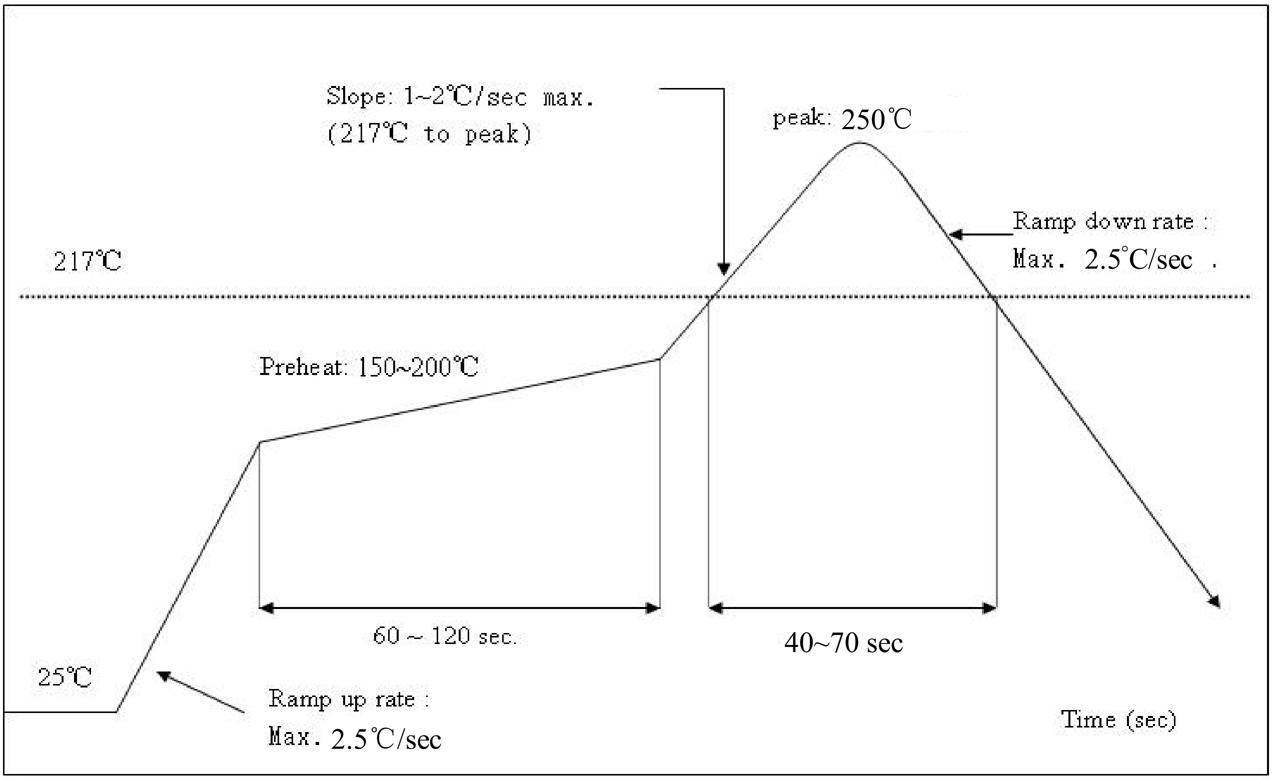
planform

8. Recommended Reflow Profile

Referred to IPC/JEDEC standard.
Peak Temperature : <250° C
Number of Times : ≤2 times


Slope: 1~2℃/sec max.
(217℃ to peak)
peak: 250℃
Ramp down rate :
Max. 2.5°C/sec .
217℃
Preheat: 150~200℃
60 ~ 120 sec.
40~70 sec
25℃
Ramp up rate :
Max. 2.5℃/sec
Time (sec)

rak

9. Contact information

Shanghai

FAE mailbox:allan.jin@rakwireless.com

Tel : 185-1082-5762

Address: Room B205, Green light kechuang garden, 2588 Lane, Hongmei South road, Minhang District, Shanghai

Shenzhen

FAE mailbox: steven.tang@rakwireless.com

Tel : 0755-26506594

Fax: 0755-86152201

Address: Room 802, Yongfu building, No.1s06, Yongfu road, Baoan District , Shengzhen

10. Change Note

Version	Date	Change
V1.0	2016-06-11	Draft
V1.1	2016-11-15	Add LoraP2P mode
V1.2	2017-08-11	Moduify the Mode Pin Function，add reference design