RAK4600 WisDuo LPWAN Module Datasheet

Overview

Description

RAK4600 WisDuo LPWAN Module includes an nRF52832 MCU and an SX1276 LoRa chip. It has Ultra-Low Power Consumption of 13.3 µA (down to 11.2 µA @ 2.0 V) in sleep mode, high LoRa output power up to 20 dB max in work mode, and BLE output power up to 4 dBm.

The module complies with LoRaWAN 1.0.2 specification. It also supports LoRa P2P Point to Point communications. The Module supports BLE 5.0 in addition to LoRa. Its RF communication capabilities (LoRa+BLE) make it suitable for a variety of applications in the IoT field.

Features

- LoRa module for Smart City, Smart Agriculture, Smart Industry
- Compact Form Factor: 15 x 23 x 2.5 mm
- 42 Pin Stamp Pad for PCB SMT mounting
- I/O ports: UART/I2C/GPIO (optional NFC interface)
- Temperature range: -40 °C to +85 °C
- Supply voltage: 2.0 ~ 3.6 V
- Frequency range: 863–870 MHz (EU) / 902–928 MHz (US), ISM and SRD systems
- Low-Power Wireless Systems with 7.8 kHz to 500 KHz Bandwidth
- Ultra-Low Power Consumption of 13.3 µA (down to 11.2 µA @ 2.0 V) in sleep mode
- LoRa Boost mode with 20 dBm output power
- BLE 5.0 (Tx power -20 to +4 dBm in 4 dB steps)

Specifications

Overview

The overview section covers the RAK4600 WisDuo LPWAN Module board overview where the top view is presented. It also includes the block diagram of the module showing its external interfaces.
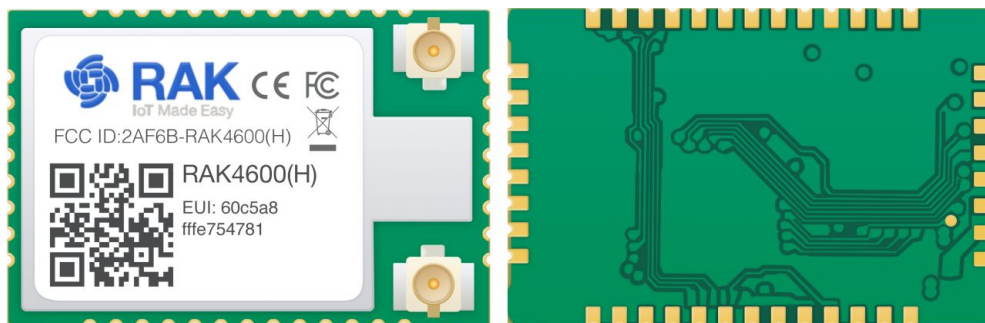
Board Overview

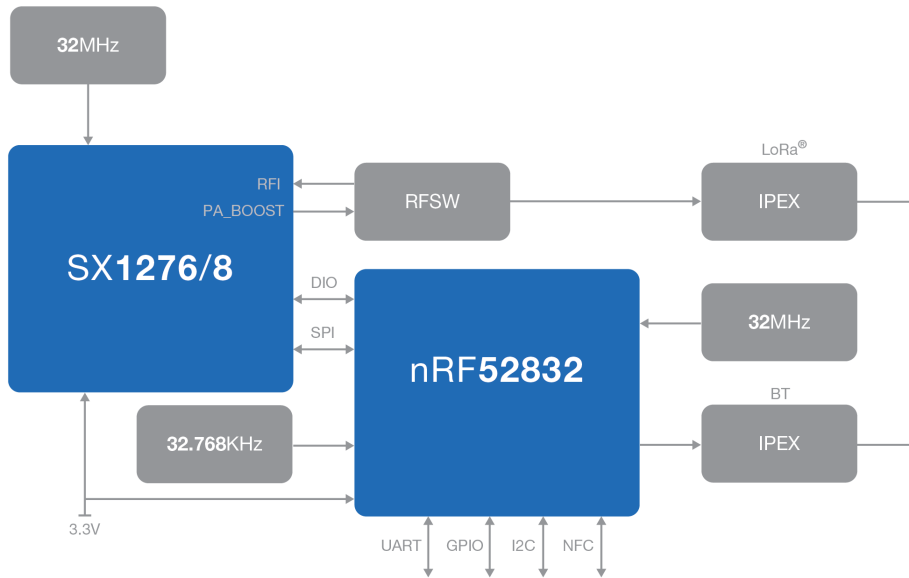**Figure 1:** RAK4600 WisDuo Top View™

Block Diagram

Figure 2: RAK4600 Block Diagram

Hardware

The hardware specifications are categorized into five parts. It discusses the interfacing, pinouts, and the standard values of the board. It displays the frequency parameters and power consumption. These categories mentioned include tabular data and diagrams of the RAK4600 WisDuo LPWAN Module board.
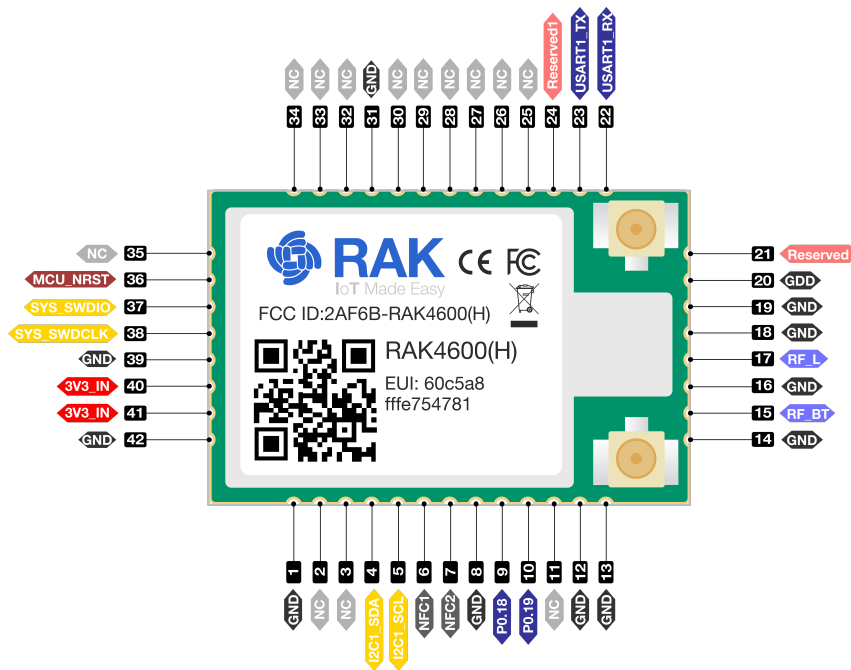
Pin Definition

Figure 3: RAK4600 Board Pinout

Pin	Name	I/O	Description
1	GND		Ground
2	NC		No Connection
3	NC		No Connection
4	I2C1_SDA	I/O	I2C, General purpose I/O (P0.13)
5	I2C1_SDL	I/O	I2C, General purpose I/O (P0.12)
6	NFC1	I/O	General purpose I/O、NFC antenna connection
7	NFC2	I/O	General purpose I/O、NFC antenna connection
8	GND		Ground
9	P0.18	I/O	General purpose I/O P0.18
10	P0.19	I/O	General purpose I/O P0.19
11	NC		No Connection
12	GND		Ground
13	GND		Ground
14	GND		Ground
15	RF_BT	I/O	BLE RF OUT
16	GND		Ground
17	RF_L	I/O	LoRa RF OUT
18	GND		Ground
19	GND		Ground
20	GND		Ground
21	Reserved	I/O	General purpose I/O (P0.14)
22	USART1_RX	I/O	USART1_RX (General purpose I/O P0.22)

Pin	Name	I/O	Description
23	USART1_TX	I/O	USART1_TX (General purpose I/O P0.23)
24	Reserved	I/O	General purpose I/O P0.17
25	NC		No Connection
26	NC		No Connection
27	NC		No Connection
28	NC		No Connection
29	NC		No Connection
30	NC		No Connection
31	GND		Ground
32	NC		No Connection
33	NC		No Connection
34	NC		No Connection
34	NC		No Connection
35	NC		No Connection
36	MCU_NRST	I/O	MCU reset
37	SYS_SWDIO	I/O	SYS_SWDIO
38	SYS_SWDCLK	I/O	SYS_SWDCLK
39	GND		Ground
40	3V3_IN		Input power
41	3V3_IN		Input power
42	GND		Ground

LoRa Transceiver IC Connection to RAK4600 Internal nRF52

LoRa IC Pin	nRF52 IO Pins
DIO0	P0.27
DIO1	P0.28
DIO2	P0.29
DIO3	P0.30
DIO4	P0.31
DIO5	NC
SPI1_CLK	P0.07
SPI1_MISO	P0.06
SPI1_MOSI	P0.05
SPI1_NSS	P0.04
NRESET	P0.03
VCTL1	P0.16
VCTL2	P0.15

RF Switch Control Logic Table

LoRa Mode	VCTL1 GPIO	VCTL2 GPIO
TX mode	H	L
RX mode	L	H

> 📝 **Note**
>
> **Logic Level**
>
> - H level (1.8 - 5.0 V)
> - L level (0 V)

RF Characteristics

Operating Frequencies

The board supports the following LoRaWAN frequency channels shown in the table below. The frequency parameter is easy to configure as you go through the device configuration setup.

Region	Frequency (MHz)
Russia	RU864
India	IN865
Europe	EU868
North America	US915
Australia	AU915
Korea	KR920
Asia	AS923

Electrical Characteristics

Several current consumption ratings are provided below for detailed RAK4600 WisDuo LPWAN Module usage. Refer to the values presented for your preferred values for specific simulations and calculations.

Operating Voltage

Feature	Minimum	Typical	Maximum	Unit
VCC	2.0	3.3	3.45	Volts (V)

Typical Current Consumption

Shown in the table provided below is the typical current consumption of the RAK4600 WisDuo LPWAN Module.

Item	Current Consumption	Condition
LoRa TX @20 dBm	125 mA	LoRa @ PA_BOOST & BT sleep
LoRa TX @17 dBm	92 mA	LoRa @ PA_BOOST & BT sleep
BT TX @4 dBm	9 mA	BT Tx mode & LoRa sleep
LoRa RX @37.5 Kbps	17 mA	
BT RX @2 Mbps	11.5 mA	

Laboratory Testing

The figures below are showing the average current consumption based on the different test cases.

Equipment:

- Power consumption meter
- RAK4600 WisDuo LPWAN Module

LoRa Packet Sending

The RAK4600 WisDuo LPWAN Module takes **92.291 ms** to send a LoRa packet which consumes **119 mA** of current.

- **Sending Time**: 92.291 ms
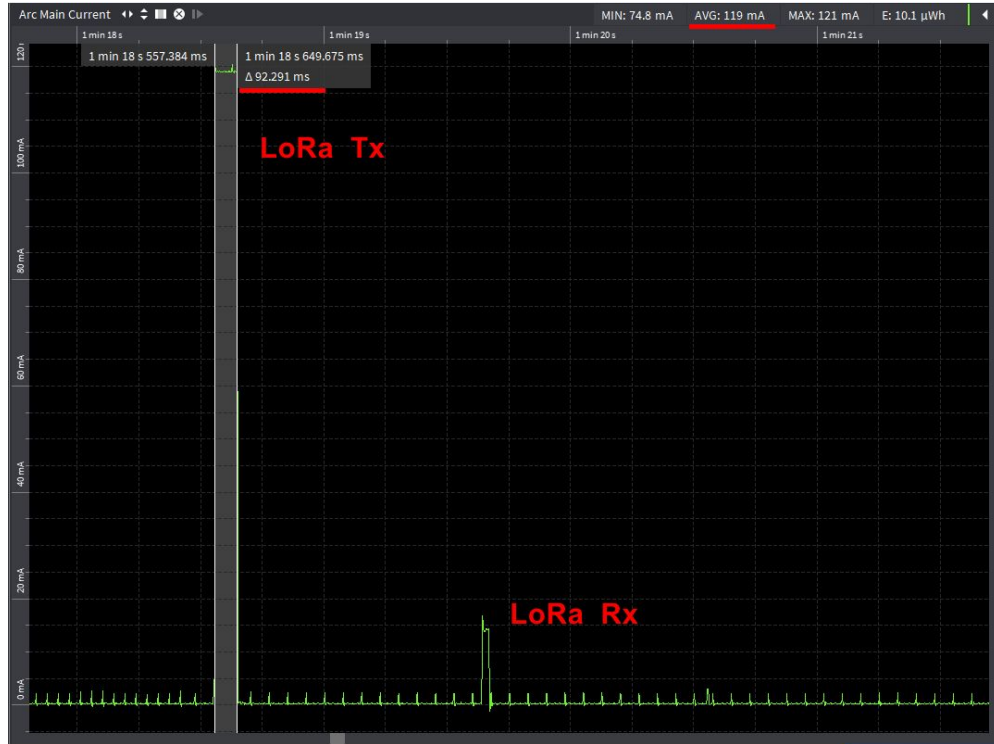- **Current consumption**: 119 mA

Figure 4: Oscilloscope Screen Capture of LoRa Packet Sending

LoRa Packet Receiving

The RAK4600 WisDuo LPWAN Module takes **30.052 ms** to receive a LoRa packet which consumes **13.8 mA** of current.

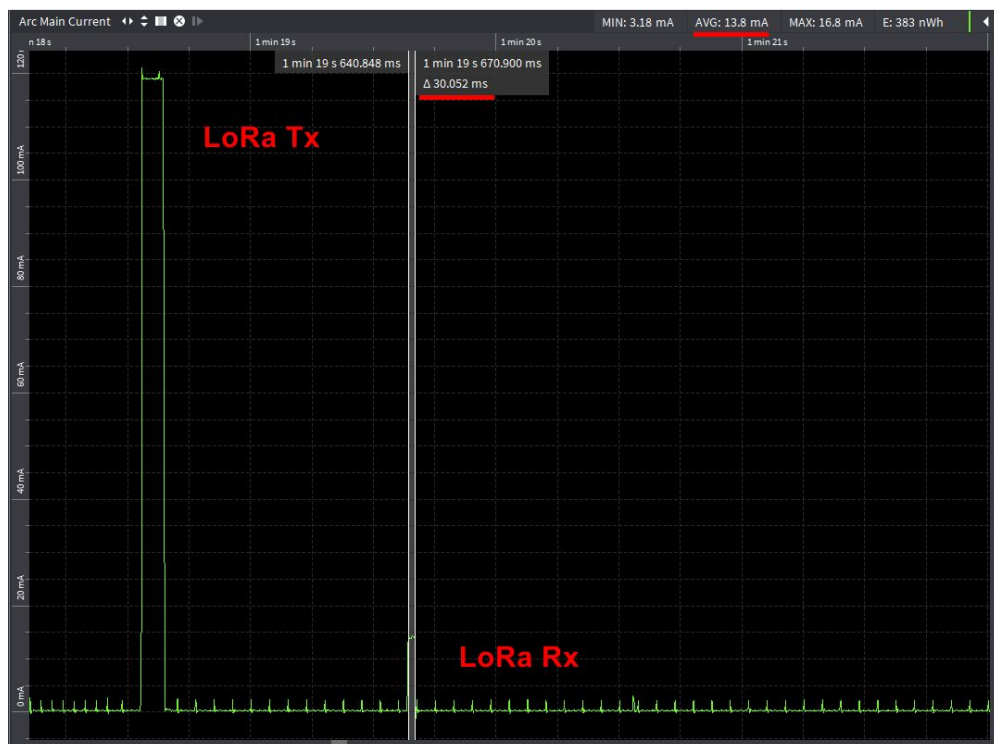- **Receiving Time**: 30.052 ms
- **Current consumption**: 13.8 mA

Figure 5: Oscilloscope Screen Capture of LoRa Packet Receiving

Sleep Current

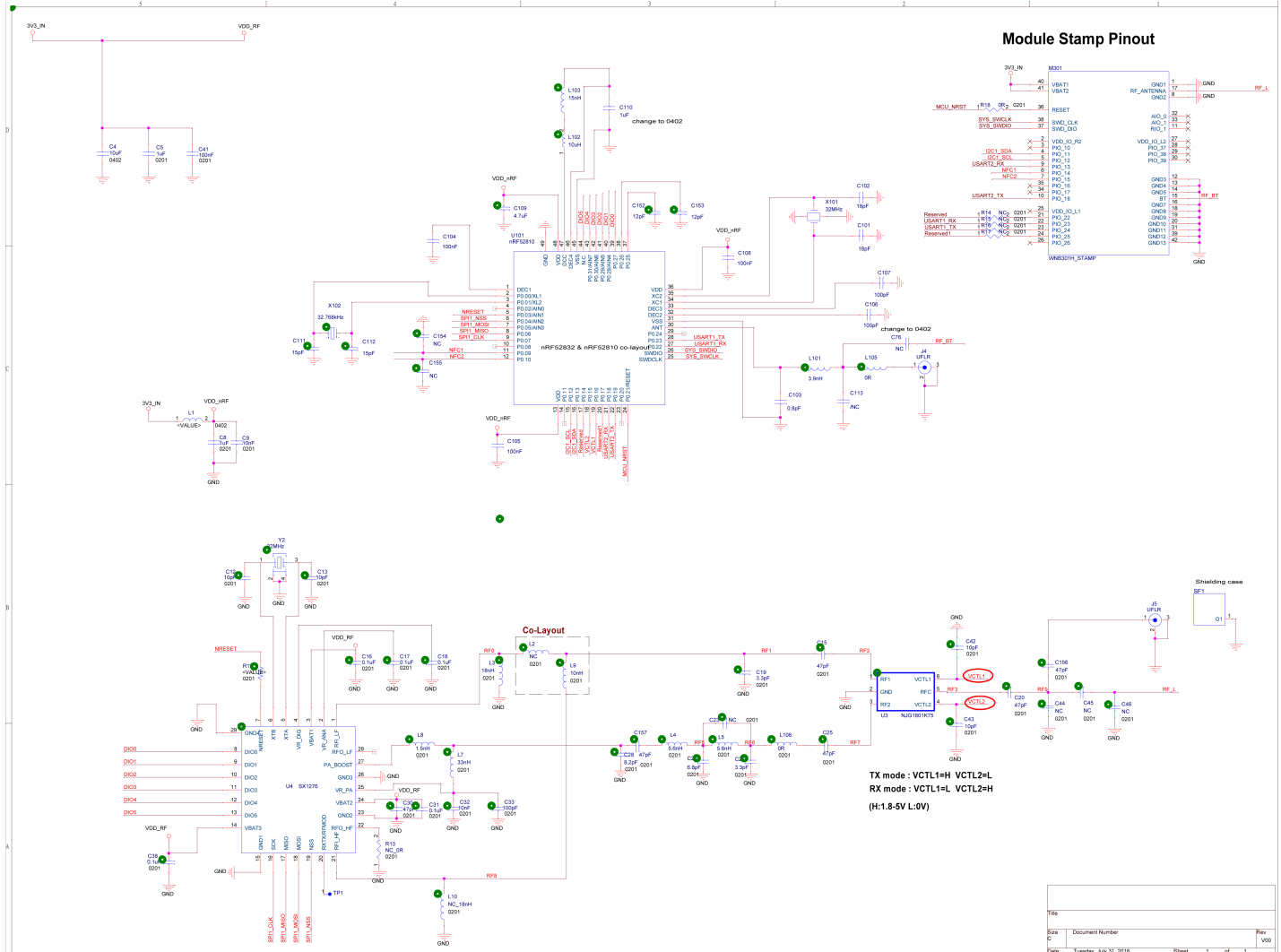| Feature	Condition	Minimum (2.0 V)	Typical (3.3 V)	Maximum	Unit
Current Consumption	EU868	11.2	13.3		μA
	US915	11.5	12.5		μA

Schematic Diagram

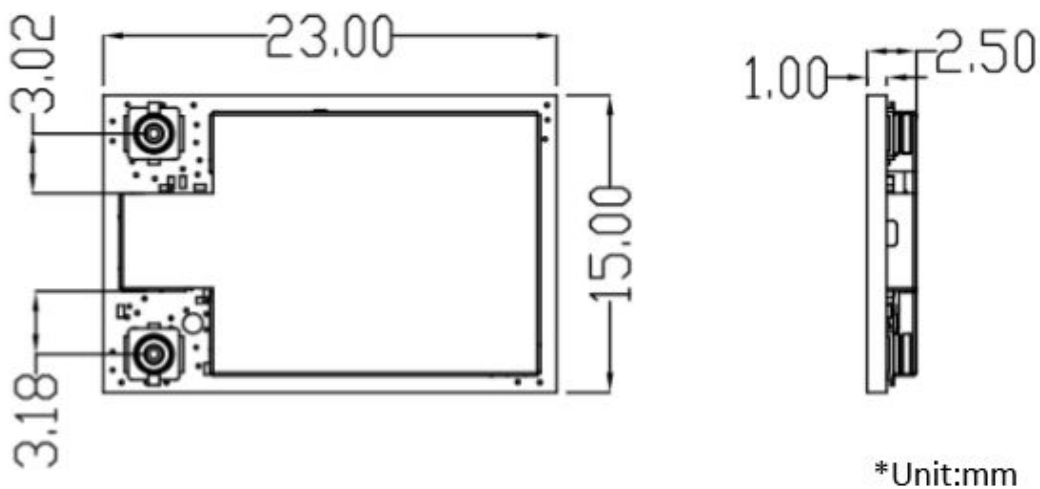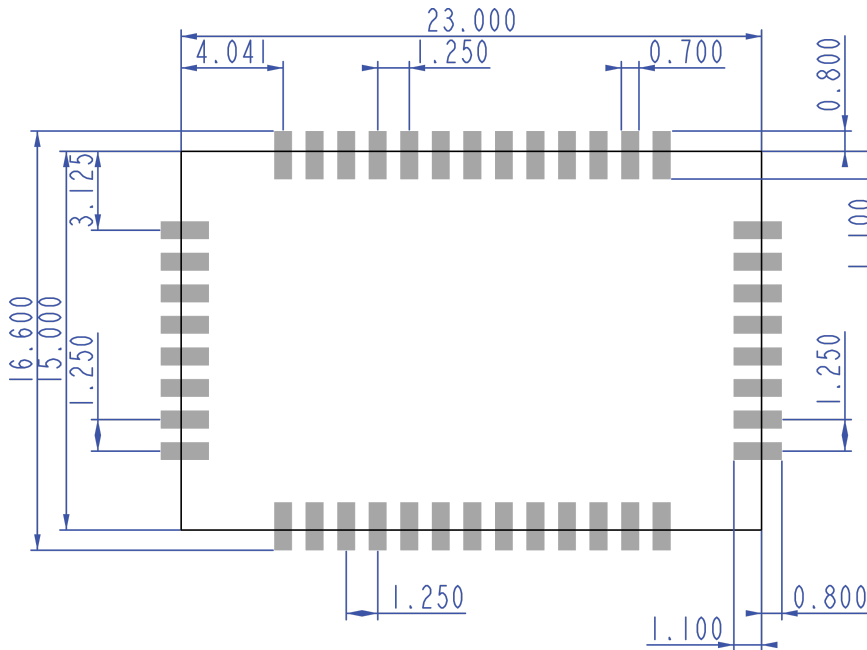**Figure 6:** Schematic Diagram

Mechanical Characteristics

Figure 7: Dimensions in Top and Side View

Figure 8: Dimensions Detailed
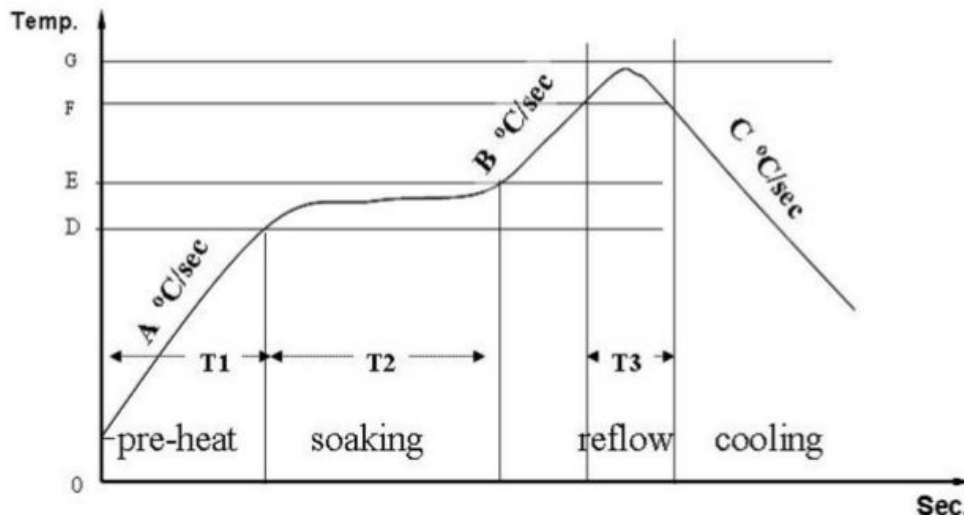
Recommended Reflow Profile

Figure 9: Recommended Reflow Profile

Standard Conditions for Reflow Soldering:

- Pre-heating Ramp (A) (Initial temperature: 150 ℃): 1~2.5 ℃/sec.
- Soaking Time (T2) (150 ℃~180 ℃): 60~100 sec;
- Peak Temperature (G): 230~250 ℃
- Reflow Time (T3) (>220 ℃): 30~60 sec
- Ramp-up Rate (B): 0~2.5 ℃/ sec
- Ramp-down Rate (C): 1~3 ℃/ sec.

Software

Download the latest firmware of the RAK4600 WisDuo LPWAN Module provided in the table below.

Firmware

Model	Version	Source
RAK4600	V3.4.0.14	Download ⧉

Certification

Last Updated: 3/11/2021, 9:22:29 AM