

# RAK4200 WisDuo LPWAN Module Datasheet

## Overview

### Description

**RAK4200 WisDuo LPWAN Module** includes an STM32L071 MCU and an SX1276 LoRa chip. It has Ultra-Low Power Consumption of 9.40 uA (down to 1.08 µA @ 2.0 V) in sleep mode and high LoRa output power up to 19 dBm max in work mode.

The module complies with LoRaWAN 1.0.2 specification. It also supports LoRa P2P Point-to-Point communications. The module is suitable for various applications that require long-range data acquisition and low power consumption.

### Features

- LoRa module for Smart City, Smart Agriculture, Smart Industry
- **Compact Form Factor:** 15 x 15.5 x 2.5 mm
- 20 Pin Stamp Pad for PCB SMT mounting
- **I/O ports:** UART/I2C/GPIO/ADC
- **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 9.40 µA (down to 1.08 µA @ 2.0 V) in sleep mode
- **Core:** ARM 32-bit Cortex – M0+ with MPU
- Up to 128 KB flash memory with ECC
- 20 KB RAM
- 6 KB of data EEPROM with ECC

## Specifications

### Overview

The overview covers the RAK4200 WisDuo board overview where the front and back views are presented. It includes also the block diagram that shows the external interfaces of the RAK4200 WisDuo.

### Board Overview



Figure 1: RAK4200 WisDuo LPWAN Module Front and Back View

### Block Diagram

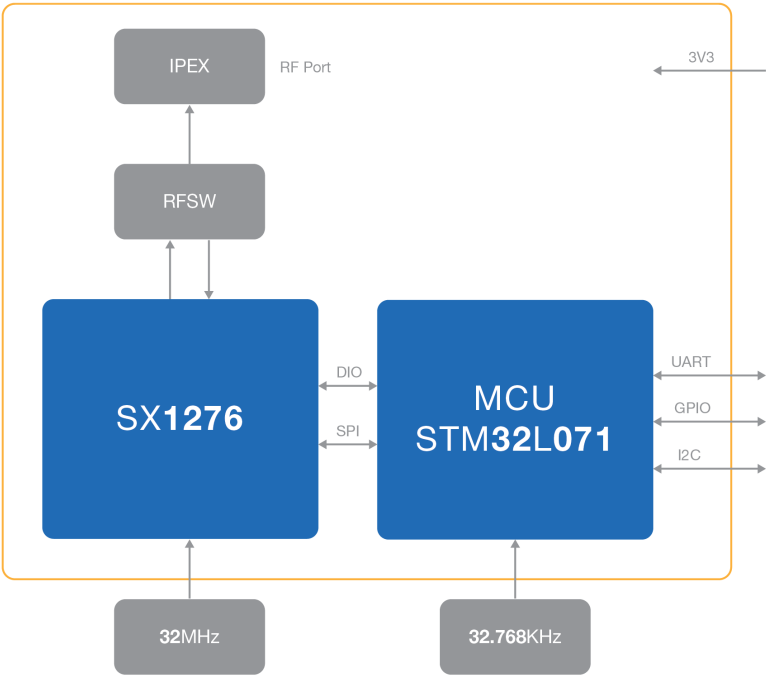


Figure 2: RAK4200 WisDuo Block Diagram

## Hardware

The hardware specification is categorized into five parts. It covers the pinouts and the corresponding functions and diagrams of the board. It also presents the parameters and its standard values in terms of electrical and mechanical.

## Pin Definition



Figure 3: Pinout for RAK4200

Pin	Name	I/O	Description
1	UART2_RX	I	UART2 Interface (AT Commands) (STM32L071 PA3)
2	UART2_TX	O	UART2 Interface (AT Commands) (STM32L071 PA2)

Pin	Name	I/O	Description
3	UART2_DE	I/O	GPIO (STM32L071 PA1)
4	UART1_TX	O	UART1 Interface (AT Commands and FW Update) (STM32L071 PA9)
5	UART1_RX	I	UART1 Interface (AT Commands and FW Update) (STM32L071 PA10)
6	UART1_DE	I/O	General GPIO or UART(Reserved) (STM32L071 PA12)
7	SWDIO	I/O	Programming (STM32L071 PA13)
8	SWCLK	I/O	Programming (STM32L071 PA14)
9	I2C_SCL	I/O	I2C interface (STM32L071 PB6)
10	I2C_SDA	I/O	I2C interface (STM32L071 PB7)
11	GND	-	Ground
12	RF	I/O	RF port (only available on <b>RAK4200 No-IPEX connector variant</b> )
13	GND	-	Ground
14	GND	-	Ground
15	SPI_CLK	I/O	Reserved PA5
16	SPI_MISO	I/O	Reserved PA6
17	SPI_MOSI	I/O	Reserved PA7
18	MCU_NRST	I/O	MCU reset (STM32L071 NRST)
19	GND	-	Ground
20	VDD	-	DC 3V3


## LoRa Transceiver IC Connection to RAK4200 Internal STM32

LoRa IC Pin	STM32 GPIO
DIO0	PB0
DIO1	PB1
DIO2	PB5
DIO3	PB4

LoRa IC Pin	STM32 GPIO
SPI1_CLK	PA5
SPI1_MISO	PA6
SPI1_MOSI	PA7
SPI1_NSS	PA4
NRESET	PA0
VCTL1	PA11
VCTL2	PA8

## LoRa Transceiver Mode

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

 **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. RAK4200 has two different types based on its frequency: RAK4200(L) for low frequency and RAK4200(H) for high frequency.

Module	Region	Frequency (MHz)
RAK4200 (L)	Europe	EU433
	China	CN470
RAK4200 (H)	Indian	IN865
	Europe	EU868
	North America	US915

Module	Region	Frequency (MHz)
	Australia	AU915
	Korea	KR920
	Asia	AS923

## Electrical Characteristics

### Electrical Consumption

Several current consumption ratings are provided below for a detailed RAK4200 WisDuo LPWAN Module usage. Refer to the values provided for specific simulations and calculations.

### Operating Voltage

Feature	Minimum	Typical	Maximum	Unit
VCC	2.0	3.3	3.6	Volts (V)

## Laboratory Testing

The following figures shown below are the average current consumptions based on the different test cases.

#### Materials:

- Power Consumption Meter
- RAK4200 WisDuo LPWAN Module

#### LoRa Packet Sending

The RAK4200 WisDuo LPWAN Module takes **53.155 ms** to send a LoRa packet which consumes **68.4 mA** of current.

- **Sending Time:** 53.155 ms
- **Current consumption:** 68.4 mA



Figure 4: Oscilloscope Screen Capture of LoRa Packet Sending

LoRa Packet Receiving

The RAK4200 WisDuo LPWAN Module takes **46.179 ms** to receive a LoRa packet which consumes **17.1 mA** of current.

- **Receiving Time:** 46.179 ms
- **Current consumption:** 17.1 mA



Figure 5: Oscilloscope Screen Capture of LoRa Packet Receiving

Operating Current

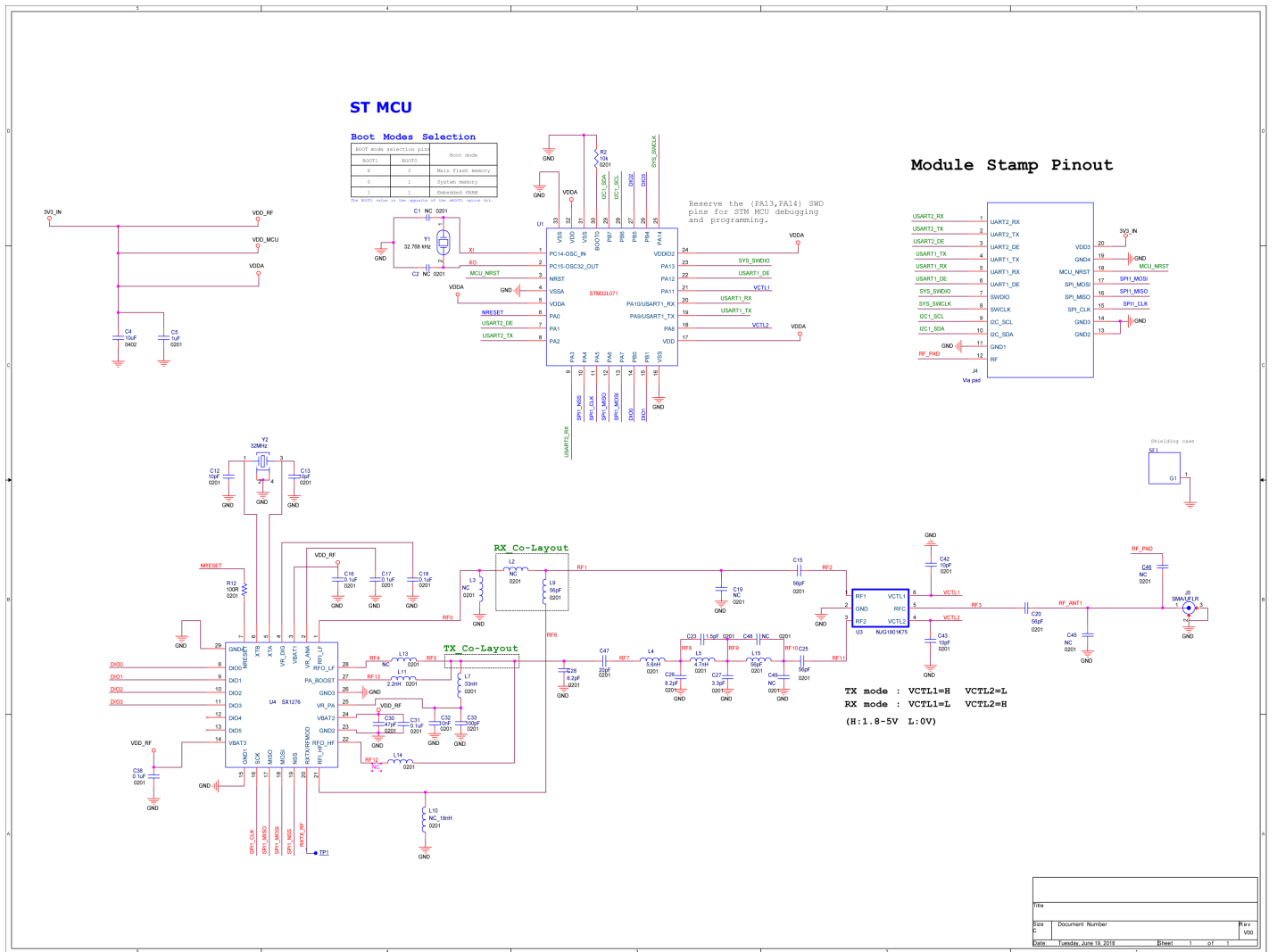
Feature	Condition	Minimum	Typical	Maximum	Unit
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RX Mode	17.1	mA
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## Sleep Current

US915	1.14	9.40	μA
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## Schematic



### Figure 6: RAK4200 Module Schematic Diagram

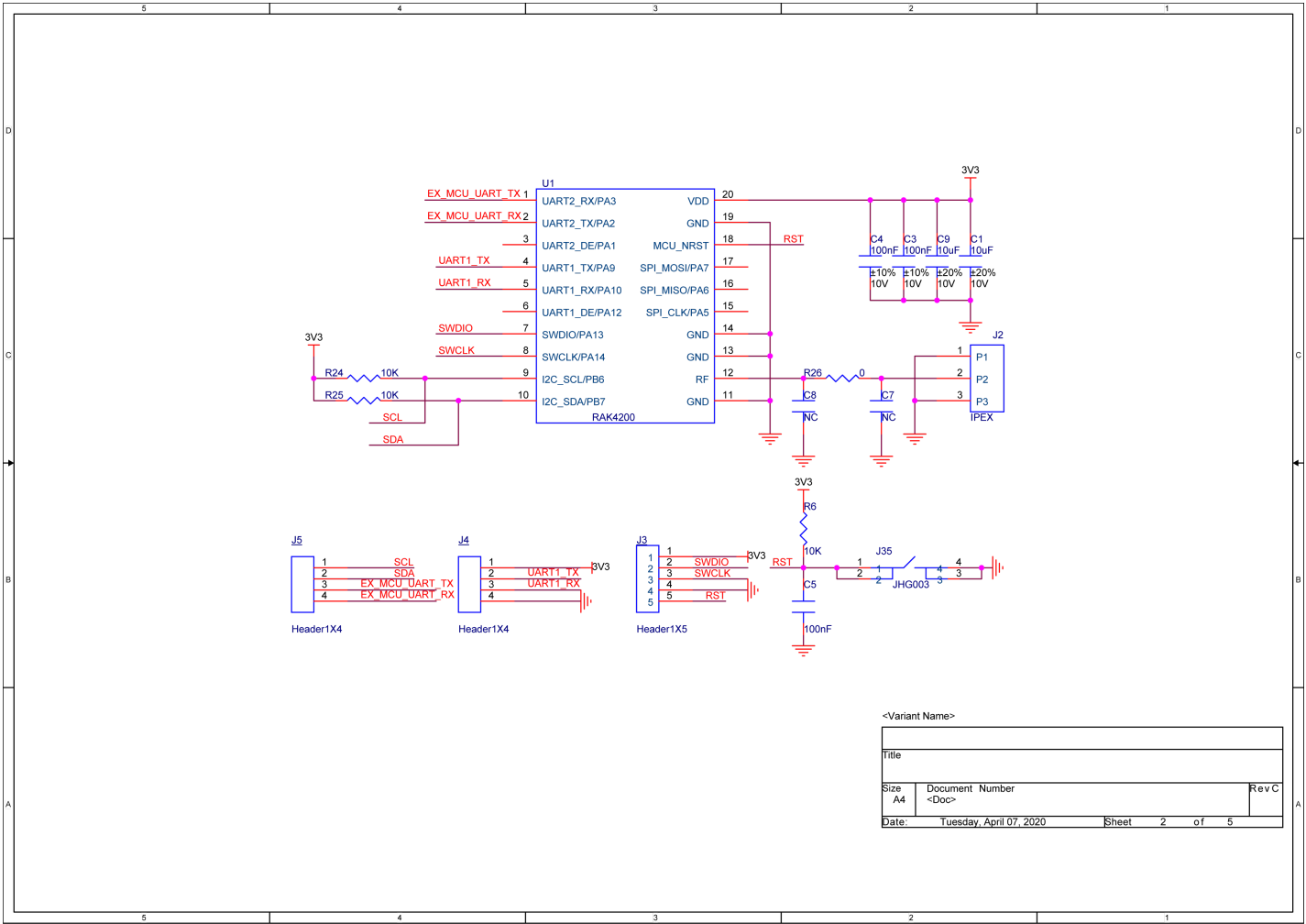


Figure 7: RAK4200 Module Reference Circuit

## Mechanical Characteristics

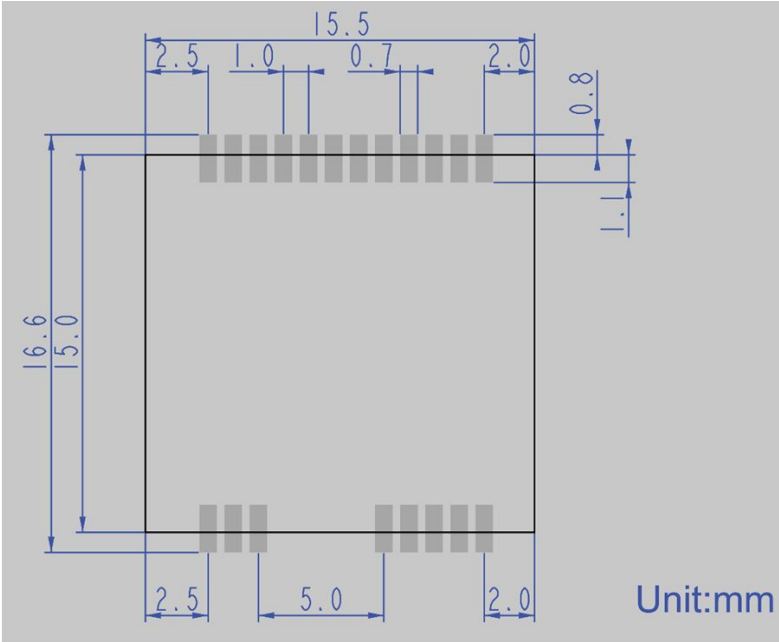


Figure 8: Mechanical Dimensions

## Recommended Reflow Profile

- MSL Rating : Class 3



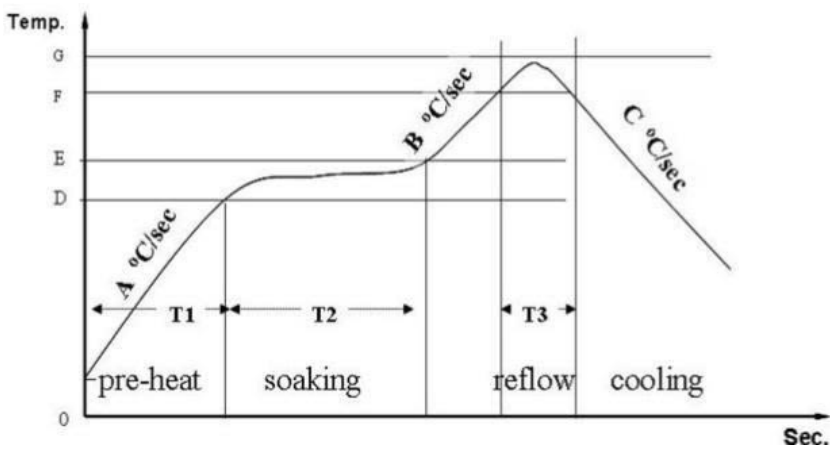



Figure 9: Recommended Reflow Profile

## Standard Conditions for Reflow Soldering:

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

## Software

Download the latest firmware of the RAK4200 WisDuo LPWAN Module as provided in the table below.

 **NOTE:**

The **bin file** contains the application code only, and you need the RAK DFU Tool to upload this file to the module.

The **hex file** contains both the bootloader and the application code. You need to use STM32CubeProgrammer to upload this.

## Firmware

Model Source	Source
RAK4200	<a href="#">Download</a>

## Certification



