

RAK811 Breakout Board Datasheet

Overview

Description

RAK811 Breakout Board is an easy to use, compact and low power long-range LoRa technology with wireless transceiver capabilities. It is based on RAK811 stamp module attached to a breakout board on Xbee form factor with standard 2.54 mm headers.

The RAK811 Breakout Board complies with Class A & C of LoRaWAN 1.0.2 specification. Additionally, it supports LoRa Point to Point (P2P) communications which helps you in implementing their own private LoRa wireless applications. You can configure the mode and operation of the module using AT commands via UART interface. RAK811 board also offers low power features which is very suitable for battery-powered applications.

Features

- Based on **Semtech SX1276**.
- **LoRaWAN 1.0.2** specification compliant.
- **Supported bands:** EU433, CN470, IN865, EU868, AU915, US915, KR920, and AS923.
- LoRaWAN Activation by OTAA/ABP.
- LoRa Point to Point (P2P) communication.
- Integrates both **SMA** and **iPEX** antenna connectors.
- Xbee form factor with standard 2.54 mm headers.
- Easy to use AT Command Set via UART interface with configurable baud rate.
- Maximum output power 100 mW (20 dBm), adjustable from 5 to 20 dBm.
- High sensitivity at -148 dBm, enabling extremely long range connectivity.
- Long-range - greater than 15 km with optimized antenna.
- Low power consumption: 11 μ A on on standby.
- Ultra-Low Power Consumption of 11.9 μ A (down to 1.11 μ A @ 2.1 V) in sleep mode.
- Multi-channel, dual data buffer (256 bytes each).
- LoRa/FSK/GFSK/OOK modulation, bidirectional two-way communication.
- Long battery life for battery-powered applications.
- LoRa technology is capable of demodulating 20 dB below noise level which significantly improves immunity to interference when combined with integrated forward error correction.
- **Operating temperature:** -30° C ~ 85° C (industrial grade)
- **Storage temperature:** -40° C ~ 85° C (non-condensing)

Specifications

This section covers the hardware and software specifications of RAK811 Breakout Board. All discussion presents both versions: RAK811(L) and RAK811(H).

Overview

The **RAK811 Breakout Board** is shown in Figure 1 with its corresponding board dimension of **42 mm x 25 mm**. This board weighs at about **0.2 kg**.

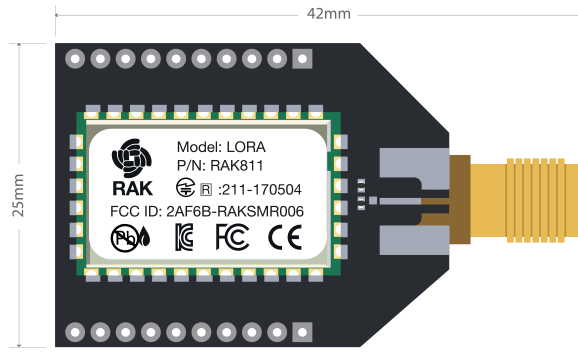


Figure 1: RAK811 Breakout Board Dimensions

Hardware

The hardware specification discusses the interfaces, pinouts and its corresponding functions and diagrams. It also covers the parameters of the both RAK811 Breakout Board in terms of RF, electrical, mechanical, and operating characteristics.

Interfaces

Module	Interfaces
RAK811 Breakout Board	UART1, GPIOs

Pin Definition

The RAK811 Breakout Board supports two different frequency variation: **High Radio Frequency** and **Low Radio frequency**.

High Radio Frequency (RAK811(H))

The high radio frequency hardware support the regions of EU868, US915, AU915, KR920, AS923, and IN865.

High RF Pin Outline

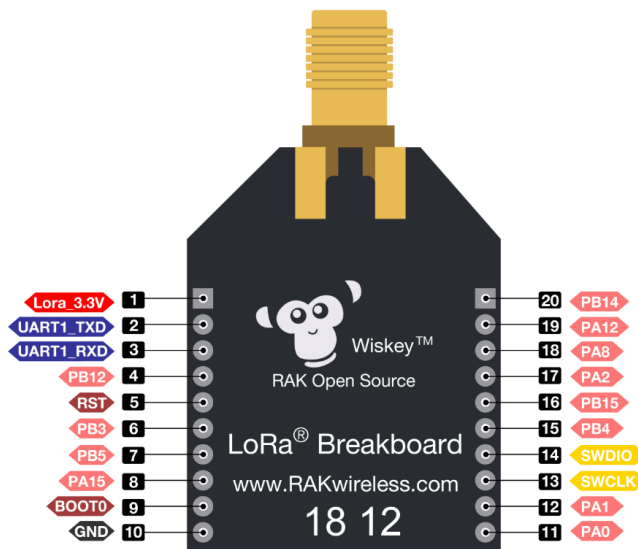


Figure 2: Board Pinout for RAK811 Breakout High RF

High RF Pin Definition

Pin No.	Name	Type	Description
1	VCC 3.3 V	P	Main Power Voltage Source Input
2	PA9/UART1_TX	O	UART1 Interface (AT Commands and FW Update)
3	PA10/UART1_RX	I	UART1 Interface (AT Commands and FW Update)
4	PB12/ADC	I/O	GPIO and ADC
5	RST	I	Reset Trigger Input, Low Active
6	PB3	I/O	GPIO only
7	PB5	I/O	GPIO only
8	PA15	I/O	GPIO only
9	BOOT0		Boot mode GPIO enable pin - high active
10	GND		Ground connections
11	PA0/ADC	I/O	GPIO and ADC
12	PA1/ADC	I/O	GPIO and ADC
13	PA14		SWD Debug Pin (SWCLK)
14	PA13		SWD Debug Pin (SWDIO)
15	PB4	I/O	GPIO only
16	PB15/ADC	I/O	GPIO and ADC
17	PA2/ADC	I/O	GPIO and ADC
18	PA8	I/O	GPIO only
19	PA12	I/O	GPIO only
20	PB14/ADC	I/O	GPIO and ADC

Low Radio Frequency (RAK811(L))

The low radio frequency is applicable to bandwidth of regions EU433 and CN470.

Low RF Pin Outline

RAK811 LoRa® Breakout Board PINOUT

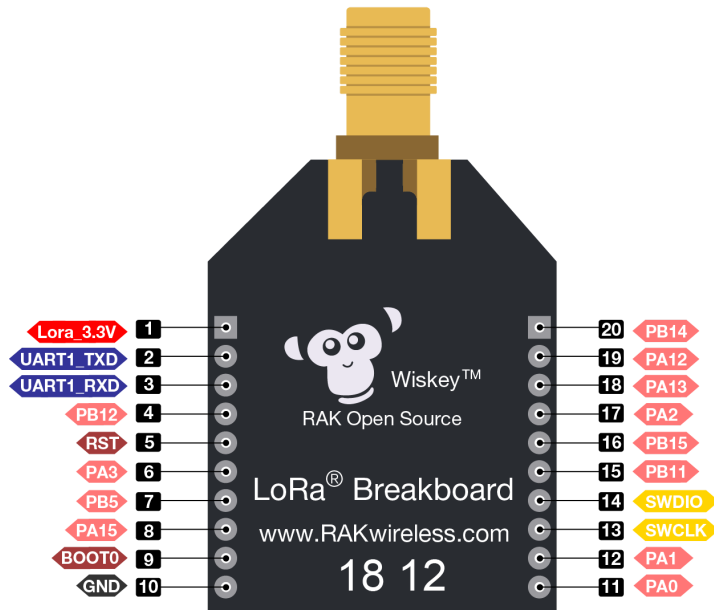


Figure 3: Board Pinout for RAK811 Breakout Low RF

Low RF Pin Definition

Pin No.	Name	Type	Description
1	VCC 3.3 V	P	Main Power Voltage Source Input
2	PA9/UART1_TX	O	UART1 Interface (AT Commands and FW Update)
3	PA10/UART1_RX	I	UART1 Interface (AT Commands and FW Update)
4	PB12/ADC	I/O	GPIO and ADC
5	RST	I	Reset Trigger Input, Low Active
6	PA3/ADC	I/O	GPIO and ADC
7	PB5	I/O	GPIO only
8	PA12	I/O	GPIO only
9	PB4		Boot mode GPIO enable pin - high active
10	GND		Ground connections
11	PA0/ADC	I/O	GPIO and ADC
12	PA1/ADC	I/O	GPIO and ADC
13	PA14		SWD Debug Pin (SWCLK)
14	PA13		SWD Debug Pin SWDIO
15	PA11	I/O	GPIO only
16	PB15/ADC	I/O	GPIO and ADC
17	PA2/ADC	I/O	GPIO and ADC
18	PB13/ADC	I/O	GPIO and ADC
19	PA12/ADC	I/O	GPIO and ADC
20	PB14/ADC	I/O	GPIO and ADC

RF Characteristics

Operating Frequencies

Module	Region	Frequency
RAK811(L)	Europe	EU433
	China	CN470
RAK811(H)	Europe	EU868
	North America	US915
	Australia	AU915
	Korea	KR920
	Asia	AS923
	India	IN865

Feature	Condition	Minimum	Typical	Maximum	Unit
Transmit	TX Power		14	20	dBm
RX Sensitivity	RSSI	-130			dBm
	SNR	-15			dB

Electrical Characteristics

Operating Voltage

Feature	Minimum	Typical	Maximum	Unit
VCC	2.1	3.3	3.45	Volts (V)

Current Consumption

Feature	Condition	Minimum	Typical	Maximum	Unit
Current Consumption	TX Power	30 (@ 14 dBm)			mA
	RX Mode	5.5			mA

Sleep Current

Feature	Condition	Minimum (2.1V)	Typical (3.3V)	Maximum	Unit
Current Consumption	EU868	8.37	11.9		μA
	US915	1.11	11.8		μA
	CN470	1.65	3.07		μA

Mechanical Characteristics

Module Dimensions

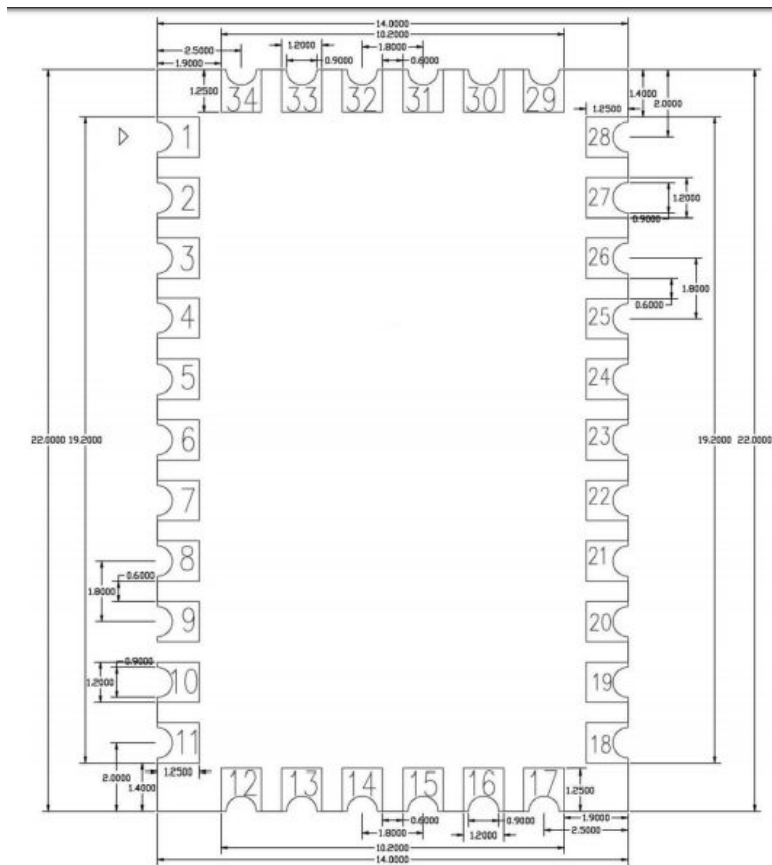


Figure 4: RAK811 Physical Dimension

Environmental Characteristics

Operating Temperature

Feature	Minimum	Typical	Maximum	Unit
Operating Temperature	-30	25	85	°C

Storage Temperature

Feature	Minimum	Typical	Maximum	Unit
Storage Temperature	-40		85	°C

Schematic Diagram

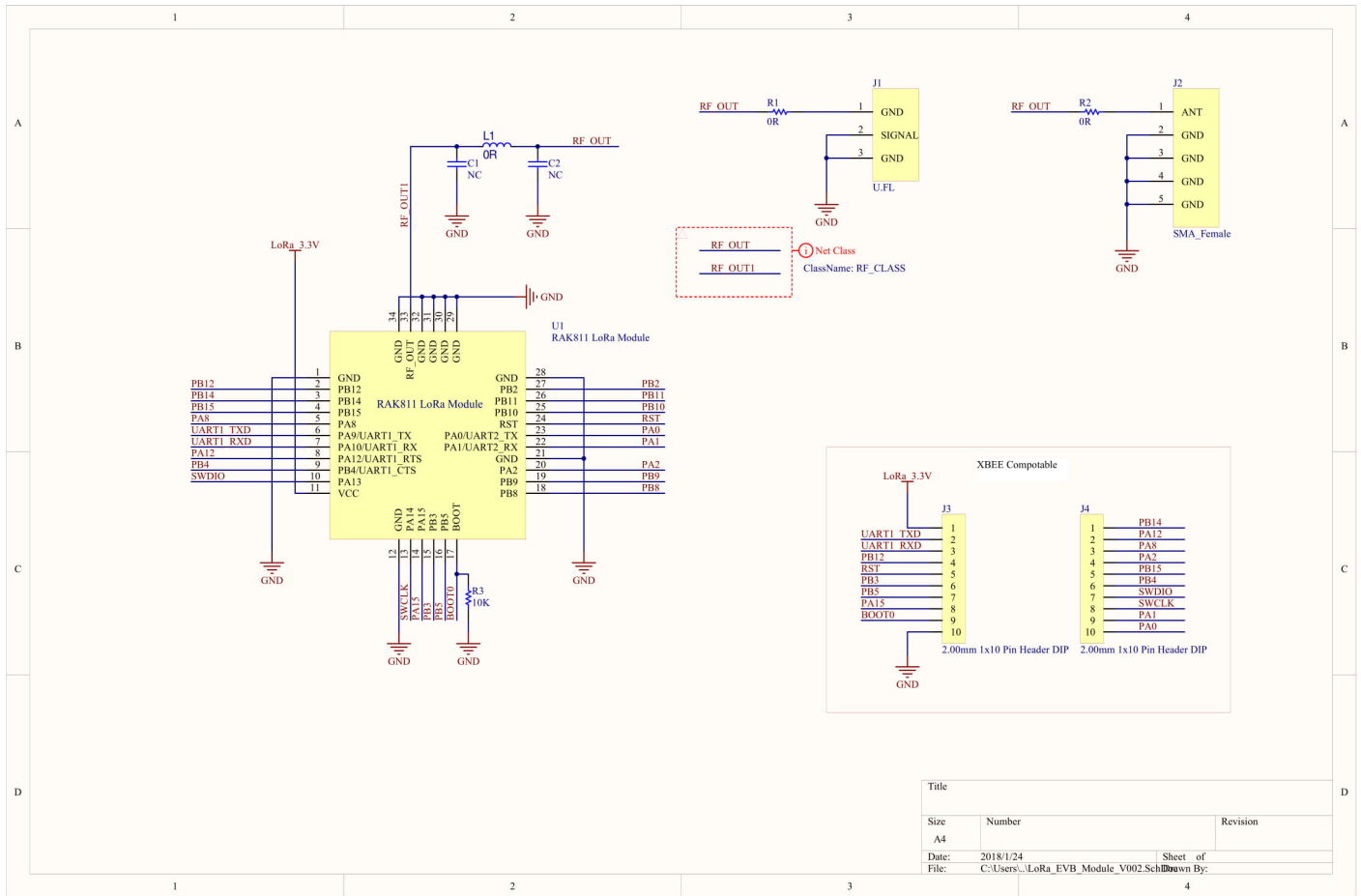


Figure 5: RAK811 Schematic Diagram

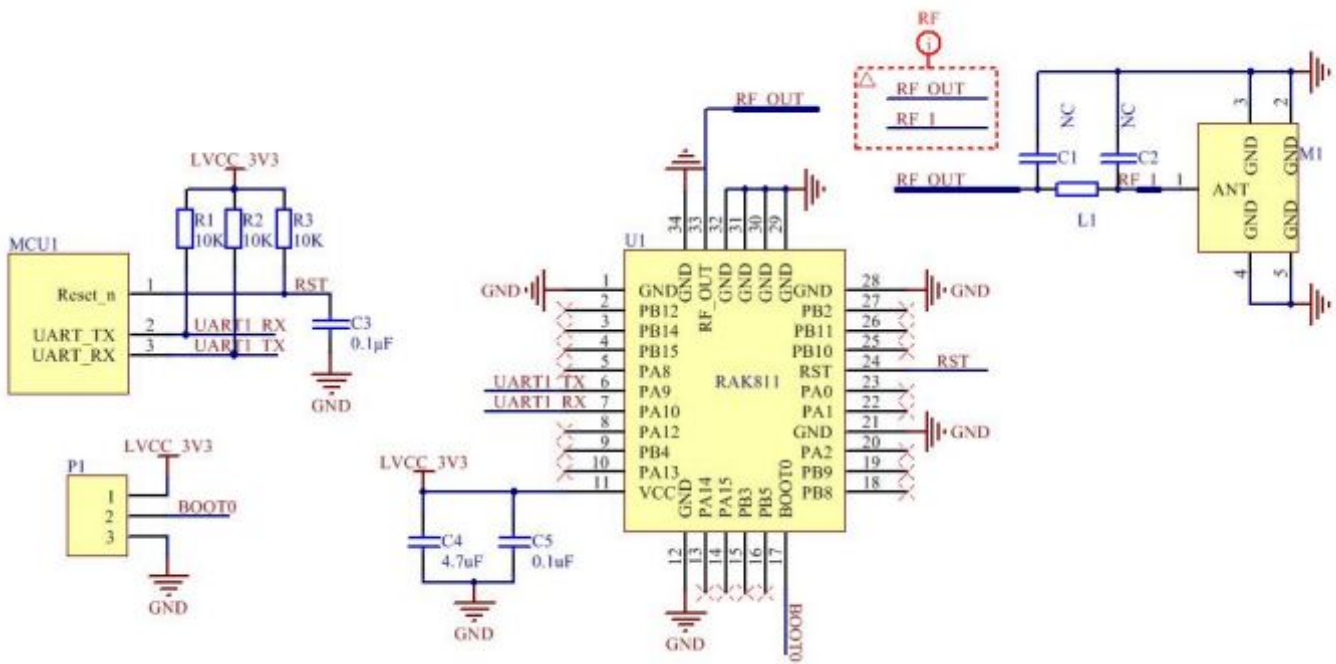




Figure 6: Reference Design

Software

Download the latest firmware of the RAK811 Breakout Board — both in low and high frequency — provided in the table below.

Firmware / OS

Model	Version	Source
RAK811(L)	V3.0.0.14.L	Download 
RAK811(H)	V3.0.0.14.H	Download 

Certification



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