

RAK4630 WisBlock LPWAN+BLE Module Datasheet

Overview

Description

The RAK4630 is a low-power long-range transceiver module based on Nordic nRF52840 MCU that supports Bluetooth 5.0 (Bluetooth Low Energy) and the newest SX1262 LoRa transceiver from Semtech. This module complies with Class A, B, & C of LoRaWAN 1.0.3 specifications and also supports LoRa Point-to-Point (P2P) communication mode which helps you in implementing your own customized long-range LoRa network quickly. The two RF communication characteristic of the module (LoRa + BLE) makes it suitable for a variety of applications in the IoT field, such as home automation, sensor networks, building automation, and IoT network applications.

The default firmware of RAK4630 is based on RUI3 (RAKwireless Unified Interface). This allows you to easily use RAK4630 as a stand-alone module by developing your own custom firmware via RUI APIs. You can directly interface sensors and other external peripherals to it without needing an additional MCU. On top of that, RAK4630 still has the capability to be interfaced to an external host MCU using AT commands via USB, UART, or BLE connection.

Features

- **LoRaWAN 1.0.3** specification compliant
- **Supported bands:** IN865, EU868, AU915, US915, KR920, RU864, and AS923
- LoRaWAN Activation by OTAA/ABP
- LoRa Point-to-Point (P2P) communication
- Custom firmware using Arduino via RUI3 API
- Easy-to-use AT Command set via UART interface
- TCXO crystal for LoRa chip
- I/O ports: UART/I2C/GPIO/USB
- SPI pins and optional NFC interface are accessible using WisBlock IO module
- Temperature range: -40° C to +85° C
- Supply voltage: 2.0 ~ 3.6 V
- Low-Power Wireless Systems with 7.8 kHz to 500 kHz Bandwidth
- Ultra-Low Power Consumption 4.23 uA in sleep mode
- LoRa PA Boost mode with 22 dBm output power
- BLE5.0 (Tx power -20 to +4 dBm in 4 dB steps)
- Serial Wire Debug (SWD) interface
- Module size: 15 x 23 x 3 mm

Specifications

Overview

Hardware

The hardware specification is categorized into three parts. It covers the RF, electrical, and mechanical parameters that include the tabular data of the functionalities and standard values of the RAK4630 WisBlock LPWAN Module.

Interfaces

Module	Interfaces
RAK4630	USB, UART1

Pin Definition

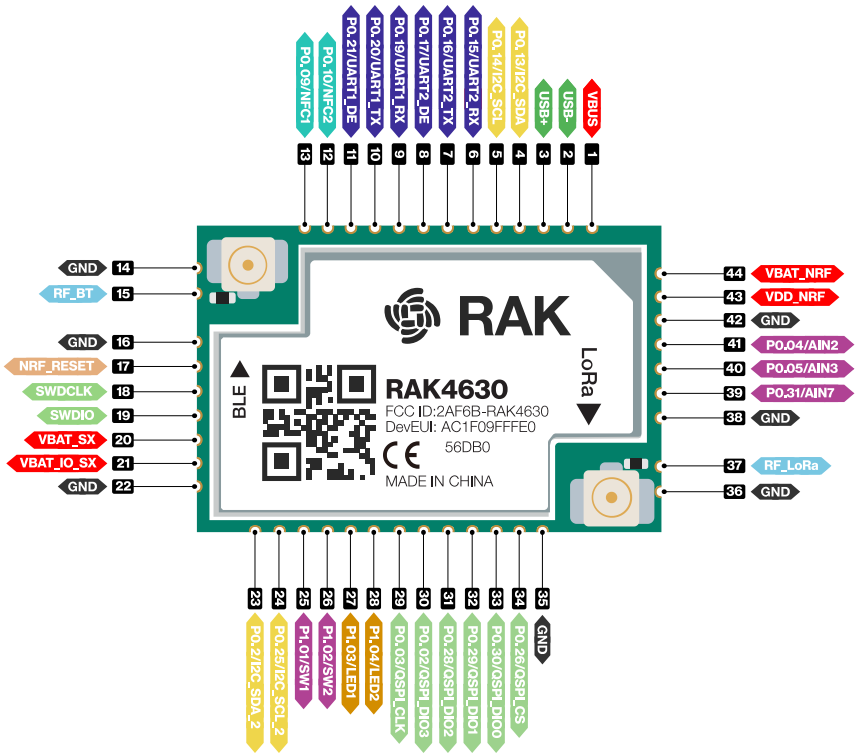



Figure 1: RAK4630 module pinout diagram

 **WARNING**

When using `RF_LoRa` and `RF_BT` for antenna connection and not the IPEX connector variant, make sure there is no ground plane (in all layers of the PCB) under the RF trace path to eliminate the possible effects of unwanted stray capacitance which can cause degradation of the RF signal levels.

Pin No.	Name
1	VBUS
2	USB-
3	USB+
4	P0.13/I2C_SDA
5	P0.14/I2C_SCL
6	P0.15/UART2_RX
7	P0.16/UART2_TX
8	P0.17/UART2_DE
9	P0.19/UART1_RX (AT Command)
10	P0.20/UART1_TX (AT Command)
11	P0.21/UART1_DE
12	P0.10/NFC2
13	P0.09/NFC1
14	GND
15	RF_BT
16	GND
17	NRF_RESET
18	SWDCLK
19	SWDIO
20	VBAT_SX
21	VBAT_IO_SX
22	GND
23	P0.24/I2C_SDA_2
24	P0.25/I2C_SCL_2

Pin No.	Name
25	P1.01/SW1
26	P1.02/SW2
27	P1.03/LED1
28	P1.04/LED2
29	P0.03/QSPI_CLK
30	P0.02/QSPI_DIO3
31	P0.28/QSPI_DIO2
32	P0.29/QSPI_DIO1
33	P0.30/QSPI_DIO0
34	P0.26/QSPI_CS
35	GND
36	GND
37	RF_LoRa
38	GND
39	P0.31/AIN7
40	P0.05/AIN3
41	P0.04/AIN2
42	GND
43	VDD_NRF
44	VBAT_NRF

Setup of the SX1262

Information to write custom firmware for the RAK4630. This shows the internal connection between the RAK4630 and required information when initializing the SX1262 LoRa Transceiver.

nRF52840 GPIO	SX1262 pin	function
P1.10	NSS	SPI NSS
P1.11	SCK	SPI CLK
P1.12	MOSI	SPI MOSI
P1.13	MISO	SPI MISO
P1.14	BUSY	BUSY signal
P1.15	DIO1	DIO1 event interrupt
P1.06	NRESET	NRESET manual reset of the SX1262

Important for successful SX1262 initialization:

- Setup DIO2 to control the antenna switch
- Setup DIO3 to control the TCXO power supply
- Setup the SX1262 to use it's DCDC regulator and not the LDO
- RAK4630 schematics show GPIO P1.07 connected to the antenna switch, but it should not be initialized, as DIO2 will do the control of the antenna switch

RF Characteristics

The RAK4630 module supports the LoRaWAN bands shown in the table below. When buying a RAK4630 module, pay attention to specifying the correct core module RAK4630 H/L for your region, in which H stands for high-frequency regions and L for low-frequency regions.

 NOTE

Detailed information about the RAK4630 BLE and LoRa antenna can be found on the [antenna datasheet](#) .

Region	Frequency (MHz)	Core Module
India	IN865	RAK4630(H)
Europe	EU868	RAK4630(H)
Europe	EU433	RAK4630(L)
North America	US915	RAK4630(H)
Canada	US915	RAK4630(H)
Australia	AU915	RAK4630(H)
Korea	KR920	RAK4630(H)
Asia	AS923-1/2/3/4	RAK4630(H)
China	CN470	RAK4630(L)

Electrical Characteristics

Power Consumption

Item	Current Average	Condition - Voltage and Dwell Time
RAK4630 Module in One-Time Sleep	4.42 uA	3.3V 10seconds
RAK4630 Module System up in Idle mode	3.35 mA	3.3V 10seconds
RAK4630 Module in LoRaWAN One-Time Sleep	4.23 uA	3.3V 10seconds
RAK4630 Module 15 Bytes Data TX Sending	67.8 mA	3.6V 1second (in RAK5005-O board)
RAK4630 Module in RX Window Received	2.22 mA	3.6V 1second (in RAK5005-O board)

Absolute Maximum Ratings

Symbol	Description	Min.	Nom.	Max.	Unit
VBAT_SX	LoRa chip supply voltage	-0.5		3.9	V
VBAT_SX_IO	LoRa chip supply for I/O pins	-0.5		3.9	V
VDD_NRF	MCU power supply	-0.3		3.9	V
VBUS	USB supply voltage	-0.3		5.8	V
VBAT_NRF	MCU high voltage power supply	-0.3		5.8	V

Recommended Operating Conditions

Symbol	Description	Min.	Nom.	Max.	Unit
VBAT_SX	SX1262 supply voltage	2.0	3.3	3.7	V
VBAT_SX_IO	SX1262 supply for I/O pins	2.0	3.3	3.7	V
VDD_NRF	NRF52840 power supply	2.0	3.3	3.6	V
VBUS	VBUS USB supply voltage	4.35	5.0	5.5	V
VBAT_NRF	NRF52840 high voltage power supply	2.5		5.5	V

Schematic Diagram

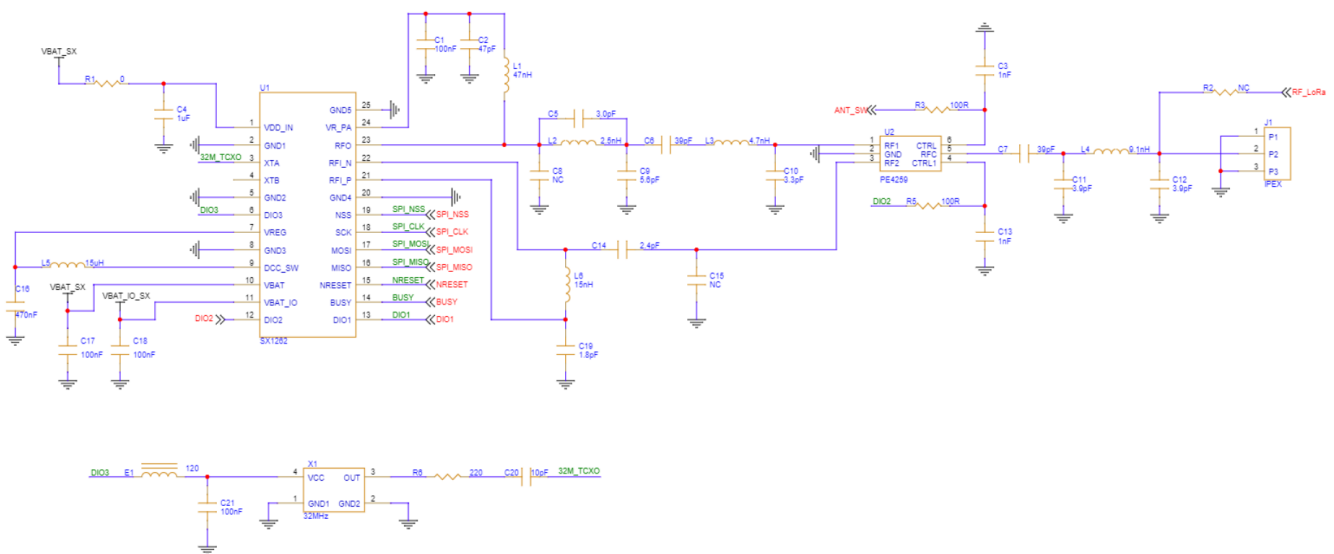
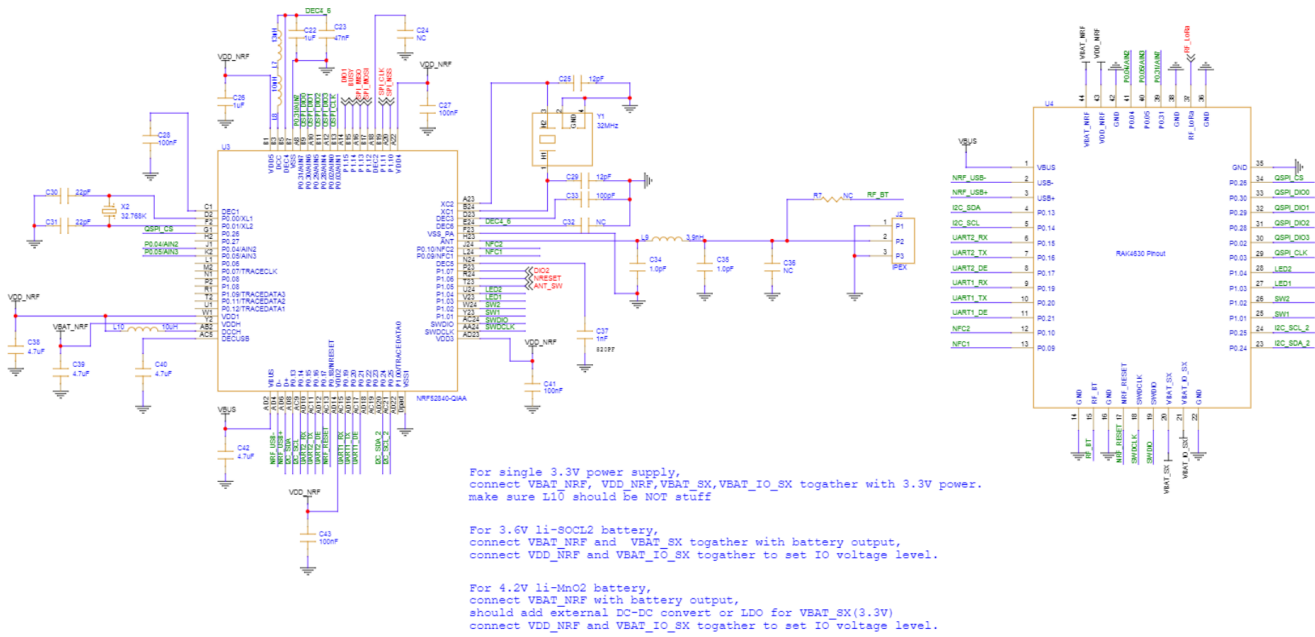


Figure 2: SX1262 Section



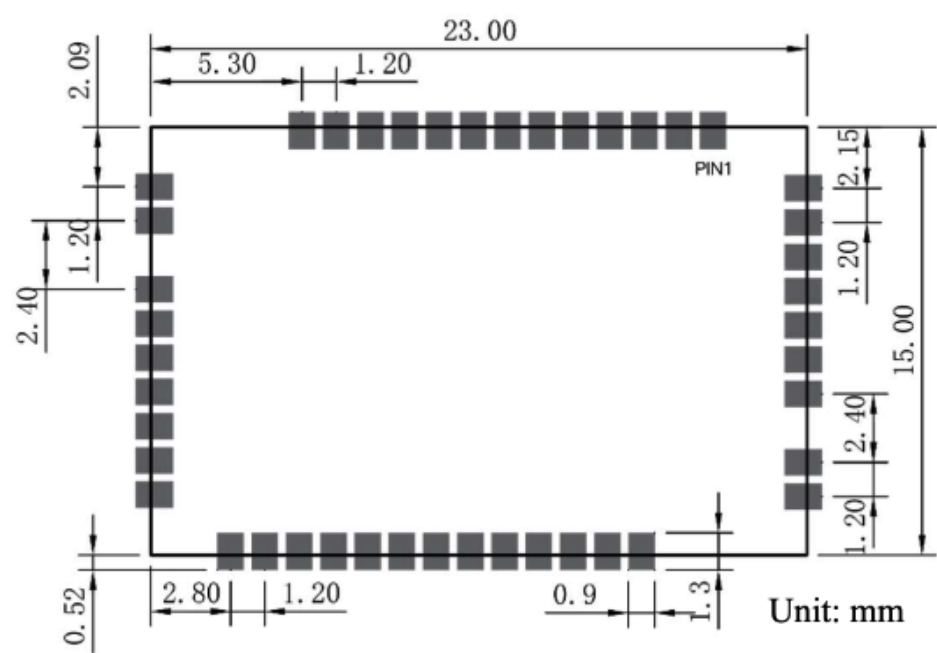


Figure 5: PCB footprint and recommendations