RAK4631 WisBlock LPWAN Module Datasheet

Overview

Description

The RAK4631 WisBlock Core module, is a RAK4630 stamp module with an expansion PCB and connectors compatible with the RAK5005-O baseboard. It allows an easy way to access to the pins of the RAK4630 module in order to simplify development and testing processes.

The module itself comprises a RAK4630 as its main component. The RAK4630 is a combination of a nRF52840 MCU and an SX1262 LoRa chip, it features ultra-low power consumption of 2.0uA during sleep mode, high LoRa output power up to 22dBm during transmission mode, and the BLE interface with output power up to 4dBm.

The module complies with LoRaWAN 1.0.2 protocols, it also supports LoRa point to point communication.

The 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, personal area networks applications (health/fitness sensors, and monitors, etc.).

Features

- TCXO crystal for LoRa chip
- I/O ports: UART/I2C/GPIO/USB/SPI (optional NFC interface)
- Temperature range: -40°C to +85°C
- Supply voltage: 2.0 ~ 3.6V
- Low-Power Wireless Systems with 7.8 KHz to 500 KHz Bandwidth
- Ultra-Low Power Consumption 2.0uA in sleep mode
- LoRa PA Boost mode with 22dBm output power
- BLE5.0 (Tx power -20 to +4dBm in 4dB steps)
- Serial Wire Debug (SWD) interface
- Module size: 20 x 30mm

Specifications

Overview

The overview covers the RAK4631 board overview and the mounting mechanics of the board into the baseboard.
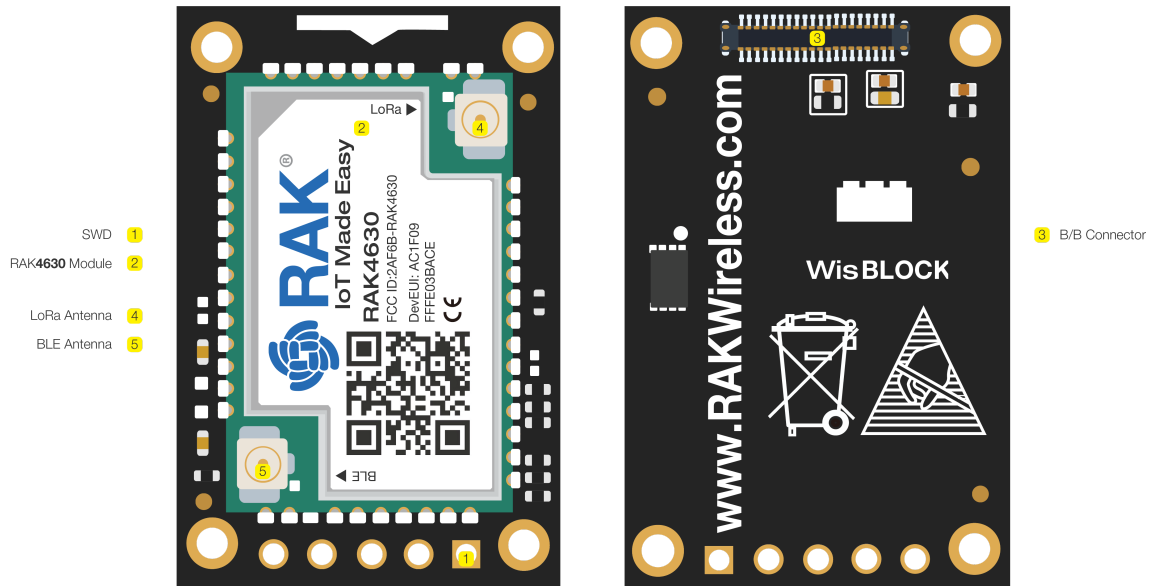
Board Overview

Figure 1: Board Realistic View

Mounting Sketch

The RAK4631 module is designed to work with the RAK5005-O base board. The Figure 2 shows how a RAK4631 module should be mounted on top of the RAK5005-O.
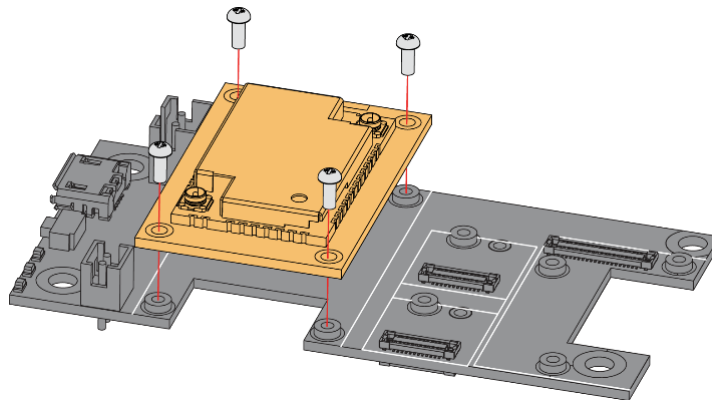

Figure 2: RAK4631 Mounting Sketch

Hardware

The hardware specification is categorized into four parts. It discusses the pinouts of the module and its corresponding functions and diagrams. It also covers the RF, electrical, and mechanical parameters that include the tabular data of the functionalities and standard values of the RAK4631 Module.

RF Characteristics

The RAK4631 module supports the LoRaWAN bands shown in Table below. When buying a RAK4631 module, please pay attention to specify the correct core module RAK4630 H/L for your region. In which H stands for high-frequency regions and L for low-frequency regions.

Region	Frequency(MHz)	Core Module
India	IN865	RAK4630(H)
Europe	EU868	RAK4630(H)
Europe	EU433	RAK4630(L)
North America	US915	RAK4630(H)

Region	Frequency(MHz)	Core Module
Canada	US915	RAK4630(H)
Australia	AU915	RAK4630(H)
Korea	KR920	RAK4630(H)
Asia	AS923	RAK4630(H)
China	CN470, CN779	RAK4630(L)

Electrical Characteristics

Power Consumption

Item	Power Consumption	Condition
Tx mode LoRa @20dBm	125mA	LoRa @ PA_BOOST&BT sleep
Tx mode LoRa @17dBm	92mA	LoRa @ PA_BOOST&BT sleep
Tx mode BT@4dBm	9mA	BT Tx mode & Lora sleep
Rx mode LoRa @37.5Kbps	17mA	LoRa @ Receive mode &BT sleep
Rx mode BT@2Mbps	11.5mA	BT Rx mode & Lora sleep
Sleep mode	2.0uA	LoRa&BT sleep

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

Symbol	Description	Min.	Nom.	Max.	Unit
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

Mechanical Characteristics

Board Dimensions
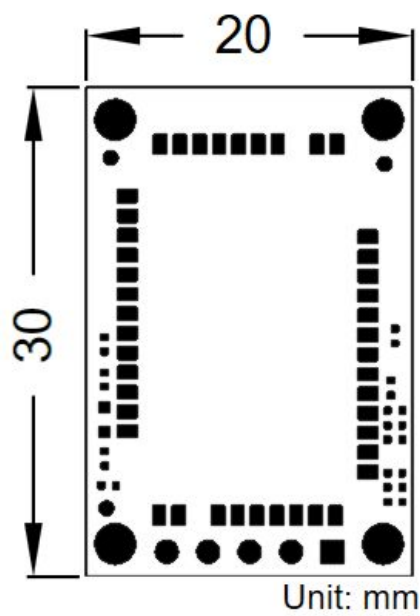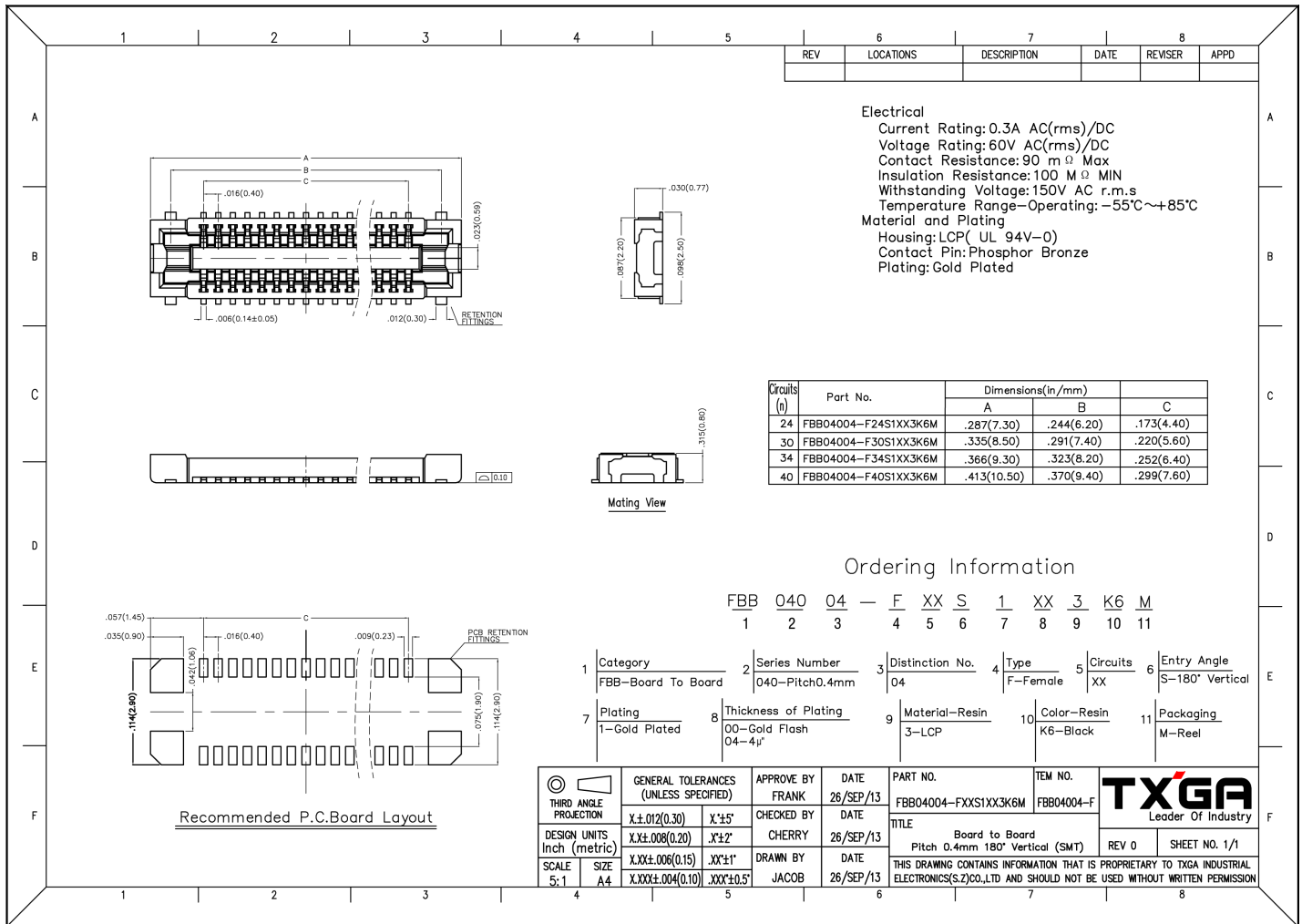

Figure 3: Mechanical Dimensions

WisConnector PCB Layout

Figure 4: WisConnector PCB footprint and recommendations

Schematic Diagram

The following section will describe the breakout module schematic. It includes WisConnector, core module, SWD interface and power up automatic reset.

WisConnector

The breakout module allows the RAK4630 stamp module's pinout to be transferred by the board-to-board WisConnector, Figure 5 shows the definition of this connector.
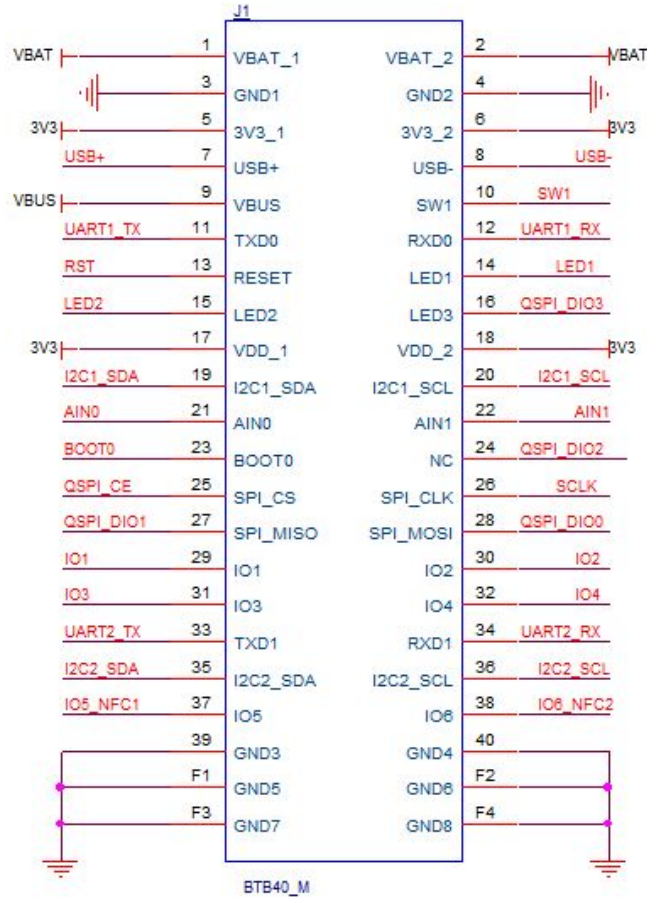
Figure 5: WisConnector pin defintion

WisConnector Pin Order

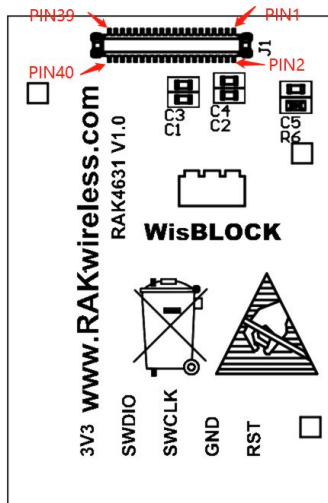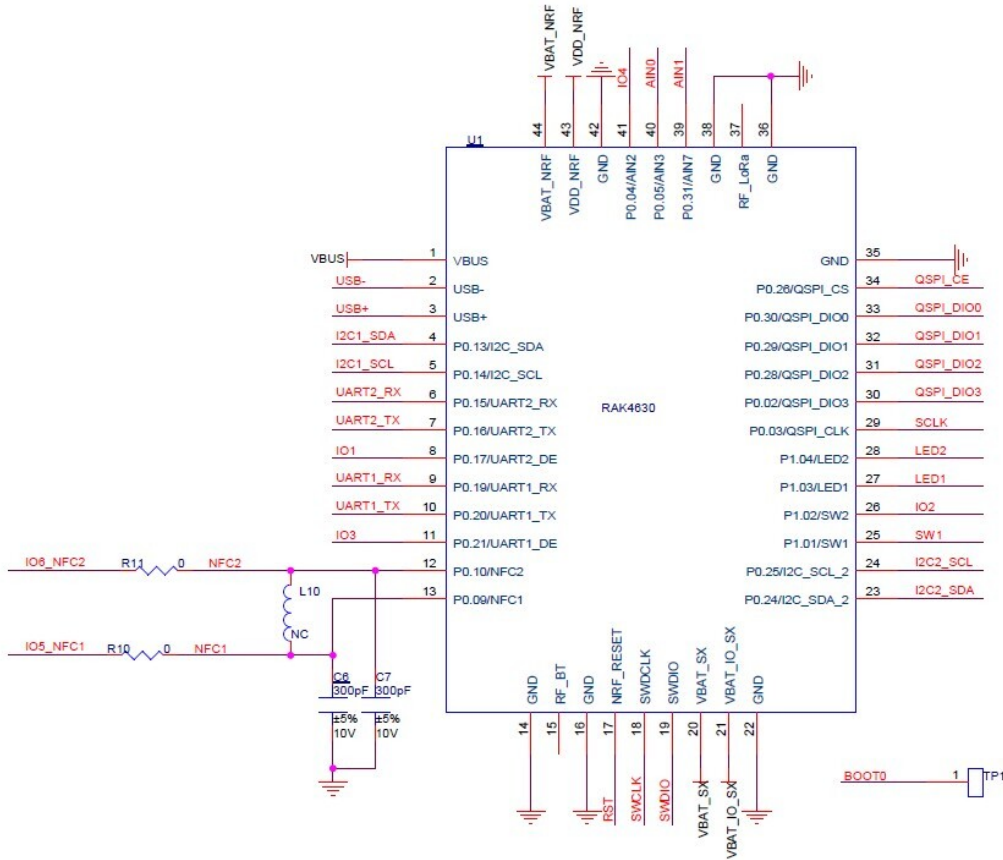Figure 6 shows the pin order of the WisConnector, which is located in the bottom layer of the module.

Figure 6: WisConnector pin order

Core Module

The breakout module itself has a RAK4630 at its core, Figure 7 shows the core module pin and connection information, by default, the NFC function is disabled for conserve the low power characteristic.
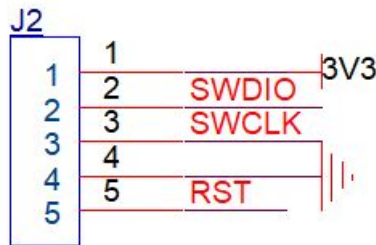
Figure 7: Core module pin definition

SWD Interface

The breakout module exposes a SWD debug interface, Figure 8 shows the connection information. Additionally, the RST pin is used for resetting the core module RAK4630.

Figure 8: SWD interface

Power up automatic reset

The breakout module has a power-up automatic reset circuit, Figure 9 shows the automatic reset mechanism, this module also can be reset though RAK5005-O reset pin
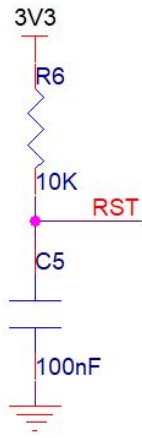
Figure 9: Power up automatic reset