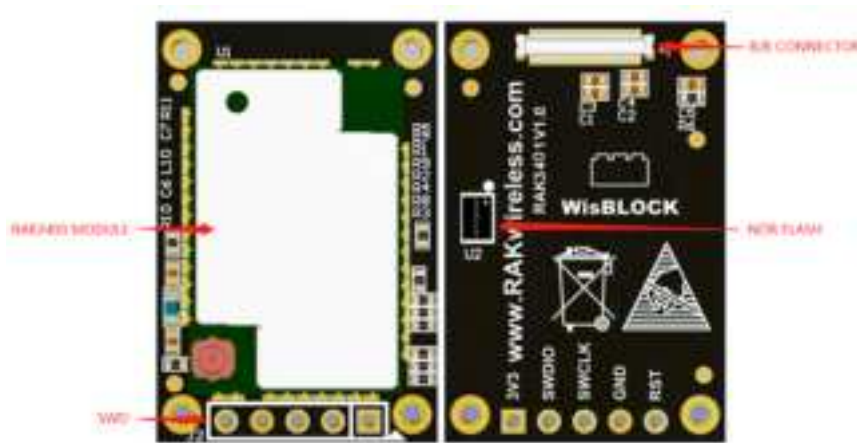


# RAK3401 Breakout Module

## WisCore-LoRa Series

Version V1.0 | December 2020



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# 1 Introduction

This document explains the design of the RAK3401 module and describes a hardware interface that is important to understand in order to build customized applications.

This document helps customers quickly to understand the interface specifications, electrical and mechanical details, as well as other relevant information of RAK3401 module.

## 2 Overview

### 2.1 General description

The RAK3401 module is part of the WisBlock series, specifically, it's one of the modules that belong to the WisCore category.

The RAK3401 is a breakout module designed to work with RAK5005 baseboard. Essentially, it is a RAK3400 stamp module with an expansion PCB and connectors compatible with the RAK5005 baseboard. It allows an easy way to access to the pins of the RAK3400 module in order to simplify development and testing processes.

The module itself comprises a RAK3400 as its main component. The RAK3400 is a combination of a nRF52840 MCU, it features ultra-low power consumption of 2.0uA during sleep mode, and the BLE interface with output power up to 4dBm.

The RF communication characteristic of the module (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.).

### 2.2 Main Features

- I/O ports: UART/I2C/GPIO/USB/SPI (optional NFC interface)
- Temperature range: -40°C to +85°C
- Supply voltage: 2.0 ~ 3.6V
- Ultra-Low Power Consumption 2.0uA in sleep mode
- BLE5.0 (Tx power -20 to +4dBm in 4dB steps)
- Serial Wire Debug (SWD) interface
- Module size: 20 x 30mm

## 2.3 Board Realistic View

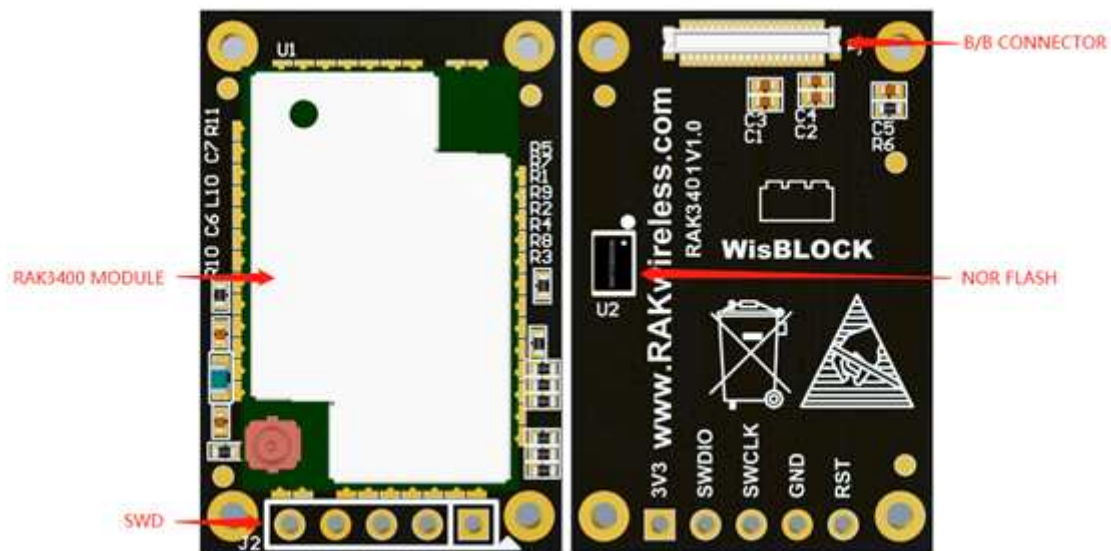


Figure 1: RAK3401's top layer (left), and bottom layer (right).

## 2.4 RAK3401 Mounting Sketch

The RAK3401 module is designed to work with the RAK5505 baseboard. Figure 2 shows how a RAK3401 module should be mounted on top of the RAK5505.

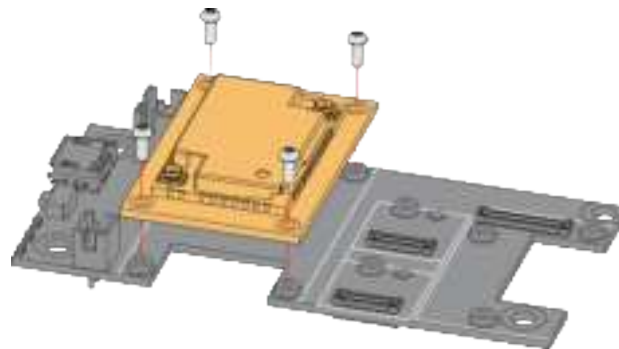


Figure 2: RAK3401 mounting sketch.

## 2.5 Schematic Diagram

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

### 2.5.1 WisConnector

The breakout module allows the RAK3400 stamp module’s pinout to be transferred to board-to-board connector, Figure 3 shows the definition of this connector.

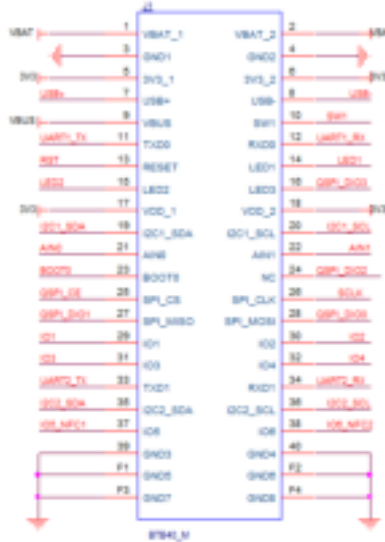


Figure 3: WisConnector pin definition.

### 2.5.2 WisConnector pin order

Figure 4 shows the pin order of the WisConnector, which is located in the bottom layer of the module.

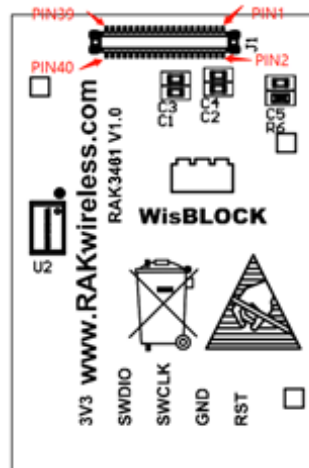


Figure 4: WisConnector pin order.

### 2.5.3 Core module

The breakout module itself has a RAK3400 at its core, Figure 5 shows the core module pin and connection information, by default, the NFC function is disabled for conserve the low power characteristic.

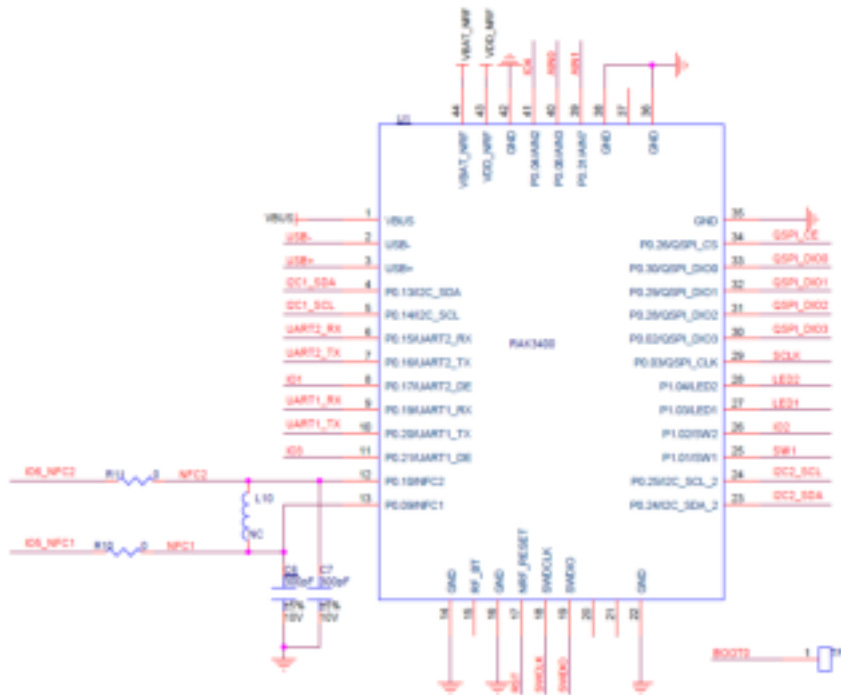


Figure 5: Cora module pin definition.

### 2.5.4 SWD interface

The breakout module exposes a SWD debug interface, Figure 6 shows the connection information. Additionally, the RST pin is used for resetting the core module RAK3400.

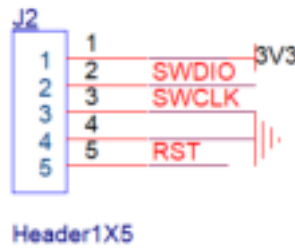


Figure 6: SWD interface.

### 2.5.5 Power up automatic reset

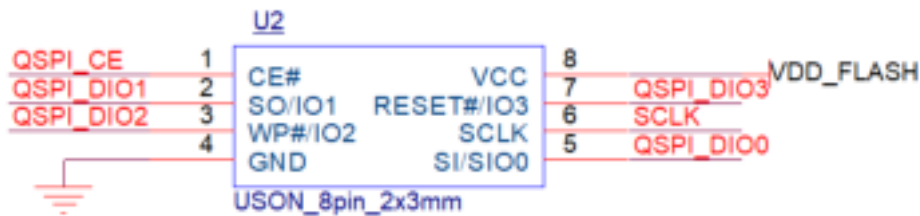
The breakout module has a power-up automatic reset circuit, Figure 7 shows the automatic reset mechanism, this module also can be reset though RAK5005 reset pin.



**Figure 7: Power up automatic reset**

### 2.5.6 Flash Memory

The RAK3400 module comprises a flash memory controlled by the SPI interface. The memory size is 8 MB.



**Figure 8: Flash Memory.**

#### Power Consumption

Table shows the power consumption characteristic of the RAK3401 module.

**Table 1: Power Consumption**

Item	Power Consumption	Condition
Tx mode BT@4dBm	9mA	BT Tx mode
Rx mode BT@2Mbps	11.5mA	BT Rx mode
Sleep mode	2.0uA	BT sleep

### 2.6 Absolute Maximum Ratings

Table shows the absolute maximum ratings of RAK3400

**Table 2: Absolute Maximum Ratings**

Symbol	Description	Min.	Nom.	Max.	Unit
--------	-------------	------	------	------	------

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
ESD HBM	Human Body Model	-	-	2000	V
ESD CDM	Charged Device Model	-	-	500	V

## 2.7 Recommended operating conditions

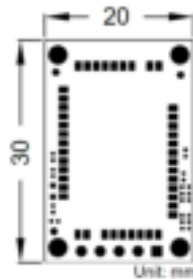
Table shows the recommended operating conditions of RAK3400.

**Table 3: Recommended operating conditions**

Symbol	Description	Min.	Nom.	Max.	Unit
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

## 3 Mechanical Dimensions

Figure 9 shows the physical dimension of the RAK3401 module.



**Figure 9: Mechanical Dimensions**



**Statement**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

**FCC Caution:**

Changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

**FCC Statement:**

"This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help."

**IC statement:**

This device complies with Industry Canada licence-exempt RSS standard(s).

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

:

This equipment complies with Industry Canada radiation exposure limits set forth for an uncontrolled environment.

Cet équipement est conforme à l'exposition aux rayonnements Industry Canada limites établies pour un environnement non contrôlé.

The proposed FCC IC label format is to be placed on the module. If it is not visible when the module is installed into the system, "Contains FCC ID: 2AF6B-RAK3400, Contains IC: 25908-RAK3400" shall be placed on the outside of final host system.

**Labelling**

— This radio transmitter [25908-RAK3400] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

— Le présent émetteur radio [25908-RAK3400] a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés cidessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

**Antenna info**

Antenna type: IPEX Antenna  
Manufacturer: Shenzhen RAKwireless Technology Co., Ltd.  
Model name: 501-0132-X1  
Antenna gain: 1.68dBi