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RAKwireless RAK3400 Bluetooth LoRa Module User Guide

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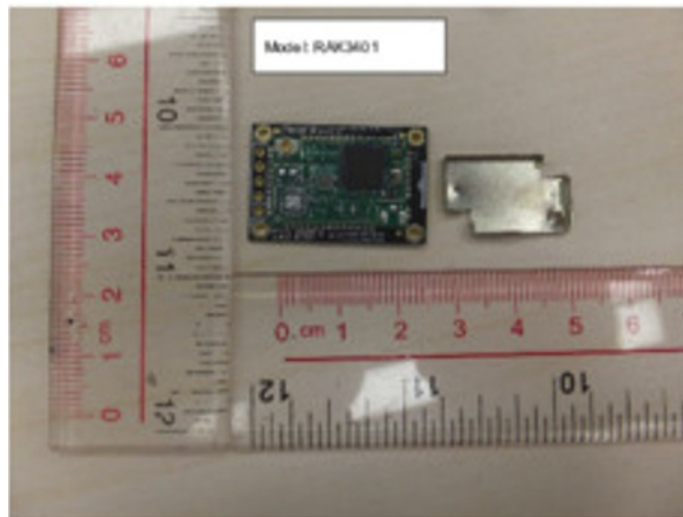
Contents

Introduction

This document defines RAK3400 module and describes hardware interface which are connected with customers applications.
This document helps customers quickly understand the interface specifications, electrical and mechanical details,

as well as other related information of RAK3400

Overview

General description
RAK3400 is an BLE5.0 wireless communication module, it includes an nRF52840, Ultra-low power consumption of 2.0uA in sleep mode, and BLE output power up to 4dBm.
The module supports BLE 5.0. Its RF communication capabilities make it suitable for a variety of applications in the IoT field

Main Features

- **Compact Form Factor:** 15 x 23 x 3 mm
- 44 Pin Stamp Pad for PCB SMT mounting
- I/O ports: UART/12C/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
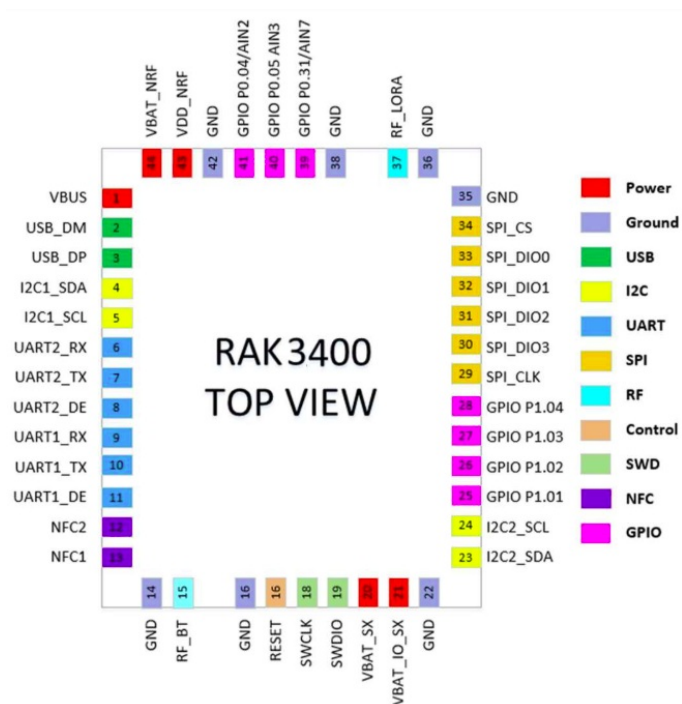- BLE5.0 (Tx power -20 to +4 dBm in 4dB steps)

Block Diagram

The following figure shows a block diagram of RAK3400.
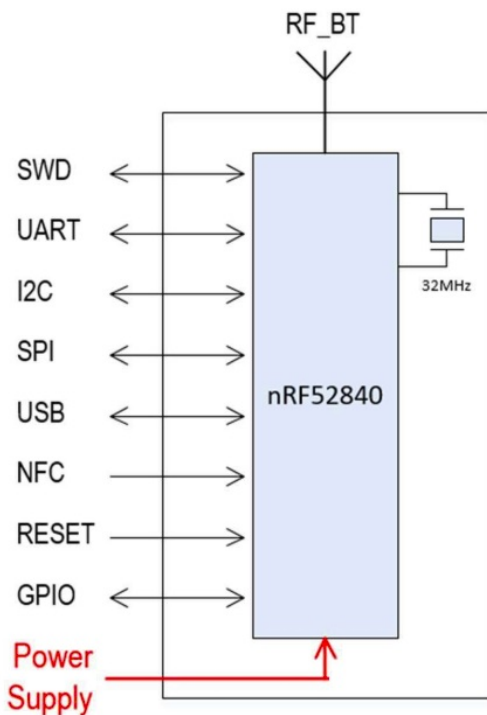
Pin Assignment

The following figure shows the pin assignment of RAK3400 module

NOTES

- For single 3.3V power supply, connect VBAT_NRF, VDD_NRF, together with 3.3V power
- For 3.6V li-SOCL2 battery or 4.2V li-MnO2 battery, connect VBAT_NRF with battery output, VDD_NRF can use to indicate IO voltage level. Please don't power any chip with VDD_NRF.
- GND pins should be connected to ground in the design.
- VBAT_SX, VBAT_SX_IO is reserved, they are not connected to any chips in RAK3400 module.

Pin Description

The following tables show the pin definition and description of RAK3400.
Table 2: Definition of I/O Parameters

Type	Description
PI	Power Input
PO	Power Output
DI	Digital Input
DO	Digital Output
10	Bidirectional
AI	Analog Input
AO	Analog Output

Table 3: Pin Description

Power Supply

Pin Name	Pin No.	Type	Description	Comment
VDD_NRF	43	PI	Power supply	
VBAT_NRF	44	Pi	High Power supply	
GND	14,16, 22,35, 36, 38, 42	Ground		

			I2C Interface	
Pin Name	Pin No.	Type	Description	Comment
I2C1 SDA	4	10	12C serial data	P0.13
12C1_SCL	5	OD	12C serial clock	P0.14
I2C2_SDA	23	10	12C serial data	P0.24
12C2_SCL	24	OD	12C serial clock	P0.25

			USB Interface	
Pin Name	Pin No.	Type	Description	Comment
VBUS	1	PI	USB power	5V input for 3.3V regulator
USB DP	3	10	USB differential clatal+)	
USB DM	2	10	USB differential data(-)	

			UART Interface	
Pin Name	Pin No.	Type	Description	Comment
UART1_TX	10	DO	UART1 transmit	P0.20
UARTI_RX	9	DI	UART1 receive	P0.19
UARTI_DE	11	DI	UART1 detect	P0.21
UART2 TX	7	DO	UART2 transmit	P0.16
UART2_RX	6	DI	UART2 receive	P0.15
uART2_DE	8	DI	UART2 detect	P0.17

			Quad SPI Interface	
Pin Name	Pin No.	Type	Description	Comment
SPI_CLIC	29	DO	SPI clock	P0.03
SPI CS	34	DO	SPI chip select	P0.26
SPI _D100	33	10	SPI data input/output 0	P0.30
SPI _D101	32	10	SPI data input/output 1	P0.29
SPI D102	31	10	SPI data input/output 2	P0.28
SPI 0103	30	10	SP' data input/output 3	P0.02

Pin Name	Pin No.	Type	Description	Comment	
SWDIO	19	Debug	SWD I/O for debug and programming		
SWCLK	18	Debug	SWD clock input for debug and programming		
RESET		M			
Pin Name	Pin No.	Type	Description	Comment	
RESET	17	DI	Reset the module		
NFC Interface					
Pin Name	Pin No.	Type	Description	Comment	
NFC1	13	DI	NFC input 1	P0.09	
NFC2	12	DI	NFC input 2	P0.10	
Antenna Interface					
Pin Name	Pin No.	Type	Description	Comment	
RF_BT	15	10	8luetooth antenna interface	500 Impedancelf unused, keep this pin open	
GPIO Interface					
Pin Name	Pin No.	Type	Description	Comment	
GPIO P1.01	25	10	General-purpose input/output		
GPIO P1.02	26	10	General-purpose input/output		
GPIO P1.03	27	10	General-purpose input/output		
GPIO P1.04	28	10	General-purpose input/output		
ADC Interface		=—			
Pin Name	Pin No.	Type	Description	Comment	
GPIO P0.31 / AIN7	39	10 / AI	General-purpose 10/ General purpose ADC interface		
GPIO P0.05 / AIN3	40	10 / AI	General-purpose 10 / General purpose ADC interface		

GPIO P0.04 / A1N7	41	10/A1	General-purpose 1 0 / General purpose ADC interface		

Power Consumption

The following table show the power consumption.
Table 4: 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

Absolute Maximum Ratings

The following table show the absolute maximum ratings of RAK3400
Table 5: 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

Recommended operating conditions
The following table shows the recommended operating conditions of RAK3400.
Table 6: 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

Mechanical Dimensions

This chapter describes the mechanical dimensions of the module. All dimensions are   measured in millimeter (mm), and the dimensions tolerances are ±0.05mm unless otherwise specified.

Top and Side Dimensions

The following figure shows the mechanical dimension of the RAK3400 module.

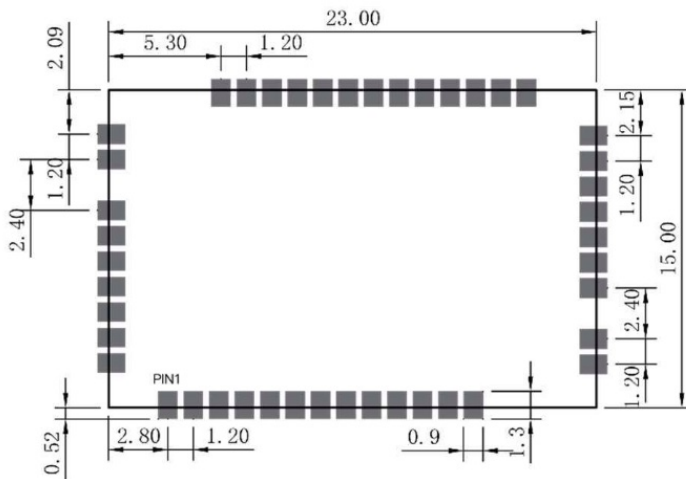**Figure 3:** Top and Side Dimensions
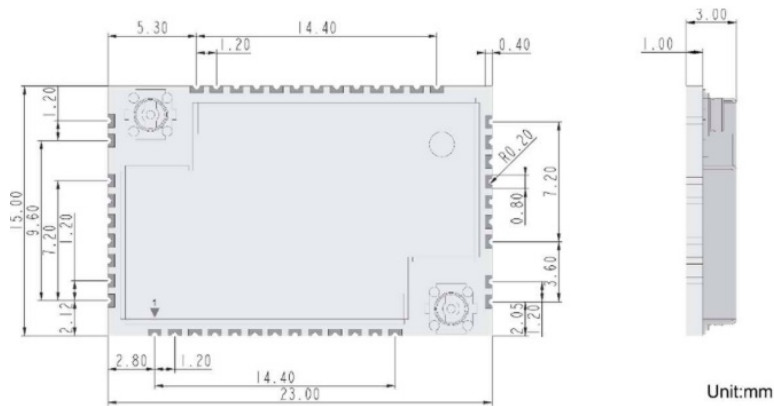
Unit:mm

Recommended Footprint

The following figure shows the recommended footprint of the RAK3400 module.
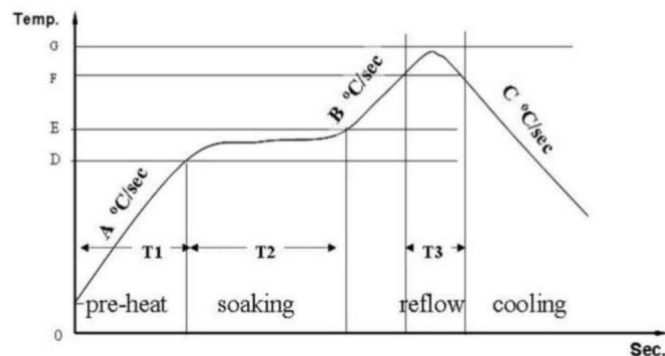
Figure 4: Recommended Footprint (Unit: mm)

Recommended Reflow Profile

The following figure shows the Recommended Reflow Soldering Thermal Profile of RAK3400.

Figure 5: Recommended Reflow Soldering Thermal Profile

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 RF Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and any part of your body

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.

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and any part of your body.

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

Antenna info
Antenna type: IPEX Antenna
Manufacturer: Shenzhen RAKwireless Technology Co., Ltd.
Model name: 501-0132-X1
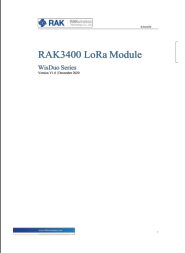**Antenna gain**: 1.68dBi
Antenna type: PIFA Antenna
Manufacturer: HL GLOBA HL L
Model name: SA06LWEG01R Model A
Antenna gain: 3.4dBi

Documents / Resources

RAK3400 LoRa Module WisDuo Series Version 1.4, December 2020	**RAKwireless RAK3400 Bluetooth LoRa Module** [pdf] User Guide RAK3400, RAK3400 Bluetooth LoRa Module, Bluetooth LoRa Module, LoRa Module, Module

References

- **User Manual**