

RAK1920 WisBlock Sensor Adapter Module Datasheet

Overview

Description

The RAK1920 module is part of the WisBlock IO series. This module was designed to be part of a production-ready IoT solution in a modular way and must be combined with a WisBlock Core and a Base module.

The RAK1920 module is a sensor extension module, it supports several defacto-standard interfaces in the IoT market and allows customers to integrate sensors manufactured by Mikroe, SparkFun, SeeedStudio, and others. For example, the RAK1920 supports the Click Boards™ series of modules provided by Mikroe, Qwiic Connect™ sensor interface designed by SparkFun, and it supports all kinds of I2C module digital I/O, UART and ADC sensors with a Grove™ interface.

Features

- Interface to all Click Boards of Mikroe
- Interface to all Qwiic sensors of SparkFun
- Interface to all I2C and Digital I/O sensors of Grove
- Interface to UART and ADC sensors options of Grove
- Reserved I2C interface
- 3.3V and 5V sensors options

Specifications

Overview

The RAK1920 module supports Mikroe's Click Boards, Sparkfun's Qwiic Connect, and Seeed's Grove sensors. Figure 1 shows the sensors' connector available in the RAK1920.

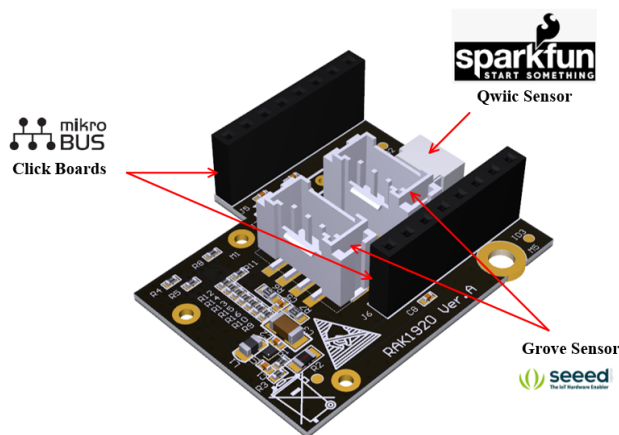


Figure 1: RAK1920 sensor extension interface

Mounting

Figure 2 shows how the RAK1920 module is integrated with the RAK5005-O baseboard. The mounting sketch is shown.

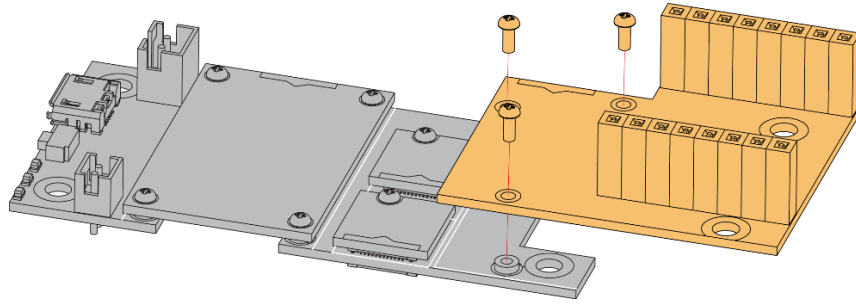


Figure 2: RAK1920 Mounting Sketch

Hardware

The hardware specification is categorized into four parts. It discusses the interfacing, its corresponding functions and the diagram of the module as well. It also covers the electrical and mechanical parameters that include the tabular data of the functionalities and standard values of the RAK1920 WisBlock Sensor Adapter Module.

Interfaces

Mikroe Click Boards Interfaces

The RAK1920 supports all the Click boards modules manufactured by Mikroe through the mikroBUS™ interface, the figure below shows the pin out diagram of the mikroBUS.

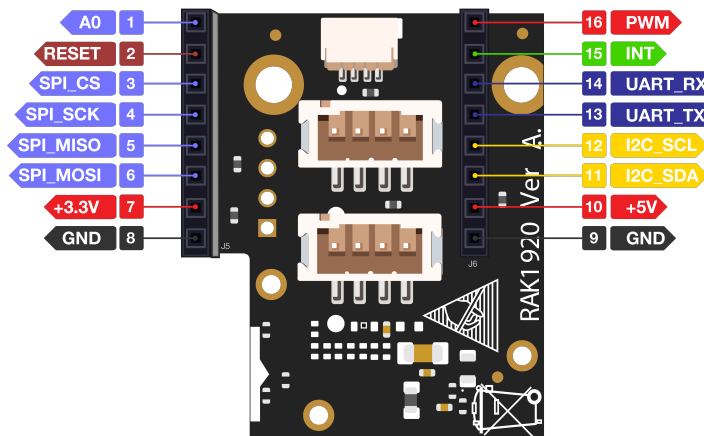


Figure 3: Mikroe's mikroBUS® interface

Pin No.	Label	Pin Definition
1	A0	Analog
2	RESET	Reset
3	SPI_CS	SPI Chip Select
4	SPI_SCK	SPI Clock
5	SPI_MISO	SPI Master Input Slave Output
6	SPI_MOSI	SPI Master Output Slave Input
7	+3.3V	VCC 3.3V Power
8	GND	Reference Ground

Pin No.	Label	Pin Definition
9	GND	Reference Ground
10	+5V	VCC 5.5V Power
11	I2C_SDA	I2C Data
12	I2C_SCL	I2C Clock
13	UART_TX	UART Transmit
14	UART_RX	UART Receive
15	INT	Hardware Interrupt
16	PWM	PWM Input

Grove Sensor Interfaces

The RAK1920 module supports the Grove I2C and digital I/O sensors. Figure below shows the pin number and definition of the Grove sensor. By default, VCC is connected to the 3.3V line of the IO connector.

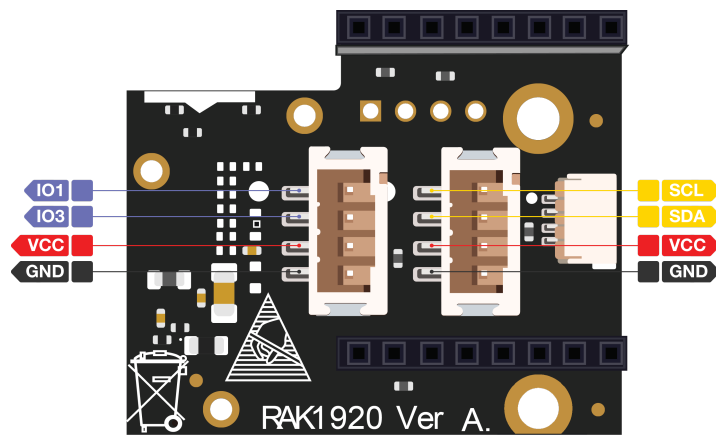


Figure 4: Grove Sensor interfaces

By default, the I2C is enabled in the RAK1920 module, but if it is required, the RAK1920 module can also support sensors with Grove UART interface and ADC sensors. To enable the UART interface, a resistance connection needs to be added by the customer. When using the Grove UART interface sensor module, replace R9 to R10, R11 to R12, when use Grove ADC interface (not ADC to I2C module) sensor module, replace R13 to R14, change R15 to R16. The figure below shows replace connection resistance location.

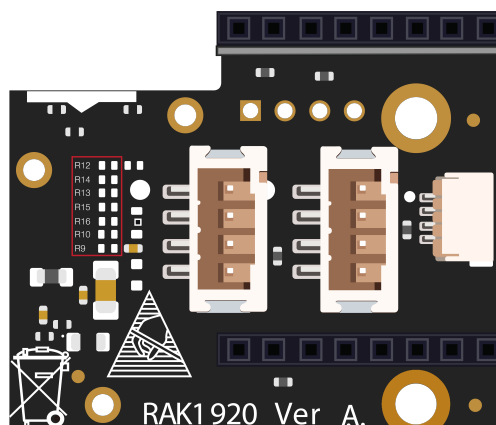


Figure 5: Replace connection resistance location

The figure below shows Grove sensor cables:



Figure 6: Grove Sensor cables

Table below shows Grove cable color and function definition.

Pin	Color	Function
1	Yellow	Digital IO1 /ADC CH1 /UART RX /I2C Clock
2	White	Digital IO2 /ADC CH2 /UART TX /I2C Data
3	Red	VCC
4	Black	GND

Qwiic Sensor Interface

The RAK1920 module supports sensors manufactured by SparkFun through the Qwiic Connet interface. Figure below shows the Qwiic Connect interface.

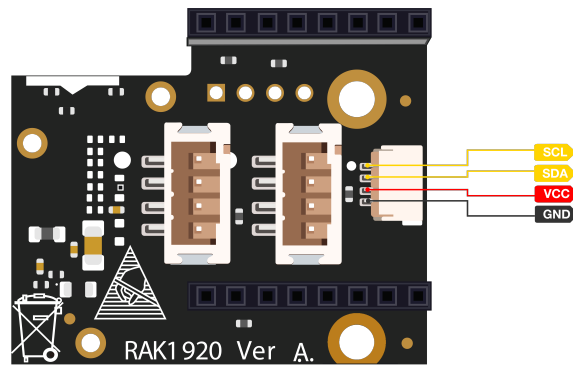


Figure 7: Qwiic Connect® interface

The figure below shows a Qwiic Connect cable:



Figure 8: Qwiic Cable

The table below shows the Qwiic Connect cable color and function definition:

Pin	Color	Function
1	Yellow	I2C Clock
2	Blue	I2C Data
3	Red	3.3V
4	Black	GND

Reserved I2C Interface

The RAK1920 module has a reserved I2C interface, it can be used for generic I2C interface sensors. Note, this I2C interface only supports 3.3V type of sensors. Figure below shows the reversed I2C interface.

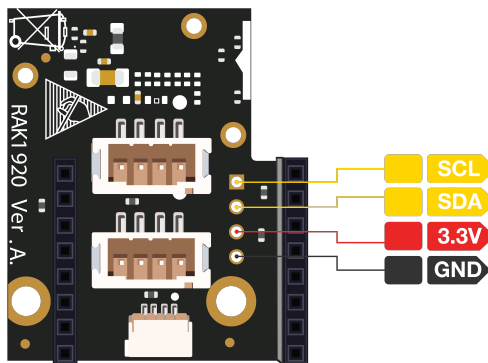


Figure 9: Reserved I2C Interface

Electrical Characteristics

Absolute Maximum Ratings

Table below shows the absolute maximum ratings of the RAK1920 module.

Symbol	Description	Min.	Nom.	Max.	Unit
VBAT	Power supply for the module	-0.5		4.2	V
Iout	Boost converter output current			800	mA

Recommended Operating Conditions

Table below shows the recommended operating conditions of the RAK1920 module.

Symbol	Description	Min.	Nom.	Max.	Unit
VBAT	Power supply for the module	2.6		4.2	V
3V3	3.3V power supply		3.3		V
5V	5.5V power supply		5.0		V

Mechanical Characteristics

Board Dimensions

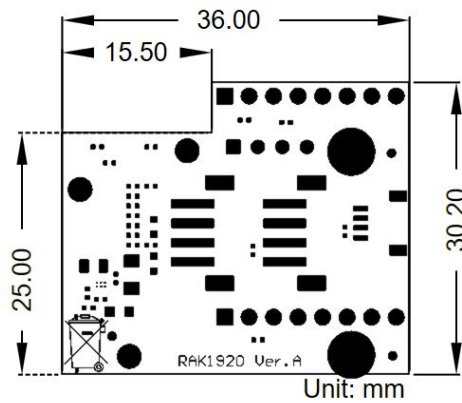


Figure 10: Mechanical Dimensions

WisConnector PCB Layout

REV	LOCATIONS	DESCRIPTION	DATE	REVISOR	APPD

Electrical
 Current Rating: 0.3A AC(rms)/DC
 Voltage Rating: 60V AC(rms)/DC
 Contact Resistance: 90 mΩ Max
 Insulation Resistance: 100 MΩ MIN
 Withstanding Voltage: 150V AC r.m.s
 Temperature Range—Operating: -55°C~+85°C
Material and Plating
 Housing: LCP(UL 94V-0)
 Contact Pin: Phosphor Bronze
 Plating: Gold Plated

Circuits (n)	Part No.	Dimensions(in/mm)		
		A	B	C
24	FBB04004-M24S1XX3K6M	.260(6.60)	.236(6.00)	.173(4.40)
30	FBB04004-M30S1XX3K6M	.307(7.80)	.283(7.20)	.220(5.60)
34	FBB04004-M34S1XX3K6M	.339(8.60)	.315(8.00)	.252(6.40)
40	FBB04004-M40S1XX3K6M	.386(9.80)	.362(9.20)	.299(7.60)

Ordering Information

FBB 040 04 — M XX S 1 XX 3 K6 M

1 2 3 4 5 6 7 8 9 10 11

1 Category FBB—Board To Board	2 Series Number 040—Pitch0.4mm	3 Distinction No. 04	4 Type M—Male	5 Circuits XX	6 Entry Angle S—180° Vertical
7 Plating 1—Gold Plated	8 Thickness of Plating 00—Gold Flash 04—4μ"	9 Material—Resin 3—LCP	10 Color—Resin K6—Black	11 Packaging M—Reel	

THIRD ANGLE PROJECTION	GENERAL TOLERANCES (UNLESS SPECIFIED)	APPROVE BY FRANK	DATE 26/SEP/13	PART NO. FBB04004-MXXS1XX3K6M	ITEM NO. FBB04004-M	
DESIGN UNITS Inch (metric)	X.±.012(0.30) X.±5'	CHECKED BY CHERRY	DATE 26/SEP/13	TITLE Board to Board Pitch 0.4mm 180° Vertical (SMT)	REV 0 SHEET NO. 1/1	
SCALE 5:1	X.XX±.006(0.15) .XX±1'	DRAWN BY JACOB	DATE 26/SEP/13	THIS DRAWING CONTAINS INFORMATION THAT IS PROPRIETARY TO TXGA INDUSTRIAL ELECTRONICS(S.Z)CO.,LTD AND SHOULD NOT BE USED WITHOUT WRITTEN PERMISSION		
SIZE A4	X.XXX±.004(0.10) .XXX±0.5'					

Figure 11: WisConnector PCB footprint and recommendations

Schematic Diagram

The following sections will describe the schematic of the RAK1920 module, which includes

- Power Supply
- IO Connector

Power Supply

The RAK1920 module supports 3.3V and 5V options, by default, the 3.3V is used as the power source of sensors. The module integrates a boost converter from the VBAT to 5V. The VBAT is the battery output voltage, usually between 3.7V and 4.2V. The EN pin enables this boost converter and is controlled by the WisBlock Core module of the overall solution.

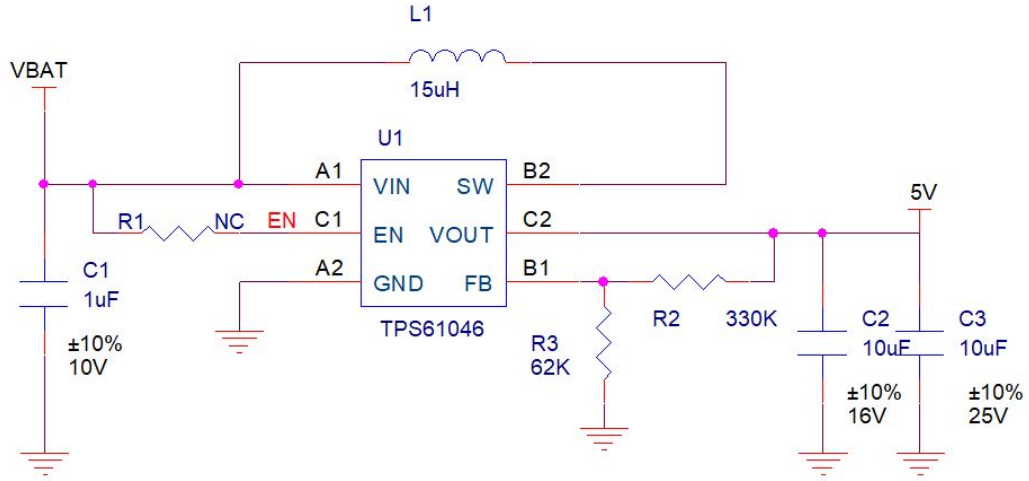


Figure 12: Power supply

IO Connector

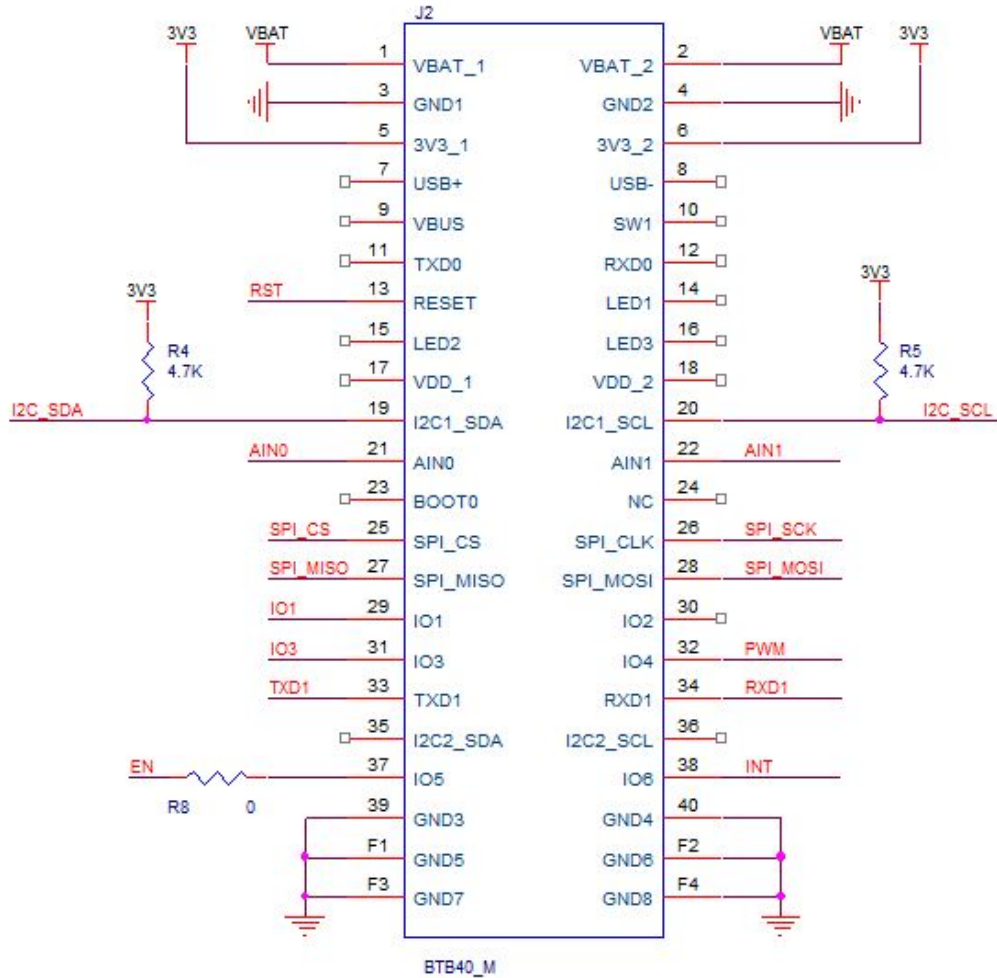


Figure 13: IO Connector

The RAK1920 module uses only a subset of all the pins available in the IO connector. These are shown in the table below:

Name	Description	Comment
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Name	Description	Comment
VBAT	battery output voltage	Maximum: 4.2 Volts
3V3	3.3 V	Default, sensor power supply
TXD1/RXD1	UART interface	Connected only to the Click Boards connector.
CS/SCK/MOSI/MISO	SPI interface	Connected only to the Click Boards
SDA/SCL	I2C interface	All I2C sensors
AIN0/AIN1	ADC input interfaces	Grove or click Boards
INT	Hardware Interrupt	Connected only to the Click Boards connector.
RST	Reset	Connected only to the Click Boards connector
PWM	PWM input	Connected only to the Click Boards connector.
EN	Boost Converter Enable	IO5
IO1/IO3	General I/O	Connected to Grove digital I/O sensors' connectors.

IO Connector Pin Order

The figure below shows the IO connector's pin order. The connector is located in the bottom layer of the RAK1920 module.

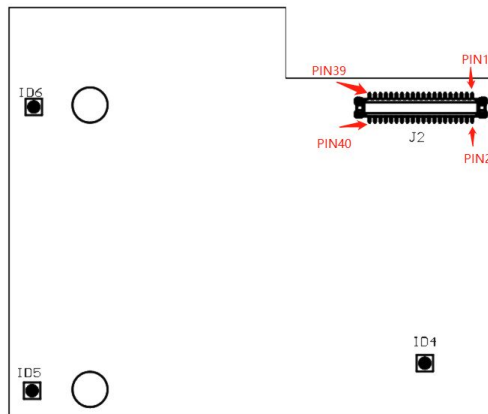


Figure 14: IO connector's pin order