RAK19010 Quick Start Guide

This guide introduces the RAK19010 WisBlock Base Board with Power Slot and how to use it.

Prerequisite

What Do You Need?

Before going through each and every step on using the WisBlock Base Board with Power Slot, make sure to prepare the necessary items listed below:

Hardware

- RAK19010 WisBlock Base Board with Power Slot
- Your choice of WisBlock Power Slot Modules
- Your choice of WisBlock Core
- Your choice of WisBlock Modules .
  It is highly recommended to also check the dedicated Quick Start Guide that you can follow on various WisBlock Modules. Each Quick Start Guide of these modules contains detailed steps on how to open the example codes and upload them to the WisBlock Core.
- Li-Ion/LiPo battery (optional)
- Solar charger (optional)

Software

Based on the choice of the WisBlock Core, select a Development Environment:

Programming via Arduino IDE

- RAKwireless BSP support for Arduino
  In Arduino IDE, once you installed the BSP, the examples for WisBlock Core will be automatically included on the list of examples.

Programming via PlatformIO IDE:

- RAKwireless WisBlock modules in PlatformIO

Product Configuration

Overview

To give you a better understanding of how the WisBlock Base works, the block diagram and power supply diagram of RAK19010 are provided in this section.

Block Diagram

The block diagram shown in **Figure 1** shows the internal architecture and external interfaces of the RAK19010 WisBlock Base Board with Power Slot.

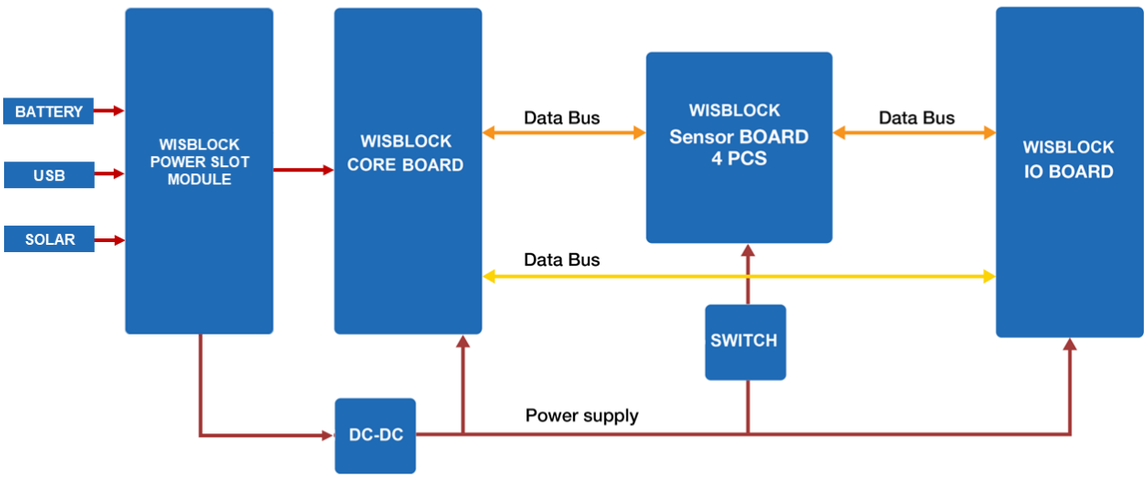

Figure 1: RAK19010 WisBlock Base Board with Power Slot block diagram

The WisBlock Power Slot module provides external interfaces to the whole board. RAK19010 will not work without the Power Slot module attached to it.

The MCU in the WisBlock Core module offers the I2C, UART, and SPI data buses to the sensor modules. Through these buses, the MCU can control and retrieve data from the sensors. Some types of MCU have fewer IO pins. In such cases, not all pins of the data bus are connected. For example, only I2C and UART are connected.

Some MCU IO pins have an alternate function. In this case, you have the option to modify the IO via software or rework the hardware to redefine the function of the IO. Refer to the datasheet of WisBlock Core to get all the details.

Power Supply Diagram

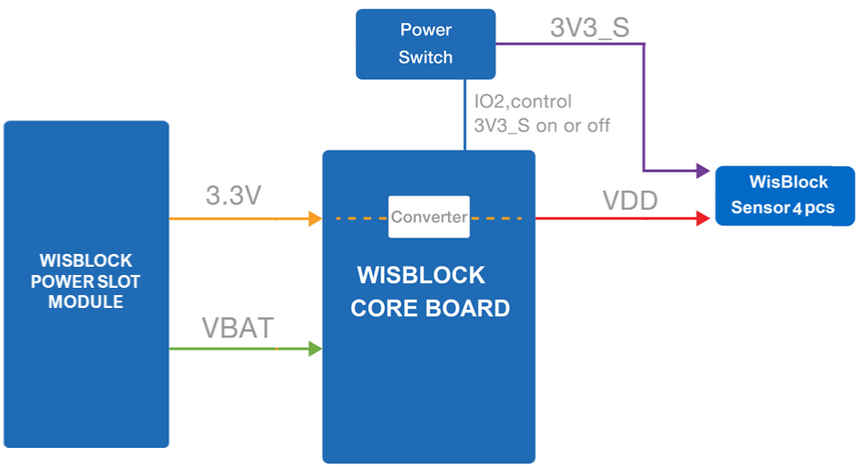

Figure 2: RAK19010 power supply block diagram

The RAK19010 WisBlock Base board with Power Slot does not have a power regulator or other power-related components. It gets a 3.3 V voltage supply and battery voltage supply lines from the Power Slot module attached to it.

RAK19010 supports 3V3_S configurable supply lines to WisBlock modules like other WisBlock Base boards. This is ideal for low-power applications. 3V3_S can be controlled by the MCU to disconnect the power sensors during idle periods to save power. 3V3_S is controlled by the IO2 pin on the WisBlock Core board.

- Set **IO2=1**, 3V3_S is on.
- Set **IO2=0**, 3V3_S is off.

Hardware Setup

RAK19010 WisBlock Base Board with Power Slot Installation Guide

RAK19010 WisBlock Base Board with Power Slot is the main board that allows you to attach a WisBlock Core, power slot module, sensors, and IO modules through the standardized expansion connectors. These connectors provide a data bus interconnection between the modules attached to the RAK19010 Base Board.

This guide shows the details related to the installation of modules into the RAK19010 board. The following section discusses the general concepts to manipulate the WisBlock Connector in any WisBlock Module. The installation and removal details of each type of WisBlock module: Core and Sensor are explained.

Attaching a WisBlock Connector

The WisBlock Connector is the interface between the RAK19010 board and the WisBlock Core, Sensor, and IO modules. Before connecting these modules, read the following instructions:

> 📝 **NOTE:**
>
> This guide uses two arrows. Refer to **Figure 3** for its representation.

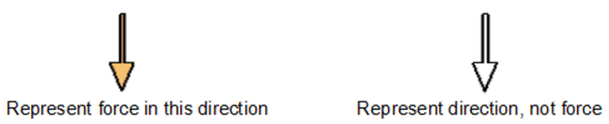

Figure 3: Notation within the guide

1. Align the connectors. Keep the header parallel and place it lightly in the corresponding lap joint of the socket.

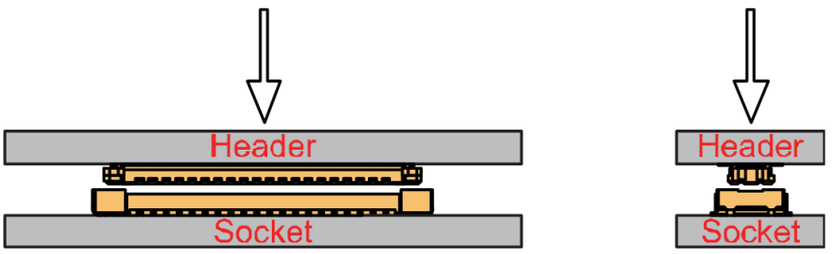

Figure 4: Alignment of WisBlock Connector

2. Fit the connector. Tilt one end of the connector (header) less than 20 degrees, while do not apply force during this process, gently place the other end in parallel.

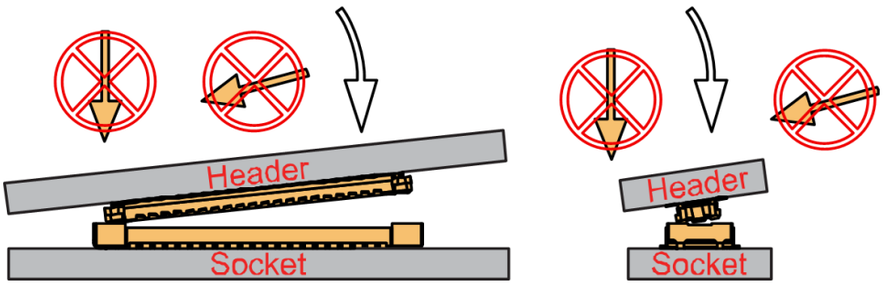

Figure 5: Fit the WisBlock Connector's header inside of the socket

3. After the above alignment steps, the header and socket are matched but still not buckled.

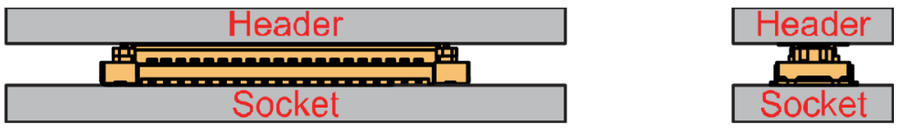

Figure 6: WisBlock Connector's header matched inside of the socket

4. Apply forces evenly by pressing in parallel, then there will be a sound confirming the completion of the buckling.

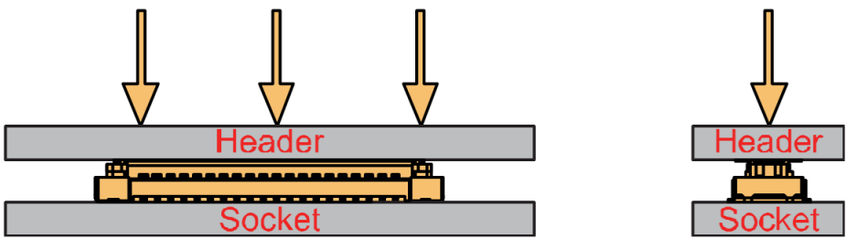

Figure 7: Apply forces to buckle the header to the socket

5. In the process of buckling and applying force, avoid the application of uneven force on both sides.

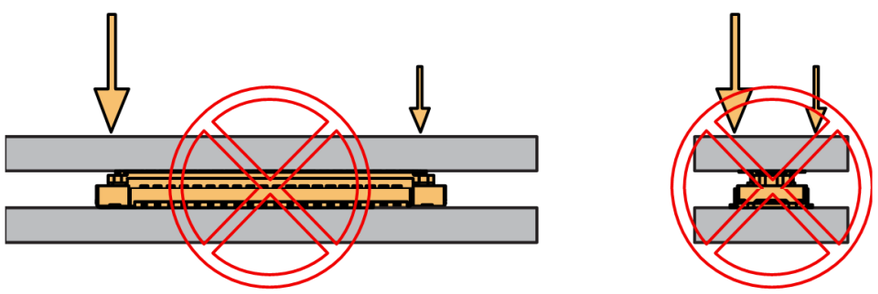

Figure 8: Avoid applying uneven forces

6. When the buckling process is completed, check that the header and socket are kept in parallel.

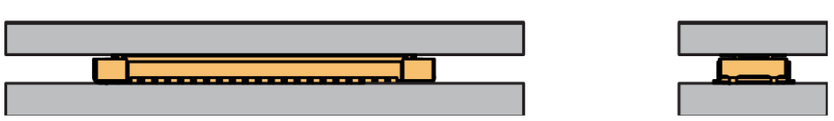

Figure 9: Correct way to buckle the WisBlock Connector's header to the socket

7. If after buckling, the header and socket are not in a parallel state (not fully assembled in one place), then press the even force on both sides of the long side to complete the correct buckling.

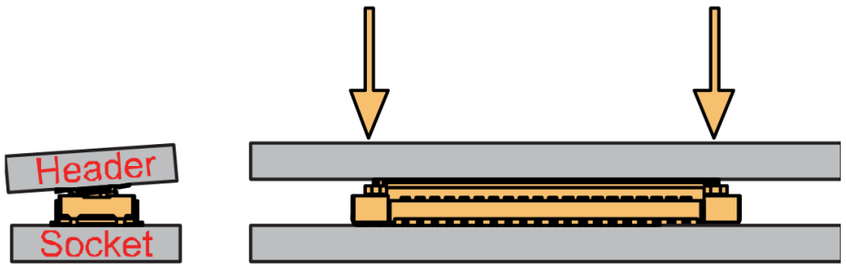

Figure 10: WisBlock Connector's header is not parallel to the socket

8. When the aforementioned steps are not completed yet, do not apply force to buckle. Otherwise, there will be a risk to damage the connector. When the connector cannot be smoothly buckled down, repeat the alignment step.

Detaching a WisBlock Connector

1. To disconnect the header from the socket, pull out in parallel with even forces.

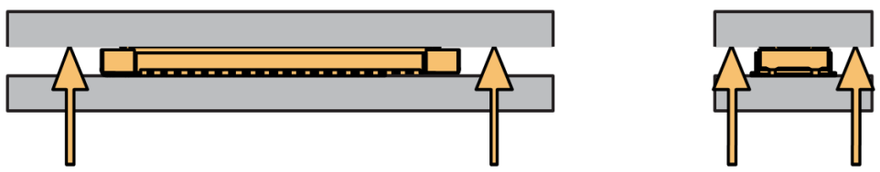

Figure 11: Correct way: Applying even forces to detach the header from the socket

2. Avoid pulling out the header asymmetrically in the long-side direction.

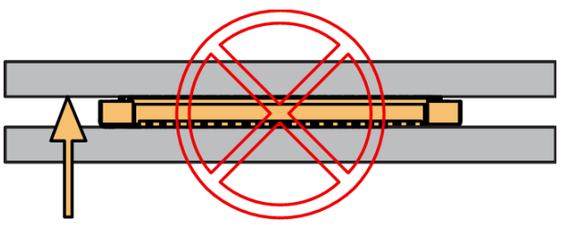

Figure 12: Wrong way: Applying uneven forces to detach the header from the socket

3. The short-side of the connector can be pulled out asymmetrically, but apply the force vertically and avoid rotating the header.

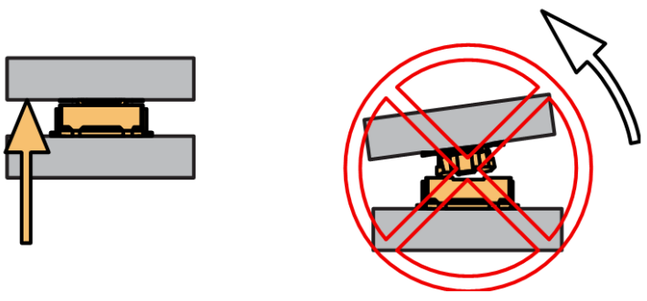

Figure 13: Wrong way: Do not rotate the header

4. Avoid applying forces in a single corner.

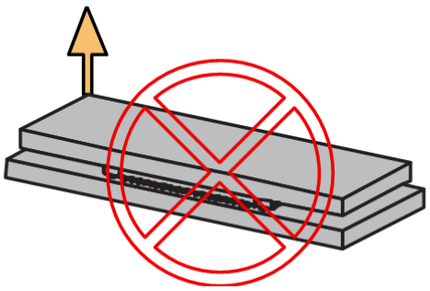

Figure 14: Wrong way: Do not apply force in a single corner of the header

Assembling a WisBlock Module

WisBlock Power Slot

A WisBlock Power Slot module is designed to be installed on the Power slot of the RAK19010 Base Board. As shown in **Figure 15**, the location is properly marked by silkscreen. Follow carefully the procedure defined in attaching a WisBlock Connector section in order to attach a Core module. Once attached, fix the module with four pieces of M1.2 x 3 mm screws.

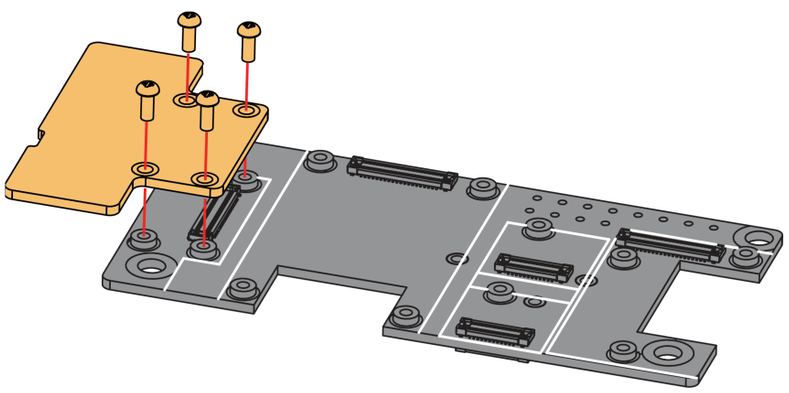

Figure 15: WisBlock Power Slot on the RAK19010 Base Board

WisBlock Core

A WisBlock Core module is designed to be installed on the CPU slot of the RAK19010 Base Board. As shown in **Figure 16**, the location is properly marked by silkscreen. Follow carefully the procedure defined in attaching a WisBlock Connector section in order to attach a Core module. Once attached, fix the module with one or more pieces of M1.2 x 3 mm screws depending on the WisBlock Core.

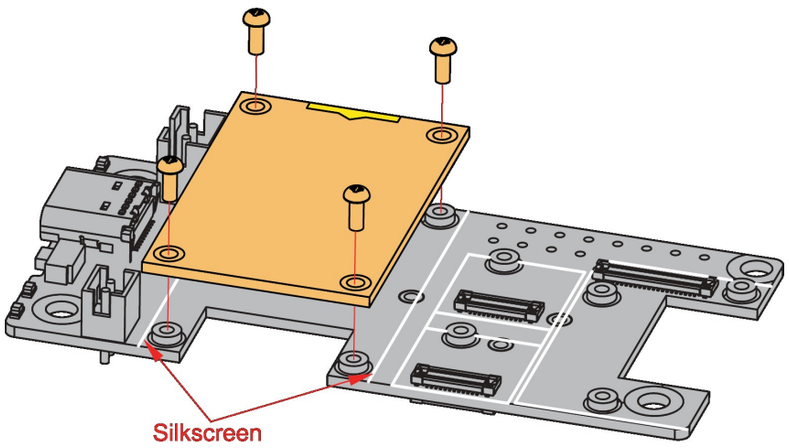

Figure 16: WisBlock Core silkscreen on the RAK19010 Base Board

WisBlock IO

A WisBlock IO module is designed to be installed on the IO slot of the RAK19010 Base Board. As shown in **Figure 17**, the location is properly marked by silkscreen. Follow carefully the procedure defined in attaching a WisBlock Connector section in order to attach an IO module. Once attached, fix the module with one or more pieces of M1.2 x 3 mm screws depending on the WisBlock IO.

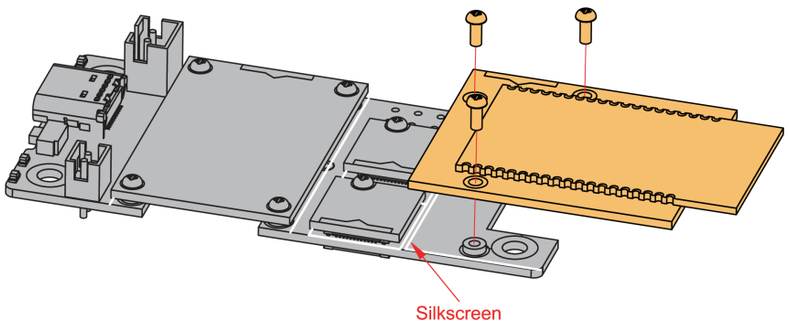

Figure 17: WisBlock IO silkscreen on the RAK19010 Base Board

WisBlock Sensor

A WisBlock Sensor module is designed to be installed on the sensor slots of the RAK19010 Base Board. As shown in **Figure 18**, the location of the slots is properly marked by silkscreen. Follow carefully the procedure of the section, attaching a WisBlock Connector, to attach a WisBlock Sensor module. Once attached, fix the module with an M1.2 x 3 mm screw.

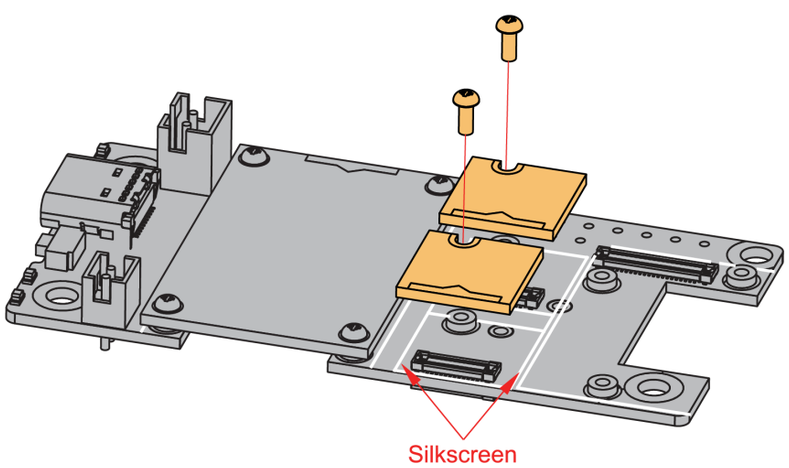

Figure 18: WisBlock Sensor silkscreen on the top of RAK19010 Base Board

Disassembling a WisBlock Module

1. The procedure to disassemble any type of WisBlock module is the same. As shown in **Figure 19**, first, remove the screws.

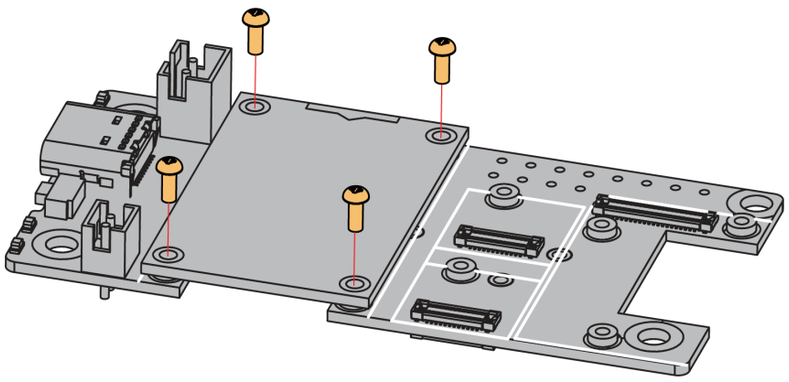

Figure 19: Removing screws from the WisBlock module

2. Once the screws are removed, on the PCB of a WisBlock module, there is a silkscreen that shows the correct location where force can be applied. By applying even force under the marked area, the module can be detached from the Base Board. See **Figure 20** and **Figure 21**.

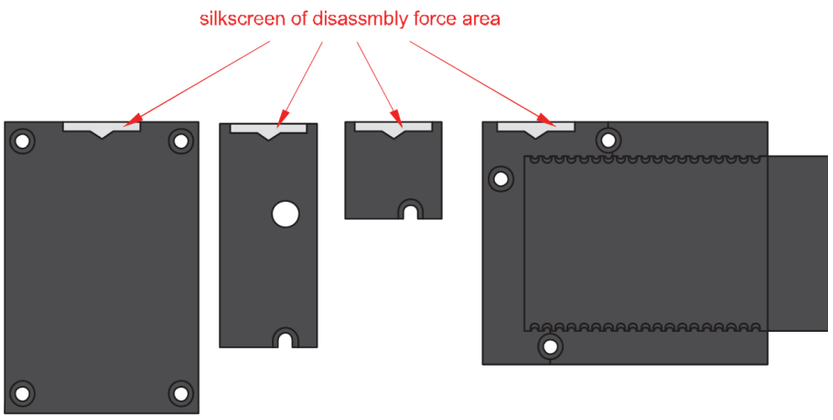

Figure 20: Detaching silkscreen on the WisBlock module

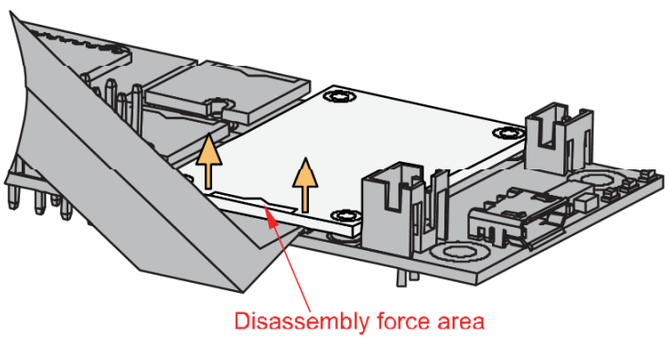

Figure 21: Applying even forces on the proper location of a WisBlock module to detach the module from the Base Board

Software Setup

The WisBlock Core is designed to be interfaced with other WisBlock Modules like sensors, displays, and other interfaces. To make useful devices, you need to upload a source code to the WisBlock Core. Before you continue, you should have already set up either an Arduino BSP or PlatformIO .

WisBlock Examples Repository

To quickly build your IoT device with less hassle, example codes for WisBlock Core are provided. You can access the codes on the WisBlock Example code repository . The example codes on folder `common` are compatible with RAK4631, RAK11200, and RAK11310 WisBlock cores.

Last Updated: 7/18/2022, 6:55:21 AM

RAK19010 WisBlock Base Board with Power Slot Datasheet

Overview

Description

RAK19010 is a **WisBlock Base Board with Power Slot** that connects **WisBlock Core** and other **WisBlock Modules**. The power slot of RAK19010 is required to have an attached WisBlock Power Slot module that provides power supply to the core and other modules. There are many different types of power slot modules compatible with RAK19010 and the choice will depend on the type of application.

It has one slot reserved for the power slot module, one for the core module, one slot for the IO module, and four sensor slots A-D for small WisBlock modules. The WisBlock Core, Power, and IO modules are attached on the top side, and smaller WisBlock modules can be attached to the top or bottom side of the RAK19010. Slot A and D hold modules up to 23 mm in size, while all slots A up to D support 10 mm WisBlock modules. Also, there are three **2.54 mm pitch headers** for extension interface with **BOOT**, **GPIO**, **ADC**, **I2C**, and **UART** pins.

WisBlock modules are connected to the RAK19010 WisBlock Base board via high-speed board-to-board connectors. They provide secure and reliable interconnection to ensure the signal integrity of each data bus. A set of screws is used to fix the modules, making it reliable even in an environment with lots of vibrations.

You can also use a RAK19005 WisBlock Sensor Extension Cable or RAK19008 WisBlock IO Extension Cable to position the WisBlock modules apart from the WisBlock Base board or in any part of your case.

Features

- Flexible building block design, which enables modular function realization and expansion
- High-speed interconnection secured with screws to ensure signal integrity
- Supports multiple types of low-power MCUs
- Supports multiple types of sensors - a single board can support a combination of two different types of sensors
- Supports different power modules depending on the applications.
  - RAK19012 - USB, LiPo and Solar
  - RAK19013 - LiPo and Solar
  - RAK19015 - Battery
  - RAK19016 - 5 V to 24 V voltage input
- **Module Slots**
  - 1 WisBlock Core module
  - 1 WisBlock power module
  - 1 WisBlock module compatible with IO slot
  - 4 WisBlock modules compatible with slots A-D
  - Pin headers accessible pins for BOOT, GPIO, ADC, I2C, and UART interfaces
- **Size**
  - **RAK19010** has a size of only 30 x 60 mm, which lets you create solutions that fit into the smallest housings.

If you can't find a WisBlock module that fits your IoT requirements, use the standard connectors of WisBlock to develop your specific function module. WisBlock supports open-source hardware architecture and you can find tutorials showing how to create your own Awesome WisBlock module.

Applications

- Wireless sensor network

- Environmental monitoring
- Wireless data transmission
- Data acquisition in the industrial environment
- Location and tracking of personnel or moving objects

Specifications

Overview

There are seven (7) slots on RAK19010 WisBlock Base Board with Power Slot:

- **CPU SLOT**: This slot is reserved for the WisBlock Core module which has the main MCU.
- **Power SLOT**: This slot is required to provide power to WisBlock Core and modules.
- **IO SLOT**: This slot is used for IO extension modules.
- **Four Sensor Slots**: The sensor slots A to D are used to connect with the I2C bus. Slots A and D can be used for GNSS modules, too.

Also, there are pin headers 2.54 mm pitch for the extension interface that connects to BOOT, I2C, UART, ADC, and GPIO pins.

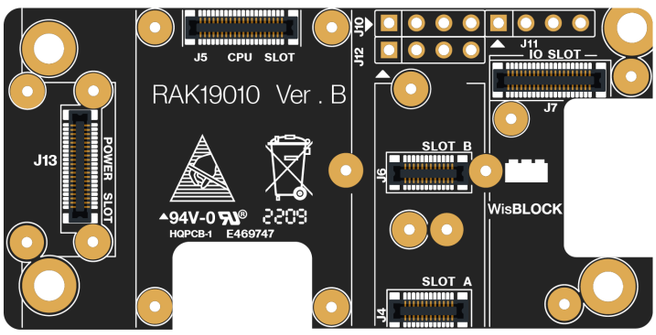

Figure 1: RAK19010 WisBlock Base Board with Power Slot top view

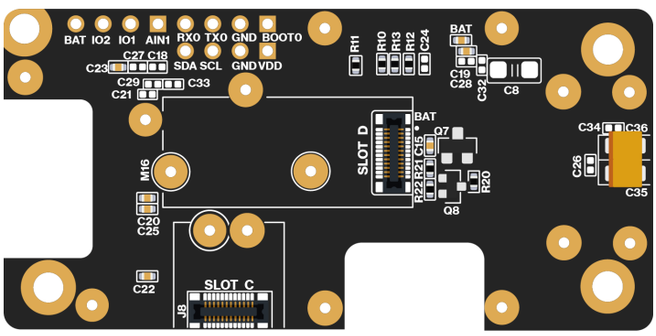

Figure 2: RAK19010 WisBlock Base Board with Power Slot bottom view

Block Diagram

The block diagram in **Figure 3** shows the internal architecture and external interfaces of the RAK19010 board.

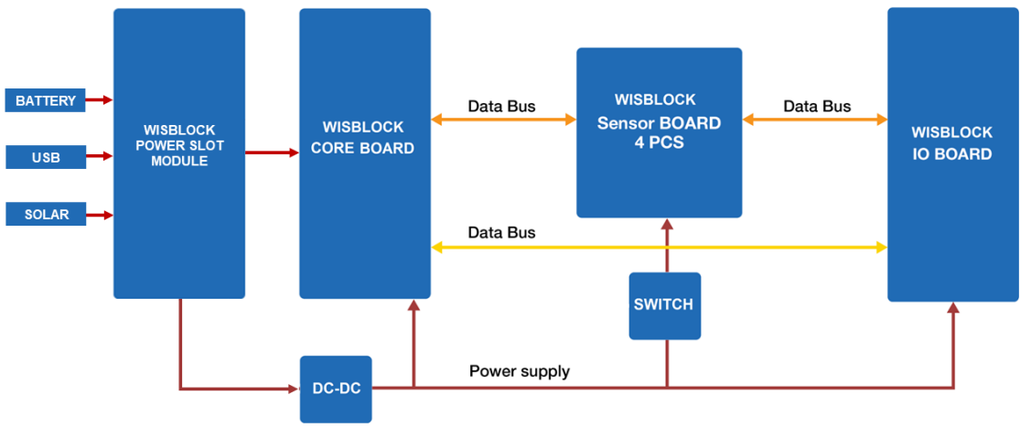

Figure 3: RAK19010 WisBlock Base Board wth Power Slot block diagram

Hardware

The hardware specification is categorized into six parts. It shows the interfacing, pinouts, and their corresponding functions and diagrams. It also presents the electrical, environmental, and mechanical parameters that include the tabular data of the functionalities and standard values of the RAK19010 WisBlock Base Board 2nd Gen.

Interfaces

RAK19010 WisBlock Base Board with Power Slot provides the following interfaces, headers, a button, and WisBlock Connectors.

- One connector for CPU slot
- One connector for the power slot
- One connector for the IO slot
- Four connectors for WisBlock sensor modules (slots A to D)
- Three 4-pin header 2.54 mm hole pads (GPIO, ADC, UART, I2C, Power)

Figure 4 show the location of RAK19010 main components.

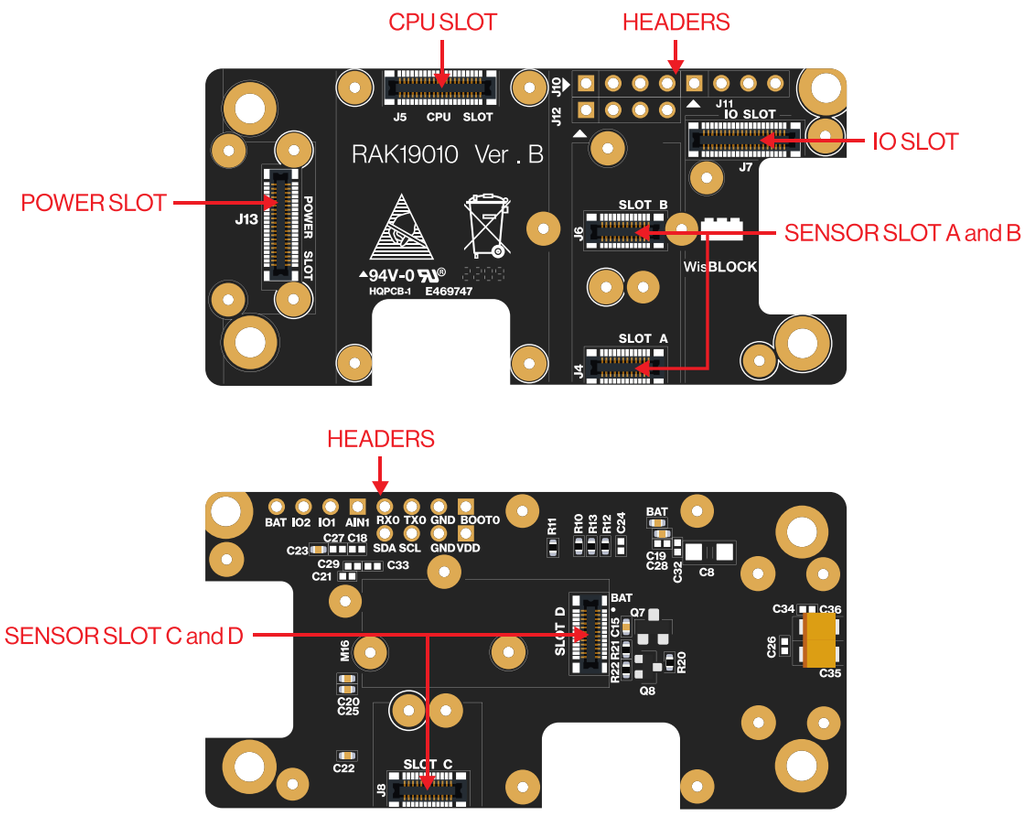

Figure 4: RAK19010 top and bottom parts

J10, J11, J12 Headers

On the RAK19010 Base Board, there are three 2.54 mm pitch headers for IO extension. BOOT, I2C, GPIO, and UART pins from the WisBlock Core module are also connected to these headers.

J10 Header Pinout

Pin	Pin Name	Description
1	BOOT	MCU BOOT pin
2	GND	Ground pin
3	TX1	UART1 TX pin
4	RX1	UART1 RX pin

J11 Header Pinout

Pin	Pin Name	Description
1	AIN1	ADC input signal
2	IO1	General purpose IO
3	IO2	General purpose IO
4	VBAT	Battery voltage

J12 Header Pinout

Pin	Pin Name	Description
1	VDD	3.3 V
2	GND	Ground pin
3	SCL	I2C1 clock
4	SDA	I2C2 data

> 📝 **NOTE BOOT pin**
>
> BOOT pin is used on startup configuration or sequence of the WisBlock Core connected to it. It is commonly used for uploading the bootloader and/or application firmware. The requirements of the state of the BOOT pin depend on the specific model of the WisBlock Core used.

Pin Definition

Connector for WisBlock Core

The **WisBlock Core module connector** is a 40-pin board-to-board connector. It is a high-speed and high-density connector, with an easy attaching mechanism.

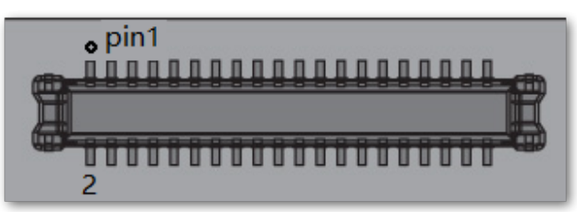

Figure 5: WisBlock Core module connector

The table below shows the pinout of the 40-pin WisBlock core connector:

Function Name of WisBlock Base	Pin Number	Pin Number	Function Name of WisBlock Base
VBAT	1	2	VBAT
GND	3	4	GND
3V3	5	6	3V3
USB+	7	8	USB–
VBUS	9	10	SW1
TXD0	11	12	RXD0
RESET	13	14	LED1
LED2	15	16	LED3
VDD	17	18	VDD
I2C1_SDA	19	20	I2C1_SCL
AIN0	21	22	AIN1
BOOT0	23	24	IO7
SPI_CS	25	26	SPI_CLK
SPI_MIS0	27	28	SPI_MOSI
IO1	29	30	IO2
IO3	31	32	IO4
TXD1	33	34	RXD1
I2C2_SDA	35	36	I2C2_SCL
IO5	37	38	IO6
GND	39	40	GND

As for the following table, it shows the definition of each pin of the WisBlock Core connector:

Pin Number	Pin Name	Type	Description
1	VBAT	S	Power supply from battery
2	VBAT	S	Power supply from battery
3	GND	S	Ground
4	GND	S	Ground
5	3V3	S	3.3 V power supply
6	3V3	S	3.3 V power supply
7	USB+	I/O	USB D+
8	USB–	I/O	USB D–
9	VBUS	S	VBUS for USB
10	SW1	I/O	Switch signal for customer's control
11	TXD0	I/O	MCU UART0 TX signal
12	RXD0	I/O	MCU UART0 RX signal
13	RESET	I	Connected to the reset switch, for MCU reset
14	LED1	I/O	LED for battery charging indication
15	LED2	I/O	LED for custom usage
16	LED3	I/O	LED for custom usage
17	VDD	S	Generated by MCU module for power sensor board if the MCU IO level is not 3.3 V
18	VDD	S	Generated by MCU module for power sensor board if the MCU IO level is not 3.3 V
19	I2C1_SDA	I/O	The first set of I2C data signal
20	I2C1_SCL	I/O	The first set of I2C clock signals
21	AIN0	A	Analog input for ADC
22	AIN1	A	Analog input for ADC
23	BOOT0	I	For ST MCU, set high when reset. The MCU will allow you to enter boot mode.

Pin Number	Pin Name	Type	Description
24	IO7	I/O	Not connected
25	SPI_CS	I/O	SPI chip select signal
26	SPI_CLK	I/O	SPI clock
27	SPI_MISO	I/O	SPI MISO signal
28	SPI_MOSI	I/O	SPI MOSI signal
29	IO1	I/O	General purpose IO
30	IO2	I/O	Used for 3V3_S enable
31	IO3	I/O	General purpose IO
32	IO4	I/O	General purpose IO
33	TXD1	I/O	MCU UART1 RX signal
34	RXD1	I/O	MCU UART1 RX signal
35	I2C2_SDA	I/O	The second set of I2C data signal
36	I2C2_SCL	I/O	The second set of I2C data signal
37	IO5	I/O	General purpose IO
38	IO6	I/O	General purpose IO
39	GND	S	Ground
40	GND	S	Ground

Connector for WisBlock Power

The **WisPower module connector** is a 40-pin board-to-board connector. It is a high-speed and high-density connector, with an easy attaching mechanism.

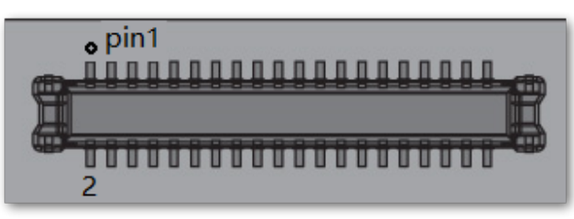

Figure 6: WisBlock Power Slot module connector

The table below shows the pinout of the 40-pin power module connector:

Pin Number	Function Name of WisBlock Base	Pin Number	Function Name of WisBlock Base
1	VBAT	2	VBAT
3	GND	4	GND
5	3V3	6	3V3
7	USB+	8	USB–
9	VBUS	10	VBUS
11	NC	12	NC
13	RESET	14	LED1
15	LED2	16	NC
17	3V3	18	3V3
19	I2C1_SDA	20	I2C1_SCL
21	AIN0	22	AIN1
23	NC	24	NC
25	SPI_CS	26	SPI_CLK
27	SPI_MISO	28	SPI_MOSI
29	NC	30	NC
31	NC	32	NC
33	NC	34	NC
35	I2C2_SDA	36	I2C2_SCL
37	IO5	38	IO6
39	GND	40	GND

As for the following table, it shows the definition of each pin of the WisBlock Power connector:

Pin Number	Pin Name	Type	Description
1	VBAT	S	Power supply from battery
2	VBAT	S	Power supply from battery
3	GND	S	Ground
4	GND	S	Ground
5	3V3	S	3.3 V power supply
6	3V3	S	3.3 V power supply
7	USB+	I/O	USB D+
8	USB–	I/O	USB D–
9	VBUS	S	USB VBUS
10	VBUS	S	USB VBUS
11	NC	NC	Not connected
12	NC	NC	Not connected
13	RESET	I	Connected to the reset switch, for MCU reset
14	LED1	I/O	LED for battery charging indication
15	LED2	I/O	LED for custom usage
16	NC	NC	Not connected
17	3V3	S	3.3 V power supply
18	3V3	S	3.3 V power supply
19	I2C1_SDA	I/O	The first set of I2C data signal
20	I2C1_SCL	I/O	The first set of I2C clock signal
21	AIN0	A	Analog input for ADC
22	AIN1	A	Analog input for ADC
23	NC	NC	Not connected
24	NC	NC	Not connected

Pin Number	Pin Name	Type	Description
25	SPI_CS	I/O	SPI chip select signal
26	SPI_CLK	I/O	SPI clock signal
27	SPI_MISO	I/O	SPI MISO signal
28	SPI_MOSI	I/O	SPI MOSI signal
29	NC	NC	Not connected
30	NC	NC	Not connected
31	NC	NC	Not connected
32	NC	NC	Not connected
33	NC	NC	Not connected
34	NC	NC	Not connected
35	I2C2_SDA	I/O	The second set of I2C data signal
36	I2C2_SCL	I/O	The second set of I2C clock signal
37	IO5	I/O	General purpose IO
38	IO6	I/O	General purpose IO
39	GND	S	Ground
40	GND	S	Ground

Connectors for WisBlock Sensor

The WisBlock sensor module connector is a **24-pin board-to-board connector**.

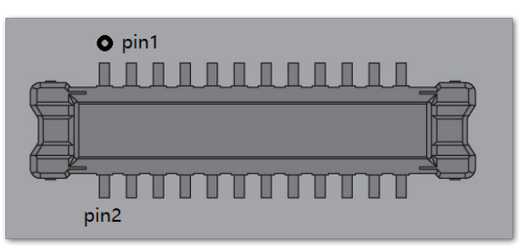

Figure 7: WisBlock Sensor module connector

> 📝 **NOTE**
>
> There are four connectors reserved for the sensor modules on the RAK19010. The pinout definition of the WisBlock modules with a 24-pin connector on WisBlock Base Board varies according to its connector.

Connector D	Connector C	Connector B	Connector A	Pin Number	Pin Number	Connector A	Co B
TXD1	NC	NC	TXD1	1	2	GND	GI
SPI_CS	SPI_CS	SPI_CS	SPI_CS	3	4	SPI_CLK	SP
SPI_MISO	SPI_MISO	SPI_MISO	SPI_MISO	5	6	SPI_MOSI	SP
I2C1_SCL	I2C1_SCL	I2C1_SCL	I2C1_SCL	7	8	I2C1_SDA	I2(
VDD	VDD	VDD	VDD	9	10	IO2	IO
3V3_S	3V3_S	3V3_S	3V3_S	11	12	IO1	IO
NC	NC	NC	NC	13	14	3V3_S	3V
NC	NC	NC	NC	15	16	VDD	VD
NC	NC	NC	NC	17	18	NC	NC
NC	NC	NC	NC	19	20	NC	NC
NC	NC	NC	NC	21	22	NC	NC
GND	GND	GND	GND	23	24	RXD1	NC

As for the following table, it shows the pin name and description of each pin in the WisBlock Sensor module connector.

Pin Number	Connector A	Connector B	Connector C	Connector D	Type	Description
1	TXD1	NC	NC	TXD1	I/O	UART TX signal
2	GND	GND	GND	GND	S	Ground
3	SPI_CS	SPI_CS	SPI_CS	SPI_CS	I/O	SPI chip select signal
4	SPI_CLK	SPI_CLK	SPI_CLK	SPI_CLK	I/O	SPI clock
5	SPI_MISO	SPI_MISO	SPI_MISO	SPI_MISO	I/O	SPI MISO signal
6	SPI_MOSI	SPI_MOSI	SPI_MOSI	SPI_MOSI	I/O	SPI MOSI signal
7	I2C1_SCL	I2C1_SCL	I2C1_SCL	I2C1_SCL	I/O	I2C clock signal
8	I2C1_SDA	I2C1_SDA	I2C1_SDA	I2C1_SDA	I/O	I2C data signal
9	VDD	VDD	VDD	VDD	S	Generated by CPU module. Used to power sensor board if MCU IO level is not 3.3 V
10	IO2	IO1	IO4	IO6	I/O	General purpose IO. IO2 controls the power switch of 3V3_S. When the 3V3_S function is used, IO2 can not be used as an interrupt of the sensor.
11	3V3_S	3V3_S	3V3_S	3V3_S	S	3.3 V power supply. Can be shut down by the CPU module.
12	IO1	IO2	IO3	IO5	I/O	General purpose IO - IO controls the power switch of 3V3_S. When the 3V3_S function is used, IO2 cannot be used as an interrupt of the sensor.
13	NC	NC	NC	NC	NC	Not connected

Pin Number	Connector A	Connector B	Connector C	Connector D	Type	Description
14	3V3_S	3V3_S	3V3_S	3V3_S	S	3.3 V power supply. Can be shut down by the CPU module.
15	NC	NC	NC	NC	NC	Not connected
16	VDD	VDD	VDD	VDD	S	Generated by CPU module. Used to power sensor board if the MCU IO level is not 3.3 V.
17	NC	NC	NC	NC	NC	Not connected
18	NC	NC	NC	NC	NC	Not connected
19	NC	NC	NC	NC	NC	Not connected
20	NC	NC	NC	NC	NC	Not connected
21	NC	NC	NC	NC	NC	Not connected
22	NC	NC	NC	NC	NC	Not connected
23	GND	GND	GND	GND	S	Ground
24	RXD1	NC	NC	RXD1	I/O	UART RX signal

Connector for WisBlock IO Slot

The WisBlock Module IO Slot connector, as shown in **Figure 8**, is a 40-pin board-to-board connector.

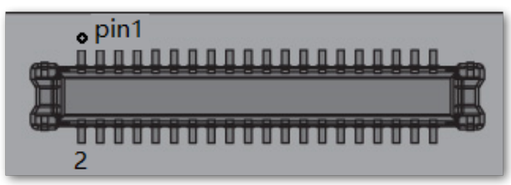

Figure 8: WisBlock IO slot connector

Pinout definition for IO slot:

Connector B	Connector A	Pin Number	Pin Number	Connector A	Connector B
VBAT	VBAT	1	2	VBAT	VBAT
GND	GND	3	4	GND	GND
3V3	3V3	5	6	3V3_S	3V3_S
USB+	USB+	7	8	USB–	USB–
VBUS	VBUS	9	10	SW1	SW1
TXD0	TXD0	11	12	RXD0	RXD0
RESET	RESET	13	14	LED1	LED1
LED2	LED2	15	16	LED3	LED3
VDD	VDD	17	18	VDD	VDD
I2C1_SDA	I2C1_SDA	19	20	I2C1_SCL	I2C1_SCL
AIN0	AIN0	21	22	AIN1	AIN1
NC	NC	23	24	NC	NC
SPI_CS	SPI_CS	25	26	SPI_CLK	SPI_CLK
SPI_MISO	SPI_MISO	27	28	SPI_MOSI	SPI_MOSI
IO1	IO1	29	30	IO2	IO2
IO3	IO3	31	32	IO4	IO4
TXD1	TXD1	33	34	RXD1	RXD1
I2C2_SDA	I2C2_SDA	35	36	I2C2_SCL	I2C2_SCL
IO5	IO5	37	38	IO6	IO6
GND	GND	39	40	GND	GND

As for the following table, it shows the pin name and description of the WisBlock IO module connector.

Pin Number	Pin Name	Type	Description
1	VBAT	S	Power supply from battery
2	VBAT	S	Power supply from battery
3	GND	S	Ground
4	GND	S	Ground
5	3V3	S	3.3 V power supply
6	3V3_S	S	3.3 V power supply. Can be shut down by a CPU module.
7	USB+	I/O	USB D+
8	USB–	I/O	USB D–
9	VBUS	S	5 V input for USB
10	SW1	I/O	Switch signal for custom used
11	TXD0	I/O	MCU UART0 TX signal
12	RXD0	I/O	MCU UART0 RX signal
13	RESET	I	Connected to the reset switch, for MCU reset
14	LED1	I/O	LED for battery charge indicator
15	LED2	I/O	LED for custom used
16	LED3	I/O	LED for custom used
17	VDD	S	Generated by CPU module - Used for power sensor board if the MCU IO level is not 3.3 V
18	VDD	S	Generated by CPU module - Used for power sensor board if the MCU IO level is not 3.3 V.
19	I2C1_SDA	I/O	The first set of I2C data signal
20	I2C1_SCL	I/O	The first set of I2C clock signals
21	AIN0	A	Analog input for ADC
22	AIN1	A	Analog input for ADC
23	NC	NC	Not connect

Pin Number	Pin Name	Type	Description
24	NC	NC	Not connect
25	SPI_CS	I/O	SPI chip select signal
26	SP_CLK	I/O	SPI clock
27	SPI_MISO	I/O	SPI MISO signal
28	SPI_MOSI	I/O	SPI MOSI signal
29	IO1	I/O	General purpose IO
30	IO2	I/O	Used for 3V3_S enable
31	IO3	I/O	General purpose IO
32	IO4	I/O	General purpose IO
33	TXD1	I/O	MCU UART1 TX signal
34	RXD1	I/O	MCU UART1 RX signal
35	I2C2_SDA	I/O	The second set of I2C data signal
36	I2C2_SCL	I/O	The second set of I2C clock signal
37	IO5	I/O	General purpose IO
38	IO6	I/O	General purpose IO
39	GND	S	Ground
40	GND	S	Ground

Electrical Characteristics

Absolute Maximum Ratings

The Absolute Maximum Ratings of the device are shown in the table below. The stress ratings are the functional operation of the device.

> ⚠**WARNING**
>
> 1. If the stress rating goes above what is listed, it may cause permanent damage to the device.
> 2. Under the listed conditions is not advised.
> 3. Exposure to maximum rating conditions may affect the device reliability.

Ratings	Maximum Value	Unit
IOs of WisConnector	–0.3 to VDD+0.3	V
ESD	2000	V

> ⚠ **WARNING**
>
> The RAK19010, like any electronic equipment, is sensitive to **electrostatic discharge (ESD)**. Improper handling can cause permanent damage to the module.

Mechanical Characteristics

Board Dimensions

Figure 11 shows the detailed mechanical dimensions of the RAK19010 Board.

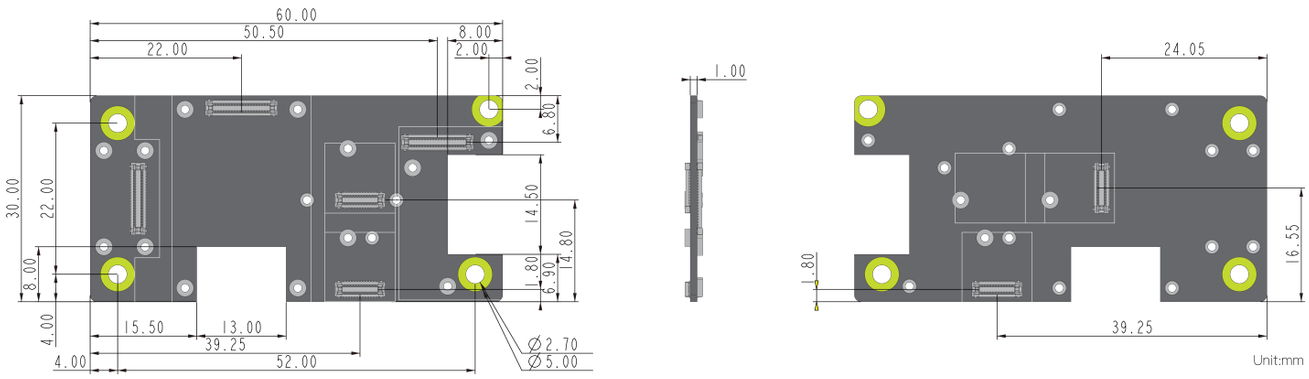

Figure 9: RAK19010 mechanical board dimension

Figure 12 and **Figure 13** show the mounting holes location and diameter of the RAK19010 Board.

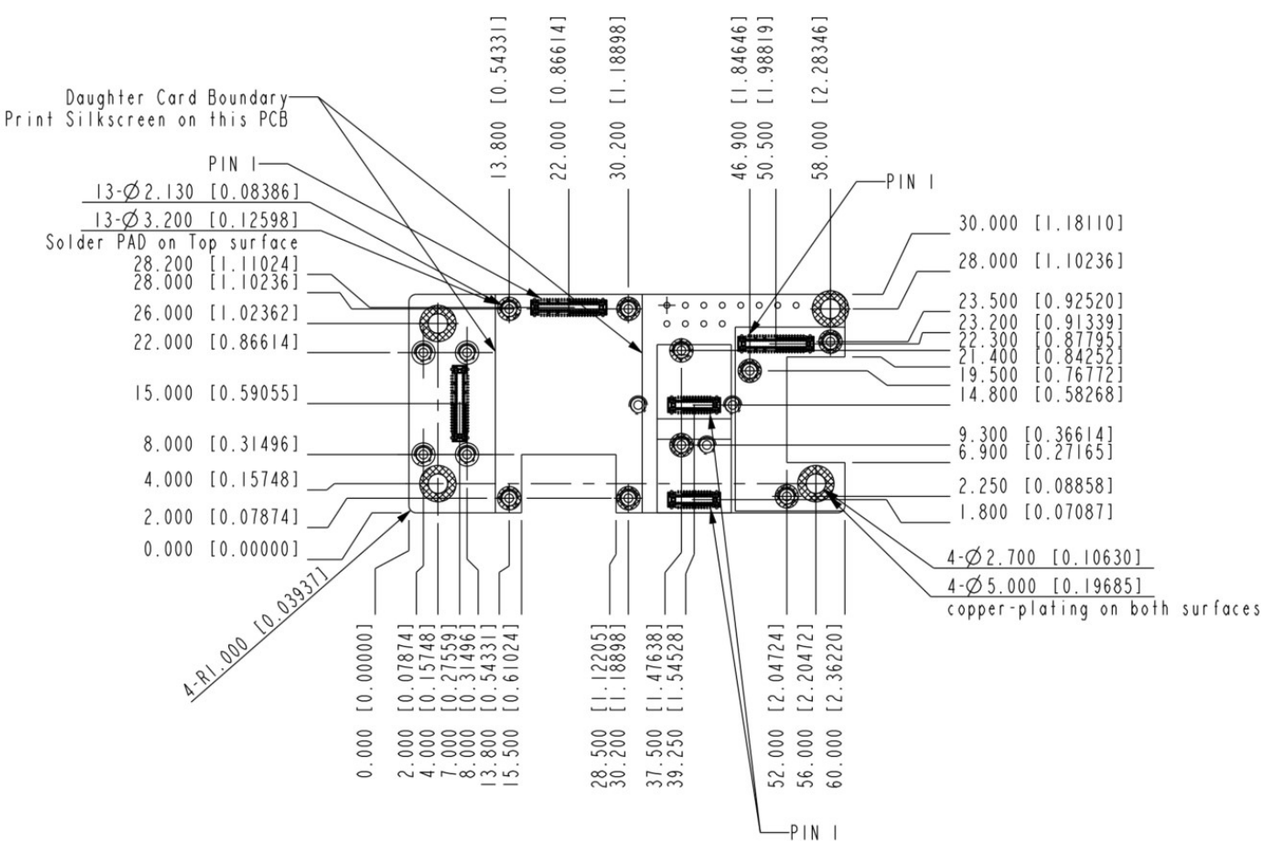

Figure 10: RAK19010 mechanical dimensions and mounting holes locations

WisConnector PCB Layout

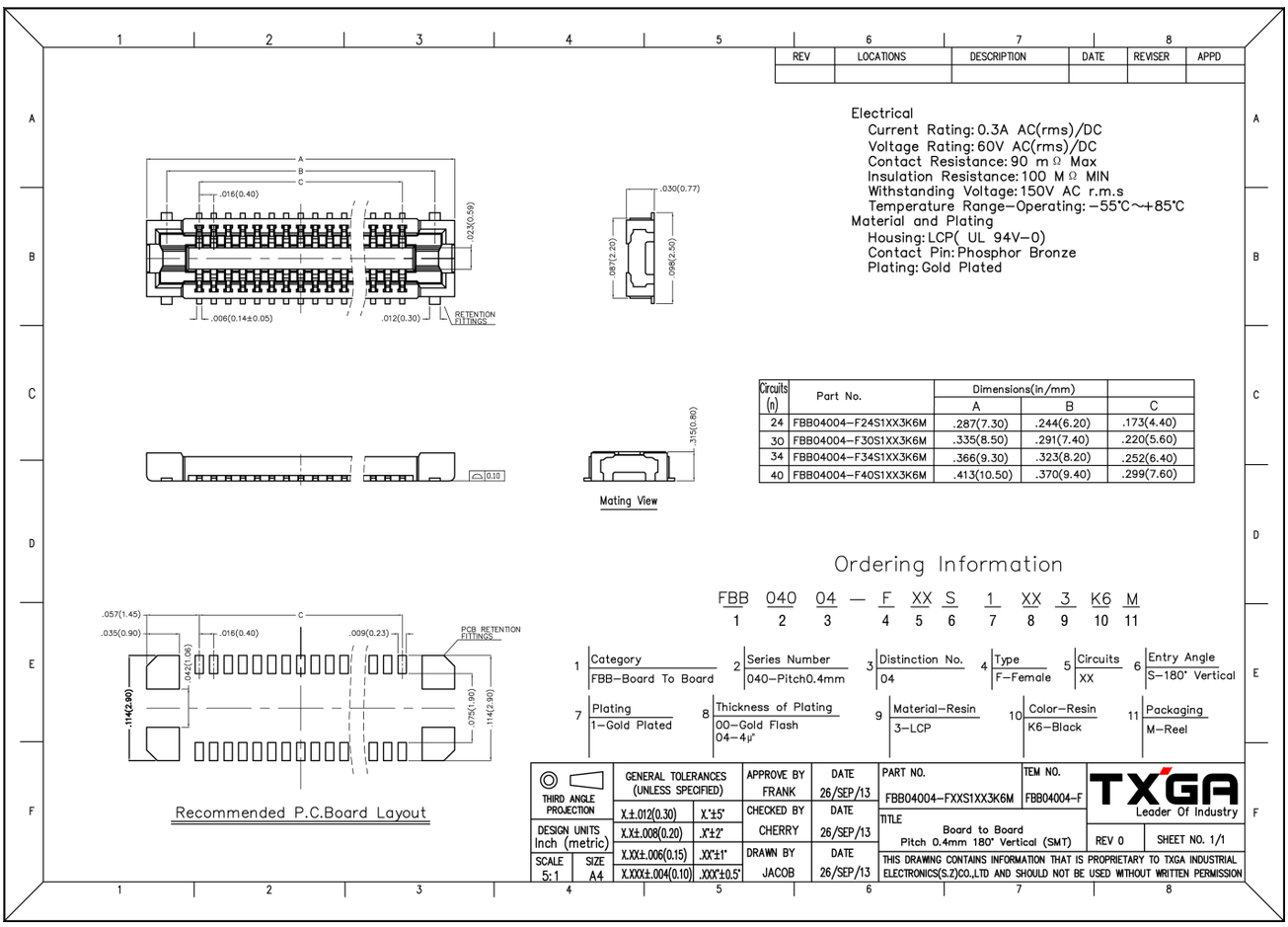

Figure 11: WisConnector PCB footprint and recommendations

Environmental Characteristics

The table below lists the operation and storage temperature requirements of RAK19010:

Parameter	Minimum	Typical	Maximum
Operational temperature range	–35 ºC	+25 ºC	+75 ºC
Extended temperature range	–40 ºC	+25 ºC	+80 ºC
Storage temperature range	–40 ºC	+25 ºC	+80 ºC

Schematic Diagram

The component schematics diagram of the RAK19010 is shown in **Figure 12**.

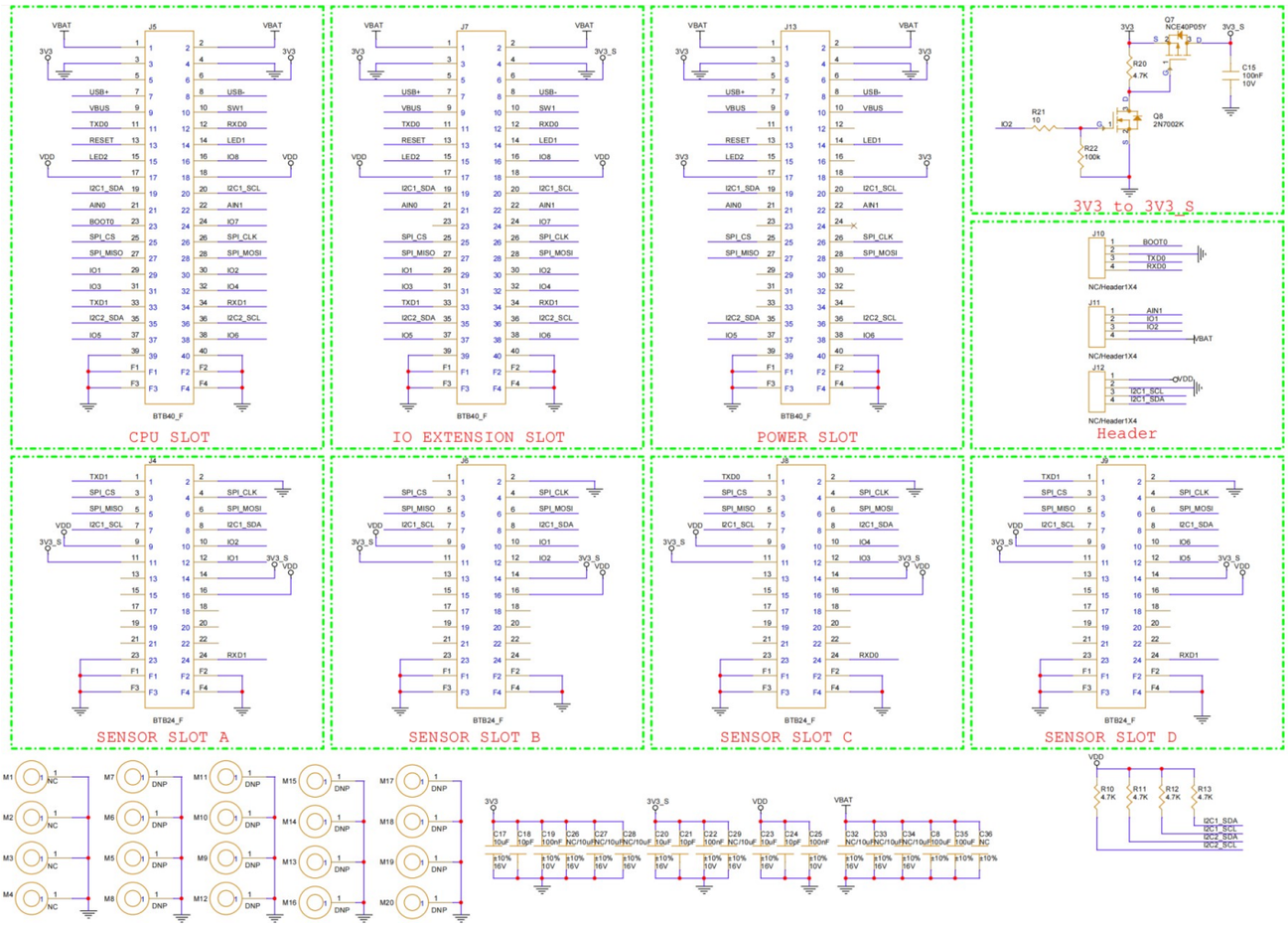

Figure 12: RAK19010 schematic diagram (Power)

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