RAK16002 WisBlock Coulomb Sensor Module Datasheet

Overview

Description

RAK16002 is a Coulomb sensor module based on LTC2941IDCB that features programmable high and low thresholds for the accumulated charge. If a threshold is exceeded, the device communicates an alert by setting a flag in the internal status register. It can measure the battery charge state in battery-powered IoT devices. Its operating range is perfectly suited for single-cell Li-Ion batteries.

The precision coulomb counter integrates current through an internal sense resistor between the battery's positive terminal and the load or charger. The measured charge is stored in internal registers. An I2C interface accesses and configures the device.

Applications

- Low power IoT products
- Indoor environment sensors
- Air quality sensors
- Soil moisture sensors
- GNSS location trackers

Features

- Based on LTC2941IDCB
- Indicates accumulated battery charge and discharge
- ±1 A Sense current range
- I2C interface
- High accuracy analog integration
- 1% Charge accuracy
- Configurable alert output/charge complete input
- 2.7 V to 5.5 V Operating range
- Quiescent current less than 100 µA
- Operating temperature: -40 °C ~ 85 °C
- Storage temperature :-65 °C ~ 150 °C
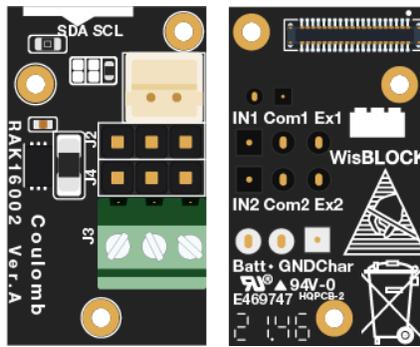- 15 mm x 25 mm

Specifications

Overview

Figure 1: RAK16002 top and back view

Mounting

The RAK16002 Coulomb module can be mounted to the IO slot of the WisBase board. **Figure 2** shows the mounting mechanism of the RAK16002 on a WisBase module, such as the RAK5005-O.
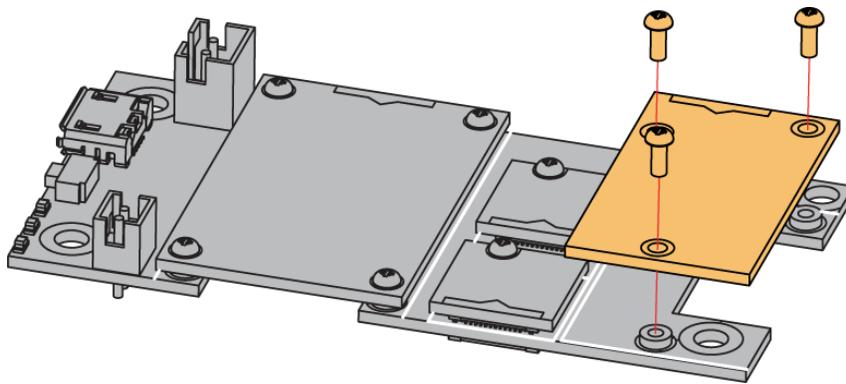

Figure 2: RAK16002 mounting mechanism on a WisBlock Base module

Hardware

The hardware specification is categorized into five parts. It shows the chipset of the module and discusses the pinouts and the corresponding functions and diagrams of the module. It also covers the electrical and mechanical characteristics that include the tabular data of the functionalities and standard values of the RAK16002 WisBlock Coulomb Sensor Module.

Chipset

Vendor	Part number
Analog Devices	LTC2941IDCB

Pin Definition

The RAK16002 WisBlock Coulomb Sensor Module comprises a standard 40-pin WisConnector compatible with the WisBlock Base IO Slot. The WisConnector allows the RAK16002 Coulomb sensor module to be mounted to a WisBlock Base board, such as RAK5005-O. The pin order of the connector and the pinout definition is shown in **Figure 3.**
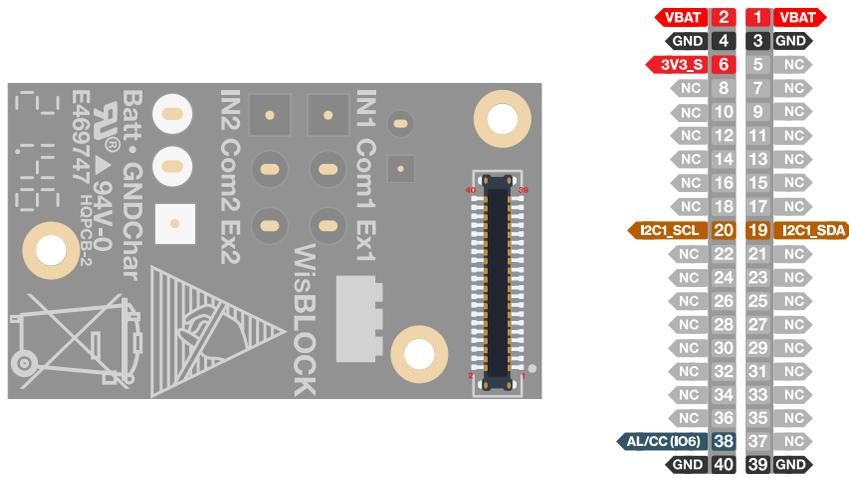
Figure 3: RAK16002 WisBlock Coulomb Sensor Module pinout

> 📝 **NOTE**
>
> - **I2C** related pin, **VBAT**, **AL/CC**，**3V3_S**, and **GND** are connected to WisIO connector.

Electrical Characteristics

This section shows the maximum and minimum ratings of the RAK16002 module and its recommended operating condition. Refer to the table presented below.

Recommended Operating Condition

Symbol	Parameter	Conditions	Minimum	Typical	Maximum	Unit
V_{BAT}	Supply Voltage		2.7		5.5	V
I_{SUPPLY}	Supply Current	Device On			120	uA
		Shutdown			2.5	uA
		Shutdown, V_{SENSE+} <=4.2 V			1	uA
V_{UVLO}	Undervoltage Lockout Threshold	$V_{SENSE+\ Falling}$	2.5	2.6	2.7	V

Mechanical Characteristics

Board Dimensions

Figure 4 shows the dimensions and the mechanic drawing of the RAK16002 module.
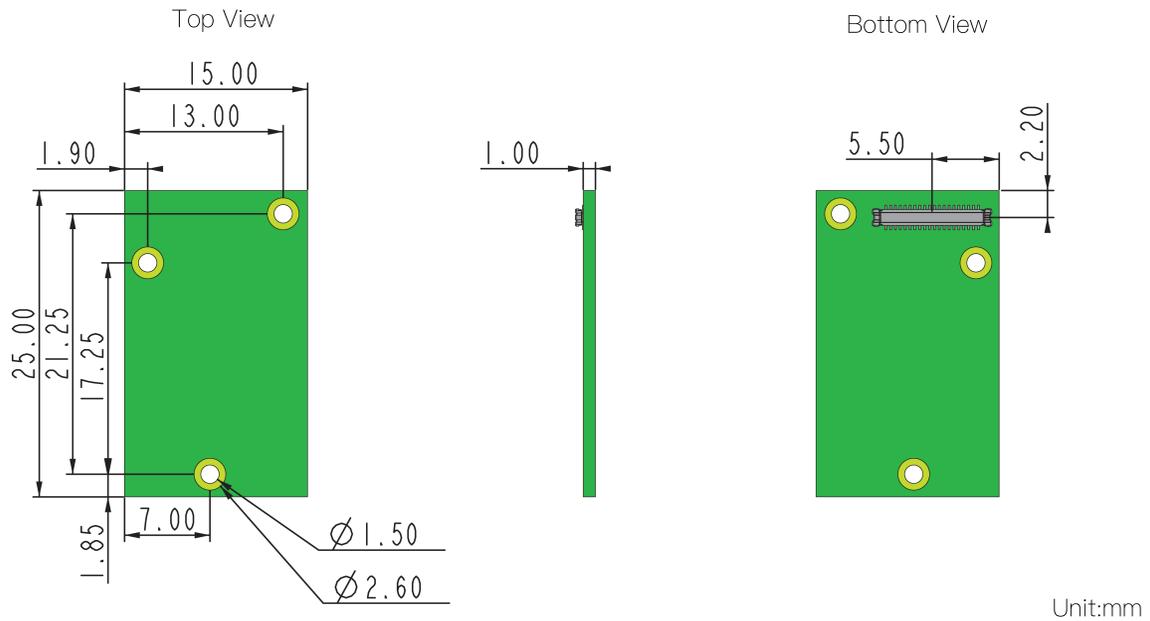
Top View

Bottom View

Unit:mm

Figure 4: RAK16002 WisBlock Coulomb Sensor Module mechanic drawing
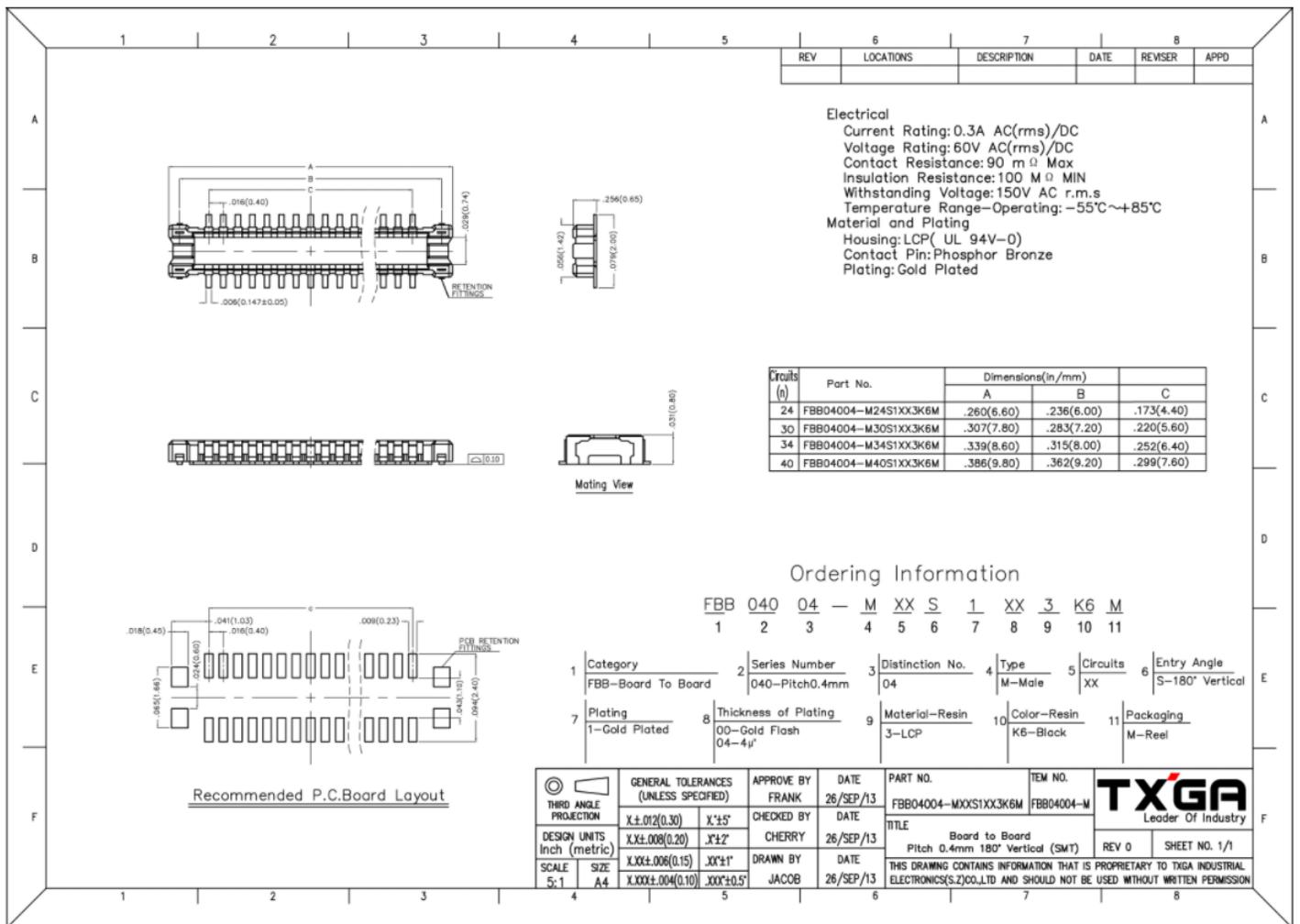
WisConnector PCB Layout

Figure 5: WisConnector PCB footprint and recommendations

Schematic Diagram

LTC2941IDCB Main Circuit

The I2C address of LTC2941IDCB is 0x64. R3 and R4 already exist on WisBase. R3 and R4 are not mounted on RAK16002. See **Figure 6**.

> 📝 **NOTE**
>
> - **J2 charge/load select**
>
>   - short pin1 and pin2, Internal charge/load
>   - short pin2 and pin3, External charge/load
>
> - **J4 battery select**
>
>   - short pin1 and pin2, Internal battery measurement
>   - short pin2 and pin3, External battery measurement
>
> - **J3**
>
>   - pin1, Connect to external charge+/load+
>   - pin2, Connect to external charge-/load- & battery-
>   - pin3, Connect to external battery+

For example

If you want to use the internal battery and the external charge/load, you should do the following (Refer to **Figure 7**.):

- short J2-2 and J2-3;
- short J4-1 and J4-2;
- connect the external charge+/load+ to J3-1;
- connect the external charge-/load- to J3-2;
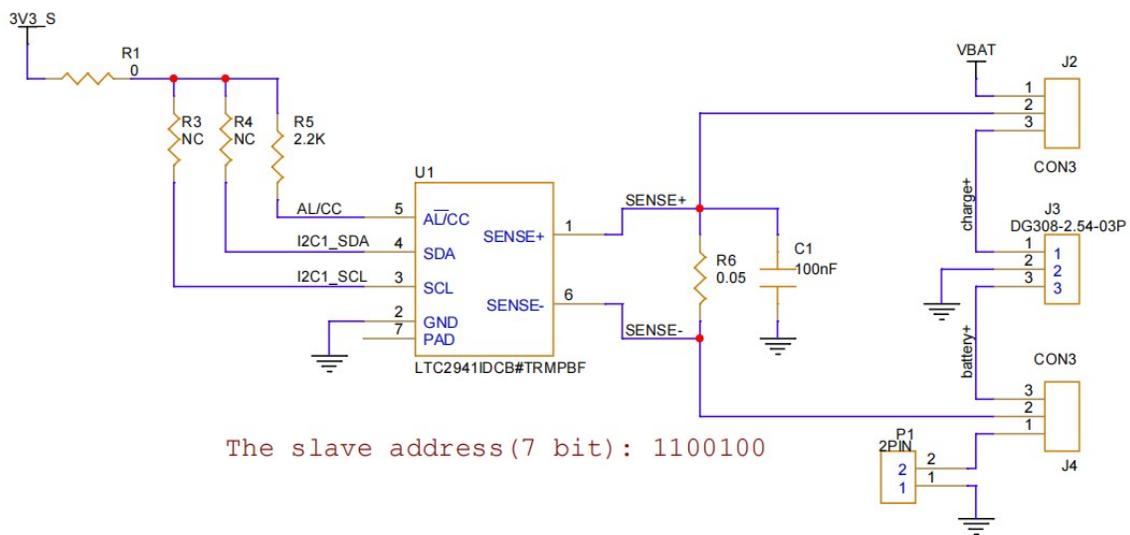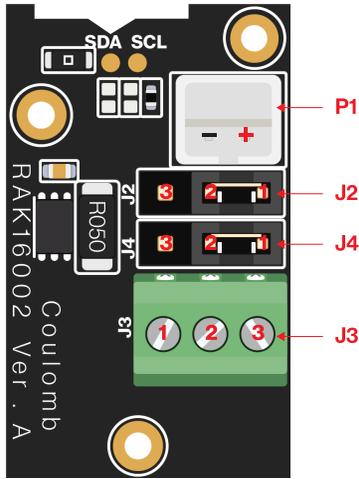- connect the internal battery to P1.

Figure 6: RAK16002 main circuit

Figure 7: RAK16002 jumper and battery connectors

Full Schematic

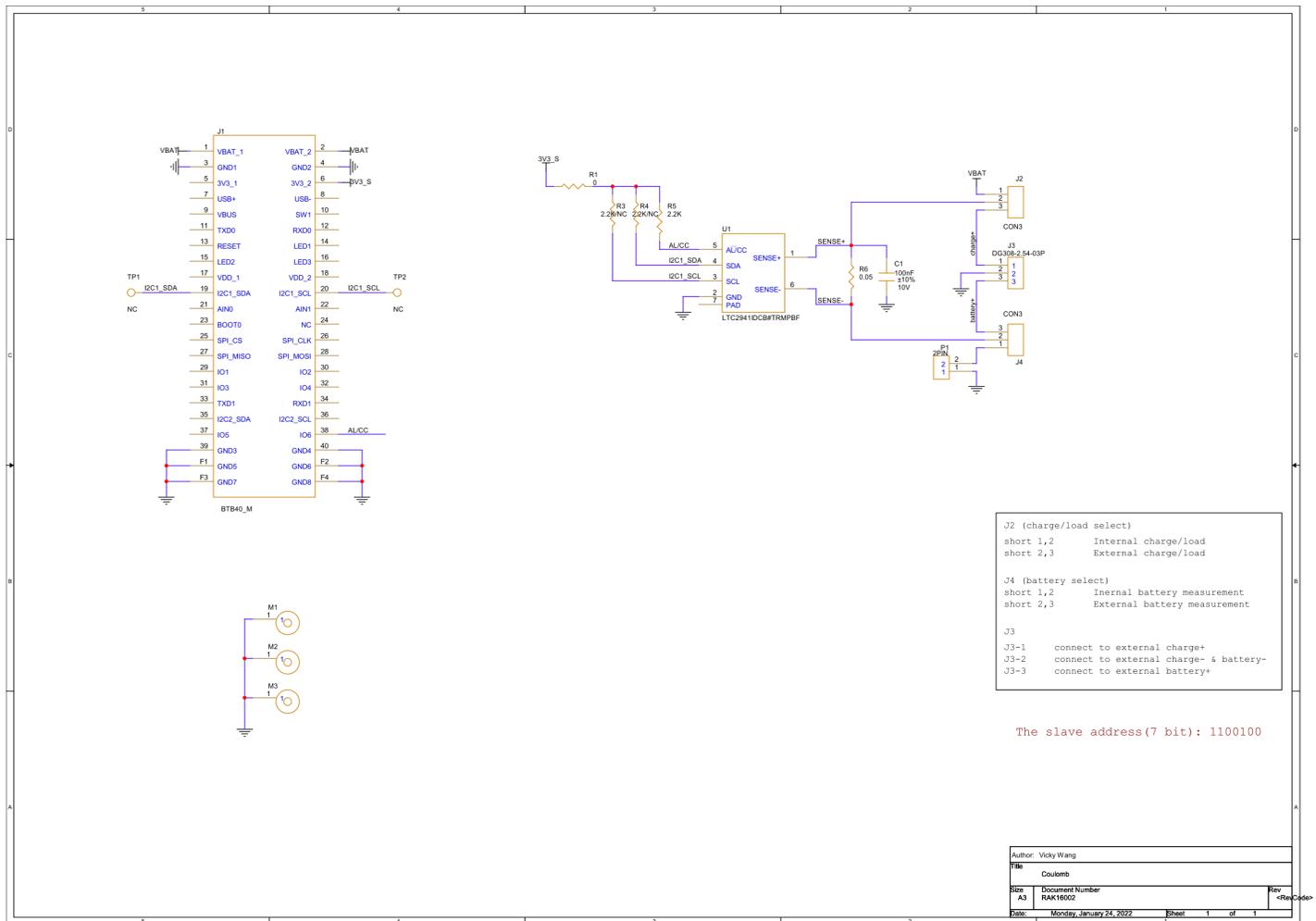**Figure 8** shows the complete schematic of the RAK16002 module.

Figure 8: RAK16002 WisBlock Coulomb Sensor Module schematic

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