

## Environment Sensing Board

NO.xxxxxxx

### 1. Overview

The RIoT-001, an environment sensing board, transmits data obtained from a temperature/humidity and pressure sensor (BME280) and an ambient light sensor (MAX44009) to tablets or other smart devices by using Bluetooth Low Energy (BLE). It can operate with a solar battery panel for indoor light\*1.

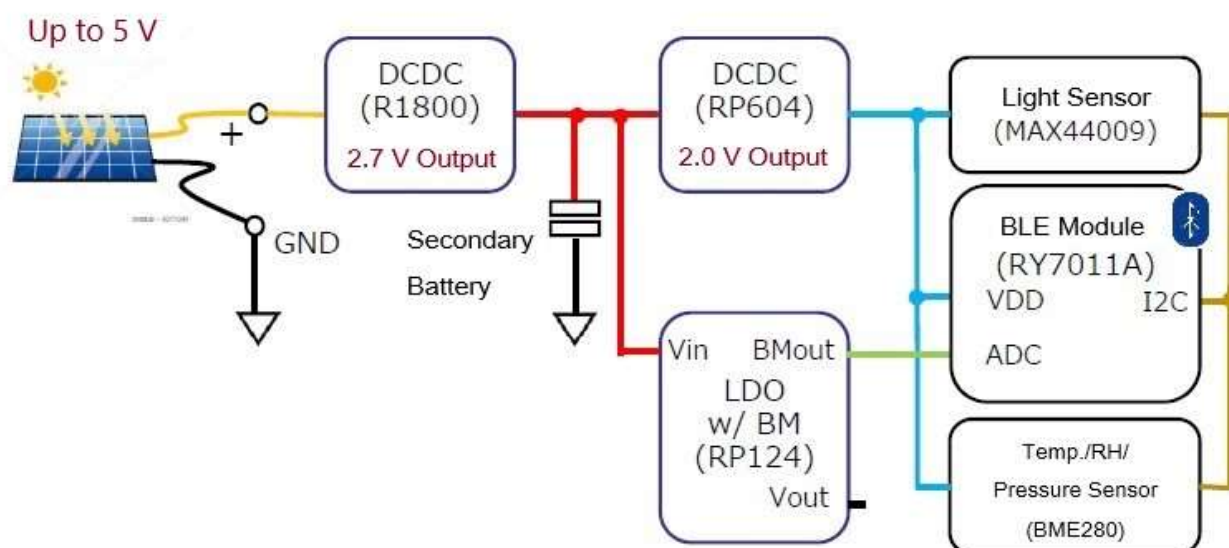
The electric power a solar battery panel generates is harvested efficiently by the R1800, a buck DC/DC converter for energy harvest, and stored in a small Li-ion secondary battery. The stored power is supplied to a BLE module with an MCU and sensors by the RP604, an ultra-low supply current buck-boost DC/DC converter.

The board also includes the RP124, a voltage regulator with a battery monitor, to monitor the secondary battery voltage. By transmitting battery information to tablets or other smart devices via an AD converter inside the BLE module, it is possible to check the state of the secondary battery voltage.

### 2. Board Specifications

#### 2-1. Block Diagram

Solar Battery Panel



\*1 Solar battery panels are not provided with the board.

## 2-2. Ratings

Symbol	Parameter	Condition	Min.	Typ.	Max.
V <sub>in</sub>	Input Voltage		2.0 V	-	5.5 V
V <sub>mp</sub>	Max. Power Voltage			4.4 V	
V <sub>out</sub>	Output Voltage		1.79 V	2.0 V	2.03 V
V <sub>lib</sub>	Secondary Battery Charging Voltage		2.62 V	2.7 V	2.78 V
I <sub>cc</sub>	Avg. Operating Current			16.4 uA *2	
T <sub>a</sub>	Operating Temperature	No condensation	0°C		50°C

\*2 The value refers to an average supply current when the board is used with firmware that intermittently operates once per 5 seconds.

## 2-3. BLE Transmission

The board contains an integrated sensor (BME280) measuring temperature, humidity and pressure, an ambient light sensor (MAX44009), and a voltage regulator with a battery monitor (RP124) for measurement of the secondary battery voltage. It calculates the measured values at BLE transmission and transmits them as BLE advertising data.

**TBD**

## 2-4. Main Parts

Part No.	Product Name	Product No.	Vendor	Notes
IC1	Buck DC/DC Converter for Energy Harvest	R1800K022A	Ricoh Electronic Devices	For power control from a solar battery panel
IC2	Buck-boost DC/DC Converter	RP604K201B	Ricoh Electronic Devices	A power supply for the BLE module, etc.
IC3	Temperature, Humidity and Pressure Sensor	BME280	BOSCH	
IC4	LDO + Battery Monitor	RP124L123B	Ricoh Electronic Devices	A battery monitor for secondary battery voltage
IC6	Ambient Light Sensor	MAX44009	MAXIM	For illuminance measurement
IC7	BLE Module	RY7011A	Renesas Electronics	A BLE module including an MCU
B1	Secondary Battery	SLB series $\phi 3 \times 7$ L (mm)	Nichicon	

Links to datasheets of each component are below. (\*4)

R1800K022A

<https://www.e-devices.ricoh.co.jp/en/products/power/dcdc/r1800/r1800-ea.pdf>

RP604K201B

<https://www.e-devices.ricoh.co.jp/en/products/power/dcdc/rp604/rp604-ea.pdf>

RP124L123B

[https://www.e-devices.ricoh.co.jp/en/products/power/vr\\_ldo/rp124/rp124-ea.pdf](https://www.e-devices.ricoh.co.jp/en/products/power/vr_ldo/rp124/rp124-ea.pdf)

BME280

[https://www.bosch-sensortec.com/bst/products/all\\_products/bme280](https://www.bosch-sensortec.com/bst/products/all_products/bme280)

MAX44009

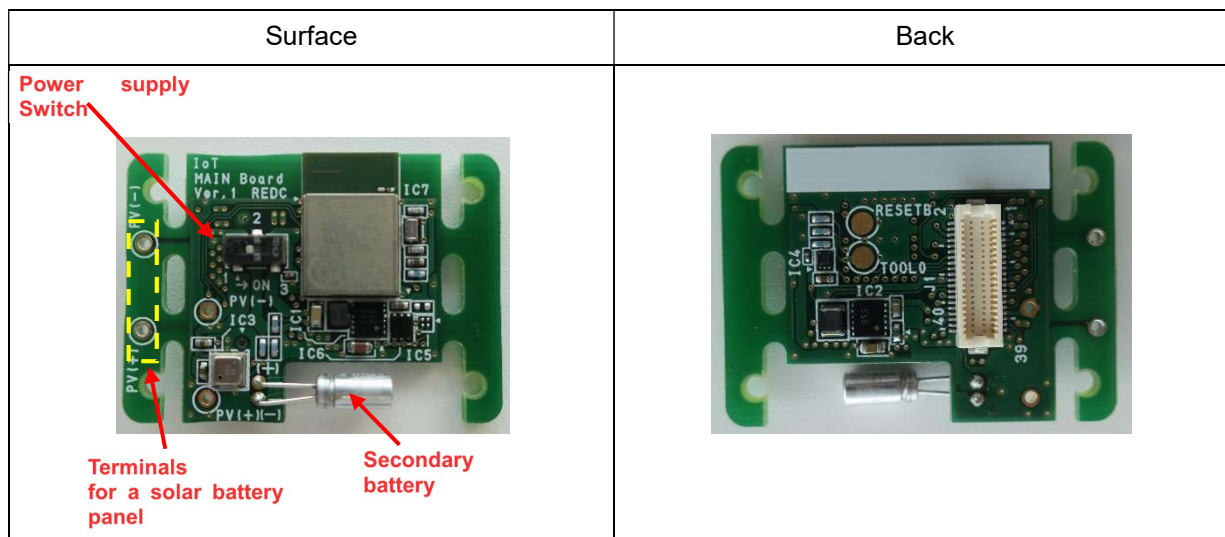
<https://www.maximintegrated.com/en/products/interface/sensor-interface/MAX44009.html>

RY7011A

<https://www.renesas.com/us/en/products/microcontrollers-microprocessors/rl78/rl78g1x/rl78g1d/device/RY7011A0000DZ00.html>

(\*4) Check the latest information on the vendors' web sites because the specifications and URLs may be updated.

## 2-5. Appearance



## 2-6. Recommended Solar Battery Panels

Amorphous silicon solar battery panels for indoor products suggested below are highly recommended.

Vendor: Panasonic Solar Amorton Co., Ltd.

Product name: AM-18xx series (open-circuit voltage:  $V_{OC} = 5.0\text{ V}$ )

Link to reference: <https://panasonic.co.jp/ls/psam/en/products/>

Other solar battery panels with  $V_{OC}$  from 4.0 V to 5.5 V are also available (optimal voltage: 5.0 V).

The terminals of the solar battery panel must be connected to the terminals of the board by such as soldering, etc.

## 2-7. Power Supply Switch

Slide the power supply switch to the ON printed on the board, and the board will start the operation as an environmental sensor by providing the BLE module and the sensors with electricity.