

# **RICOH Electronic Devices and NICHICON Develop a Wireless, Maintenance-Free IoT Access Point and Edge Device System**

**RICOH Electronic Devices Co., Ltd.  
NICHICON CORPORATION**

RICOH Electronic Devices Co., Ltd. and NICHICON CORPORATION have developed a wireless, maintenance-free IoT access point and edge device system that utilizes energy harvesting.

This product will be exhibited at the NICHICON booth at the ET & IoT 2021 exposition.

## **Development Background**

IoT-based remote monitoring of the surrounding environment (location, temperature, humidity, and other factors) is used for a wide range of applications such as to predict the maintenance needs of infrastructure and production facilities, confirm the location of containers and movable equipment, and in systems to watch over people and pets. This IoT system consists of an edge device equipped with various sensors that periodically collect data on the surrounding environment and transmit it wirelessly to an access point that receives the data and transfers it to a server.

RICOH Electronic Devices and NICHICON have collaborated to develop an IoT system consisting of a maintenance-free edge device and an access point capable of communicating with the edge terminal at a range of up to 200m. The edge device can be powered by energy harvesting and a rechargeable battery, and is equipped with an environmental sensor that can detect pressure, humidity, temperature, and gases (e.g., alcohol and organic solvent vapors). The device is also equipped with a motion sensor that can measure inclination and vibration.

The system uses a low-current-consumption step-down DC-DC converter for energy harvesters to step down the power generated by energy harvesters such as solar cells or microwave power supply and store it in a small li-ion rechargeable battery. The stored energy is efficiently converted by a low-current-consumption step-up DC-DC converter to achieve wireless and maintenance-free operation of the edge devices and access points.

The system can be installed indoors or outdoors without any wiring as long as energy harvesting or microwave energy charging is available. In addition to a wide variety of environmental data, it can collect data on the movement of objects on which sensors are installed. We expect the system to be used in a variety of places, including offices, stores, disaster sites, construction sites, factories, and exhibition halls.

## IoT System Configuration

Operation of the edge device, access point, and server



## Specifications

### IoT Edge Device:

Input voltage: 5.0V

Average operating current: Without GAS sensor: 9.7 $\mu$ A (TBC)

With GAS sensor: 90 $\mu$ A (TBC)

Sensor refresh interval: 10 seconds

Wireless specifications: Bluetooth Low Energy

Sensor specifications: Temperature, humidity, barometric pressure, illumination, acceleration, GAS (Indoor Air Quality)

Other functions: On-board Real Time Clock

Dimensions: W22.5mm X D22.5mm X H14mm

### Access Point:

Input voltage: 2.0V–5.5V

Average current: TBD

Wireless specifications: Bluetooth Low Energy

920MHz band wireless communication function

### On-Board Power Supply IC:

#### Power Supply IC for Energy Harvester R1801

A step-down DC-DC converter for power storage specialized for a photovoltaic energy harvester

- Ultra-low current consumption of typ. 200nA and high efficiency (80% at 10 $\mu$ A) at no load/room temperature
- Minimum EMF 1.00 $\mu$ W ( $V_{IN} = 4V$ ,  $V_{OUT} = 3.0V$ )
- Maximum power point control voltage and output voltage can be adjusted with external terminal

<https://www.n-redc.co.jp/en/products/dc-dc-switching-regulator/spec/?product=r1801>

#### DC-DC Converter for IoT Devices RP605

Ultra-low current consumption step-up/step-down DC-DC converter with battery monitor function

- RP604 awarded Electric/Electronic Components Award in 2019 Cho Monozukuri Innovative Parts and Components Awards
- Current consumption at no load of typ. 0.4 $\mu$ A (DC-DC part: 0.3 $\mu$ A, battery monitor part: 0.1 $\mu$ A)
- Maximum output current of 300mA (at step-down)

<https://www.n-redc.co.jp/en/about/info/20200129.html>

### **Low-Current-Consumption Real Time Clock (RTC) R2221**

Compact, two-wire (I2C bus) serial interface high-precision Real-Time Clock

- Ultra-low current consumption (typ. 0.18μA at 3V)
- 32kHz clock output function for sub-clock of external microcomputer
- I2C bus compliant (SCL, SDA) serial interface

<https://www.n-redc.co.jp/en/products/real-time-clock/spec/?product=r2221>

### **On-Board Rechargeable Battery:**

Edge device: SLB08115L140

Access point: SLB12400L151

<https://www.nichicon.co.jp/english/products/slb/>

#### **For Reference**

##### ■ RICOH Electronic Devices Co., Ltd.

RICOH Electronic Devices develops power supply IC products optimized for IoT applications and manufactures them at its own plants in Japan, with the aim of “continuing to assist customers without troubling them.”

##### ■ NICHICON CORPORATION

NICHICON is a global manufacturer of electronic components that develops, manufactures, and sells aluminum electrolytic capacitors, film capacitors, and circuit products. It pursues an aggressive corporate strategy in four market segments: Energy, Ecology & Medical equipment; Automotive & Railway-car related appliances; Home appliances & Industrial inverters; and Information & Communications equipment.

#### **Contact**

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