Connect with IoT

ROHM IoT Solutions

Creating novel devices and applications.
Semiconductor solutions that expand the possibilities of IoT.
Supporting manufacturing and contributing to society through innovative technologies.

ROHM Co., Ltd.
Adding sensor, control, and network algorithms

**IoT Initiatives**

Achieving IoT, in which devices are connected to the internet, involves sensors for detecting conditions, MCUs for processing sensor information, and networks for sharing and transmitting data. For many years, ROHM has been working on developing products and proposing solutions for creating sensor networks across the entire ROHM group. For example, one area where IoT is expected to make a significant impact is long-term equipment monitoring for machine health and infrastructure. Analyzing sensor data and creating algorithms to detect abnormalities will make it possible to predict breakdowns and accidents before they occur. We believe that new systems and services such as this will emerge as networks continue to evolve and expand, driving ROHM to leverage its resources and technologies to contribute to meeting the needs of the market and society.

**ROHM provides total solutions including sensors and wireless communication required for IoT**

**ROHM OPEN SOLUTIONS LAB**

ROHM Open Solutions Lab opened this spring as a communications space created with the goal of creating new solutions with customers by utilizing open source hardware and software.
**Algorithm-Based Analysis**

**Sensor Signal**
- Acceleration

**Frequency Analysis**
- Strength
- Correlation
- Frequency

**Gateway**

Detected abnormalities are sent to a gateway to be used for monitoring, operation, prevention, and improvement.

**ROHM IoT SOLUTIONS LAB  Factory Area**

- **A Abnormal Barometric Pressure Detection**
  Enables monitoring of the current value and changes in atmospheric pressure.
  - Barometric pressure sensor
  - Wi-SUN communication module

- **B Automatic Dimmer Control**
  Detects brightness and automatically monitors dimming and lighting conditions.
  - Ambient light sensor, LED driver

- **C Color Identification Management**
  Detects colors and monitors misuse and status.
  - Color sensor, Wi-SUN communication module

- **D Abnormal Vibration Detection**
  Monitors operating status. Allows for abnormality detection and predictive management.
  - Accelerometer, EnOcean® wireless communication module, high performance and ultra-low-power MCU

**ROHM IoT SOLUTIONS LAB  Home Area**

- **A Lighting Control**
  Performs indoor/outdoor operation and monitoring of lighting pattern and color temperature.
  - Wi-SUN communication module

- **B Presence Detection Control**
  Detects the presence of people and performs device operation. Supports wireless communication using energy harvesting technology.
  - EnOcean® wireless module

- **C Temperature/Humidity Management**
  Detects the humidity and temperature and monitors the indoor environment.
  - EnOcean® temperature/humidity sensor modules

- **D Open/Close Monitoring**
  Detects the opening/closing of doors and windows and manages status. Monitors door locks and manages indoor traffic.
  - EnOcean® magnetic contact module
Connect with IoT

Communication using the universal 2.4GHz frequency band

**Wi-Fi Module Evaluation Kits** BP359x series

The BP359x series integrates ROHM’s BU1805GU system IC and is certified under both the IEEE802.11b/g/n standard and Japan’s Radio Law. Pre-tuned wireless characteristics and built-in antenna allow customers to skip radio waves and immediately begin evaluation and development without complicated characteristics adjustment. In addition, the optimized antenna configuration eliminates the need for high-frequency designs.

- **UART**
  - Onboard RS-232C I/O
  - USB-UART conversion
  - Supports USB BUS power

*BP359C can be used with both BP3591 and BP3599.

*(When using BP359I perform startup with the flash memory on BP3598. When using BP3599 perform startup using the flash memory on BP3598.)*

**Wireless LAN Module Lineup**

- **BP359I**
- **BP359S**
- **BP3599**

All necessary documents and software can be downloaded from ROHM’s website.

**Wi-Fi Support Page**


**Wi-Fi Module Evaluation Kits** EDK 400J

**EnOcean® Evaluation Kit** EDK 400J

EnOcean’s module is an ultra-low-power wireless communication device that can be installed virtually anywhere, featuring a battery-less design that requires no maintenance. The lack of wiring allows it to be introduced even in hotels and important cultural institutions. The EDK 400J evaluation kit is a programming kit that facilitates application development.

**Bundled Products (i.e. EDK 400J)**

- PTM 2102 (Switch Module)
- USB 400L (Receiver USB Module)
- PTM 430J (Electronic Circuit Board for Switch Module)
- ECO 200 (Electromagnetic Induction Element for Switch Module)
- STM 431J (Temperature Sensor Module)
- STM 400J (Wireless Energy Harvesting Module)*
- EOP 350 (Programming Board)*
- USB Cable (for connecting the EOP 350 to a PC)*

*Evaluation Kit Contents

1. STM 400J within the EDK 400J is mounted on a dedicated board for connecting to EOP 350.  
2. Used when mounting firmware for STM 431J and STM 400J.

**Dolphin V4 API (S/W)**

EDK 400J is available for purchase.

- Library files
- Manual on peripheral functions
- Sample source

**Dolphin V4 Suite (S/W)**

A software group for performing program writing, device settings, and chip calibration.

**Keil integrated development environment (µVision)**

Together with Dolphin V4 API/Suite (S/W), allows for series firmware development including original firmware coding, compiling, and writing.

**Dolphin View**

An evaluation tool for evaluating and analyzing EnOcean® wireless signals.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Target Country/Region</th>
<th>EDK Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>902MHz</td>
<td>Japan (ARIB STD-T-108)</td>
<td>EDK 400J</td>
</tr>
<tr>
<td>902MHz</td>
<td>North America (FCC PART 15)</td>
<td>EDK 350U</td>
</tr>
<tr>
<td>868MHz</td>
<td>EU, India (ETSI EN 300 220)</td>
<td>EDK 350</td>
</tr>
</tbody>
</table>

**Note:** Each product will support a different frequency based on country/region.

**Dedicated EnOcean® Site**


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Registered as a Wi-SUN certified CTBU

**Wi-SUN USB Dongle** BP35C2

ROHM’s BP35C2 is a USB dongle that integrates the BP35C0 featuring class-leading* reception sensitivity. The built-in antenna, pre-adjusted wireless characteristics, Radio Law certification, and installed MAC addresses make it possible to easily construct a Wi-SUN environment by simply connecting to the USB port of IoT equipment such as home gateways.

**BP35C2 USB Dongle**

- Host CPU I/F: USB
- Size: 21.4×9.7×8.5
- Supply voltage: 4.5 to 5.5V (single power supply)
- Operating Temperature: 20 to +50

**Onboard Wi-Fi Module BP35C0**

- Built-in system LSI: ML7416N
- 900MHz band transceiver type
- Compatible with ARIB STD-T108
- Supply voltage: 2.6 to 3.6V (single power supply)
- Host CPU I/F: UART

**Frequency**

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</tr>
<tr>
<td>EU, India (ETSI EN 300 220)</td>
<td>Under Planning</td>
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</tbody>
</table>

**Note:** Each product will support a different frequency based on country/region.

Ideal for compact communication equipment such as HEMS controllers and consumer appliances

The BP35C0 is a compact surface-mount Wi-SUN module (utilizing external antenna) equipped with an MCU, 920MHz band radio communication function (RF) featuring class-leading* reception sensitivity, and LAPIS Semiconductor’s ML7416N wireless communication IC with large memory capacity optimized for Wi-SUN.

In addition, support for HAN and Wi-SUN B route profile is provided in a class-leading* small 18mm x 19mm size, making it ideal for HEMS controllers and home appliances. Naturally, the dongle conforms to the ARIB STD-T108 standard, ensuring compliance under Japan’s Radio Law.

**Wi-SUN-certified CTBU**

**MCU- Equipped RF Module** BP35A1

The BP35A1 is a 920MHz specified low power wireless module that supports Wi-SUN (Wireless Smart Utility Network). Incorporating a 32bit high power MCU enables adoption in a variety of HEMS devices. In addition, the user-friendly module is Radio Law certified (Japan) and includes firmware is compatible with the Wi-SUN standard ideal for IoT/M2M/HEMS/BEMS equipment. It is also registered as a CTBU (Certified Test Bed Unit) recognized by the Wi-SUN Alliance as a reference standard, playing the role of a reference unit for Wi-SUN communication.

**BP35A1**

- Onboard RS-232C I/O
- USB-UART conversion
- Supports USB BUS power

**Evaluation Kit**

**LAPIS Semiconductor RFID: Class-leading* reception sensitivity.**

**BP35A1**

**Specified Low Power Module BP35A1**

**Adapter Board BP35A7A**

**Sub-Board BP35C2**

**Wireless LAN Module Lineup**

- **BP35A1**
- **BP35A7A**
- **BP35A1 (Adapter Board)**
- **BP35C2 (Sub-Board)**

**Certification Number**

- ROHM October 2017 study

**Note:** This product is limited to Japan.

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**BP3599**

**Note:** This is product limited to Japan.
USB-UART conversion
Onboard RS-232C I/O

BP35C0-Equipped Adapter Board
Integrates the industry's smallest SMD module BP35C0

USB type enables immediate evaluation via PC

Bluetooth® USB Dongle
MK71251-02B-USB-EK
We offer tools for evaluating and developing applications using LAPIS Semiconductor's Bluetooth® module. In addition to a smartphone application (BLE Tool) that facilitates the development of communication devices with a smartphone, GUI tools for easy PC settings, and USB-type evaluation boards that enable immediate development using a PC, we contribute to customer development with a serial communication SDK, beacon SDK, and Beacon Tool smartphone application optimized for beacon development.

MK71251-02B-USB-EK (USB Dongle)
MK71251-02B-USB-EK (USB Dongle) are also compliant with the radio laws in the US (FCC), Canada (IC), and the EU (CE). And even in wearables and other products expected to be adopted overseas, it will be possible to broadcast radio waves as in Japan.

Numerous Development Support Tools
The BLE TOOL smartphone app for Bluetooth® low energy control enables easy verification of Bluetooth® low energy device communication. In addition to 7 standard Bluetooth® SIG profiles*1 and services, users can perform evaluation and communication demos of LAPIS Semiconductor's original VSSPP (serial port profile) and VSP (acceleration profile).

Using the BEACON TOOL smartphone app for Bluetooth® low energy beacons makes it possible to evaluate the beacon device functionality of the MK71251-02B. In addition to evaluating beacon packet reception and display, operations such as updating of the iBeacon application code wirelessly using the OAU*2 function can be verified.

Beacon Evaluation Smartphone Application
Bluetooth®

Free

Control Smartphone Application
Bluetooth®

Free

MK71251-02B-USB-EK
MK71251-02B-USB-EK

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Wireless Communication/ MCU Evaluation Kits
Integrated support provided, from design and coding to evaluation and ROM code writing

On-Chip Debug Emulator
uEASE/nanoEASE

LAPIS Semiconductor’s program development support system consists of hardware and software tools that actively support program development. The software tools feature a user-friendly graphical user interface (GUI) that facilitate operation, making it possible to perform tasks more efficiently - from program creation and build (object creation) to debugging.

MCU with On-Chip Debugger uEASE

uEASE is a standard on-chip emulator that supports all LAPIS Semiconductor 8bit/16bit flash MCUs.
Size: 50.0 (D) × 90.0 (W) × 17.0mm (H) Weight: 50g

MCU with On-Chip Debugger nanoEASE

nanoEASE, which supports LAPIS Semiconductor 8bit/16bit flash MCUs (generate an internal voltage) that operate from a single power supply, is a more compact on-chip debugger than uEASE.
Size: 50.0 (D) × 60.0 (W) × 7.0mm (H) Weight: 15g

ROHM Group MCUs for IoT
Low Power Microcontrollers
LAPIS Semiconductor’s low-power MCUs achieve class-leading* performance by leveraging original low power technologies cultivated over many years. For IoT, high performance a CMOS MCUs equipped with a proprietary 16bit RISC-type U16 core and 32bit ARM® Cortex®-M0+ are available. Other lineups are offered to meet diverse customer needs, including ‘tough’ MCUs strong against noise and high-temperature environments.

High Performance Ultra-Low Power 16bit MCUs
ML620Q503H/ML620Q504H
These high performance 16bit CMOS MCUs integrate a proprietary RISC-type 16bit CPU U16 core. LAPIS Semiconductor was able to improve upon the low power technology of its 8bit U8 Core MCUs while increasing processing power. In addition, current consumption is reduced by optimally combining 3 power down modes, and the broad range of peripherals supports a variety of system requirements.

High Performance Ultra-Low Power 32bit MCUs
ML630Q464/ML630Q466
32bit MCUs ideal for USB data loggers in cold chain applications. Built-in USB2.0, PDF generation function, and LCD driver makes it possible to safely store and transfer log data.

High Performance Low Power ‘Tough’ MCUs
ML62Q1000 series
High performance 16bit CMOS MCUs utilizing an original U16 Core. This series inherits the superior noise immunity and high temperature characteristics of LAPIS Semiconductor’s market-proven ‘tough’ MCUs. Superior processing performance with abundant peripherals is achieved while maintaining low power consumption. The lineup includes general-purpose high performance types with program memory ranging from 16KB to 256KB as well as models that integrate an LCD driver.

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ROHM offers complete solutions, including sensors, wireless communication, gateways, and cloud required for IoT.

**Proposed collaborations**

We can provide proposals regarding device development in response to customer demands. We also offer optimal IoT solutions, including sensors, MCUs, and wireless communication, based on system proposals in collaboration with leading manufacturers.

### Sensing & Wireless

- **Frequency Band:**
  - 2.4GHz
  - 920MHz band

- **Communication Distance:**
  - Several tens of meters or more
  - Approx. 100m

- **Communication Speed:**
  - 72Mbps
  - 125kbps
  - Up to 9,600bps

### Motion Sensors

- Acceleration
- Gyroscope
- Geomagnetic
- Pressure
- Capacitive Switch
- Touchscreen
- Human Presence

### Environmental Sensors

- Color
- Optical Heart Rate
- Temperature
- Ambient Light
- Proximity
- Infrared
- Hall
- Soil

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**IEEE 802.15.4**

- Frequency Band: 2.4GHz
- Communication Distance: Tens of meters
- Communication Speed: 250Mbps

**Bluetooth**

- Frequency Band: 2.4GHz
- Communication Distance: Approx. 10m
- Communication Speed: 1Mbps

**Broadband**

- Frequency Band: 900MHz band
- Communication Distance: Approx. 500m
- Communication Speed: 50kbps and up

**Narrow Band**

- Frequency Band: 426/429MHz
- Communication Distance: Hundreds of meters
- Communication Speed: Up to 9,600bps

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**Low Power MCU**

- Frequency Band: 2.4GHz
- Communication Distance: Several tens of meters or more
- Communication Speed: 72Mbps
ROHM Sensor Medal

ROHM’s sensor medal is a wireless sensor evaluation kit that integrates ROHM group motion sensors. It can instantly detect the wearer’s activity as well as the location/movement of equipment. In addition, the energy-saving design makes it ideal for IoT applications. And the built-in 16bit low power MCU facilitates evaluation of sensor data using an app on a smartphone or tablet.

Board Layout

Web Page
Konix Iot Evaluation Kit: Frequency 868MHz (North America)
URL: http://www.konix.com/iot-evaluation-and-development-kit
All information is available on the below websites.

Board Layout

Web Page
Part No. BTL3X3/BTL4X1: Frequency 915MHz (EU/India)
URL: https://www.kionix.com/iot-evaluation-and-development-kit
All required documents and software can be downloaded from ROHM’s website.

Applications

Applications and sensor loggers that chronologically display the data of each sensor are available. The software is compatible with Android™.

Web Page
ROHM Sensor Medal: Frequency 920MHz (Japan)
URL: http://www.rohm.co.jp/web/japan/sensor-medal-support
All required documents and software can be downloaded from ROHM’s website.

Note: Android™ is a registered trademark of Google Inc.
ROHM IoT Catalogs

In addition to this IoT brochure, we offer catalogs on our broad portfolio of sensors, wireless ICs/modules, and low power MCUs.

Sensor Catalog

Here we introduce the ROHM Group’s broad portfolio of sensors, from motion sensors capable of accurately detecting the movement and orientation of objects to environmental sensors designed to quickly sense ambient conditions. Also included are interfaces for analyzing, amplifying, and processing sensor output signals.

Wireless LSIs/Modules

The ROHM Group’s wireless communication ICs and modules are described in detail. The broad lineup covers the sub-GHz to 2.4GHz bands, allowing users to select the ideal protocol based on set requirements, from IEEE802.15.4 and Bluetooth® to even the newest standards such as LPWA.

Low Power Microcontrollers

ROHM Group company LAPIS Semiconductor achieves class-leading* performance by leveraging proprietary low-power technology. As such, they have been widely adopted in a variety of markets, including home appliances, industrial equipment, and infrastructure. The wide lineup includes both high performance types and low power ‘tough’ MCUs ranging from 8bit to 32bit, making it possible to meet a variety of application needs.

*LAPIS Semiconductor October 2017 study

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4) Examples of application circuits, circuit constants and any other information contained herein are provided only to illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.
5) The technical information specified herein is intended only to show the typical functions of and examples of application circuits for the Products. ROHM are not grant you, explicitly or implicitly, any license to use our intellectual property or other rights held by ROHM or any other parties. ROHM shall have no responsibility whatsoever for any dispute arising out of the use of such technical information.
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7) The Products specified in this document are not designed to be radiation tolerant.
8) For use of our Products in applications requiring a high degree of reliability (as exemplified below), please contact and consult with a ROHM representative: transportation equipment (cars, ships, trains), primary communication equipment, traffic lights, fire/already protection, safety equipment, medical systems, servers, solar cells, and power transmission systems.
9) Do not use our Products in applications requiring extremely high reliability, such as aerospace equipment, nuclear power control systems, and submarine repeaters.
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