Creating novel devices and applications.
Semiconductor solutions that expand the possibilities of IoT.
Supporting manufacturing and contributing to society through innovative technologies.
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** ➔ **wireless communication** required for IoT

**ROHM OPEN SOLUTIONS LAB**

Opened in 2017, ROHM OPEN SOLUTIONS is a communication space created with the goal of developing new solutions in tandem with customers by leveraging open source hardware and software.
**Gateway**

**Algorithm-Based Analysis**

- **Sensor Signal**
  - Acceleration

  ![Graph showing frequency analysis](image)

**Cloud**

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

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**ROHM IoT SOLUTIONS LAB Factory Area**

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

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

- **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

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

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**ROHM IoT SOLUTIONS LAB Home Area**

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

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

- **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

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**Legend**

- A: Lighting Control
- B: Presence Detection Control
- C: Temperature/Humidity Management
- D: Open/Close Monitoring
- E: Abnormal Barometric Pressure Detection
- F: Automatic Dimmer Control
- G: Abnormal Vibration Detection
- H: Color Identification Management
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 PDU

*BP3595 can be used with both BP3591 and BP3599. (When using BP3591, perform startup with the flash memory on BP3590. When using BP3599, perform startup using the flash memory on BP3598.)*

**Frequency**

- 920MHz
- 915MHz
- 868MHz

**Registration and Certification**

- Japan (ARIB STD-T-108)
- North America (FCC PART 15)
- EU, India (ETSI EN 300 220)

- Supports USB BUS PDU
- Supports Wi-SUN B route profile
- Supports HAN and Wi-SUN B route profile
- Supports Wi-SUN B route profile and HAN

**Features**

- Supports USB BUS PDU
- Supports Wi-SUN B route profile
- Supports HAN and Wi-SUN B route profile
- Supports Wi-SUN B route profile and HAN

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

- PTM 430J (Switch Module)
- USB 400J (Power USB Module)
- PTM 430J (Electronic Circuit Board for Switch Module)
- ECO 200J (Electronic Induction Element for Switch Module)
- STM 433J (Temperature Sensor Module)
- STM 400J (Wireless Energy Harvesting Module)
- EOP 350J (Programming Board)*
- USB Cable (For connecting the EOP 350 to a PC)

*Evaluation Kit Contents

**Note**

- Each product will support a different frequency based on country/region.
- This is product limited to Japan.

**MCU-Equipped RF Module**

**BP35A1**

- Onboard RS-232C I/O
- USB-UART Conversion
- Supports USB BUS Power

**Wi-sun certified CTBU**

**BP35C2**

- Host CPU IF: USB
- Size: 21.4x49.7x8.5mm
- Supply Voltage: 4.5 to 5.5V (Single Power Supply)
- Operating Temperature: -20 to +50°C

**Onboard Wi-SUN 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 IF: UART

**Frequency**

- 920MHz
- 915MHz
- 868MHz

**Note**

- Each product will support a different frequency based on country/region.
- This is product limited to Japan.

**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, 920 MHz 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 15mm 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.
MK71251-0xx-USB-EK(USB Dongle)

MK71251-0xx-USB-EK(USB Dongle) are also compliant with the radio laws in the US (FCC), Canada (IC), and the EU (CE). And even in wearable 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 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 the iBeacon application code wirelessly using the OALU® function can be verified.

Integrates the industry's smallest SMD module BP35C0

BP35C0-Equipped Adapter Board BP35C0-T01

ROHM's BP35C0-T01 evaluation board with built-in compact Wi-SUN compatible general-purpose module (BP35C0) supports connection to the BP35C. Wi-SUN firmware is installed in the MCU, and the board has achieved certification under Japan's Radio Law in an industry-small form factor (15mm×19mm), making it ideal for compact communication equipment such as HEMS controllers and consumer appliances utilizing Wi-SUN.

BP35C0-T01
Adapter board equipped with BP35C0

BP359C
Conversion Board for UART 5/6
• Onboard RS-232C I/O
• USB-IUART Conversion
• Supports USB BUS Power

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

Wi-SUN Board Page [Japanese]

URL: https://micro.rohm.com/jp/download_support/wi-sun/

Wireless Communication/ MCU Evaluation Kits

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 EASE1000/uEASE

EASE1000/uEASE are standard on-chip emulators compatible with LAPIS Semiconductor's entire lineup of 8bit/16bit flash MCUs. Size : 50.00(W)×30.00(D)×17.00(H)[mm], 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 : 50.00(W)×60.00(D)×7.00(H)[mm], Weight : 15g

LAPIS Semiconductor's low-power MCUs achieve class-leading* performance by leveraging original low power technologies cultivated over many years. For IoT, high performance 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 optionally 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.

Note: This is product limited to Japan.

*ROHM October 2018 study
ROHM offers complete solutions, including Sensors, Wireless Communication, Gateways, and Cloud, required for IoT.

**Sensing & Wireless**

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

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

- **IEEE 802.15.4**
- **Bluetooth**
- **WiSUN**

**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.

**Motion Sensors**
- Acceleration
- Gyroscope
- Geomagnetic
- Pressure
- Capacitive Switch
- Touchscreen
- Presence Detection

**Environmental Sensors**
- Color
- Optical Heart Rate
- Temperature
- Ambient Light
- Proximity
- Infrared
- Hall
- Soil
Sensor Evaluation Kit

This sensor shield is an evaluation kit designed to be used in combination with ROHM’s high-performance sensor modules. The sensor expansion board supports open platforms such as Arduino Uno and mbed®. And various documents and software are available for download from the dedicated sensor shield page. Ideal for prototyping and initial set development.

Broad Sensor Lineup

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accelerometer</td>
<td>KX224-1053</td>
</tr>
<tr>
<td>Geomagnetic Sensor</td>
<td>BM1422AGMV</td>
</tr>
<tr>
<td>Pressure Sensor</td>
<td>BM1383AGLV</td>
</tr>
<tr>
<td>Color Sensor</td>
<td>BH1749NVC</td>
</tr>
<tr>
<td>Optical Sensor for Heart Rate Monitor</td>
<td>BH1790GLC/BH1792GLC</td>
</tr>
<tr>
<td>Temperature Sensor</td>
<td>BD1020HVF</td>
</tr>
<tr>
<td>Ambient Light Sensor and Proximity Sensor</td>
<td>RPP-0521RS</td>
</tr>
<tr>
<td>Hall IC</td>
<td>BTD411G</td>
</tr>
</tbody>
</table>

Additional Sensor Modules (Sold Separately)

- Optical Sensor for Heart Rate Monitor: BH1792GLC
- Current Sensor: <BM14270MLUV

Various documents and software can be downloaded from the dedicated sensor shield page.

Applications

Internet of Things (IoT), Electronic circuits and training materials

Sensor Shield Page

URL: https://www.rohm.com/sensor-shield-support

*Refers to an MCU board for prototyping and programming

Sensor IC

- BH1422AGMV
- BH1792GLC
- KX126-1063
- BM14270MLUV
- BM1383AGLV
- BH1790GLC
- BD1020HVF
- RPR-0521RS

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

SensorMedal-EVK-002

URL: https://www.rohm.com/sensor-medal-support

RoKiX-Sensor-Node-EVK-701

URL: https://github.com/RohmSemiconductor/RoKiX-IoT-Platform

Target Applications: IoT prototyping, programming learning (e.g. Python/C/C#)

Online Distributors


Add-On Board for Sony® SPRESENSE™

The SPRESENSE-SENSOR-EVK-701 sensor and SPRESENSE-BLE-EVK-701 Bluetooth® low energy add-on boards integrate SPRESENSE’S GPS receiver function and high resolution audio codec along with sensor and BLE communication functionality, contributing to the evaluation and development of more advanced IoT devices.

Applications

GPS trackers, drones, and IoT equipment

Dedicated site for Sony® SPRESENSE™ add-on boards

URL: https://www.rohm.com/support/spresente-add-on-board

Allows users to download various necessary documents and software.

Off Code

Sensor evaluation kit featuring wireless communication

Ideal for initial module development using sensors and radio

Accelerates IoT device development by simplifying the introduction of sensors and Bluetooth low energy communication

Available for purchase in single units

Provides wireless capability and instantaneous sensing with smartphones and tablets.
In addition to this IoT pamphlet, ROHM provides catalogs for Sensors, Wireless Communication LSIs/Modules, and Low Power MCUs.

**Sensor Catalog**

Contains detailed information on ROHM Group sensor products. The wide lineup includes environmental sensors that can quickly detect ambient conditions and motion sensors capable of accurately detecting the orientation and movement of objects. Interfaces are also available for carrying out amplification, analysis, and processing of sensor output signals.

**Wireless Communication LSIs/Modules**

Details the entire lineup of wireless communication ICs and modules offered by the ROHM Group. The broad portfolio covers the Sub-GHz to 2.4GHz bands, as well as multi-band types. And a variety of standards are supported, from LPWA and IEEE802.15.4 to specified low power wireless and Bluetooth. 13.56MHz wireless charger chipsets are also offered, allowing users to select the ideal product based on application requirements.

**Microcontrollers**

ROHM Group company LAPIS Semiconductor leverages original low power technology to achieve class-leading performance. The extensive lineup of market-proven products has been adopted in a wide range of applications, including consumer electronics, industrial equipment, and public infrastructure. Users can select from a variety of MCU types in different capacities from 8bit to 32bit along with 'tough' high performance models.

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Catalog No. 61X7158B-01 0.19 ROHM © PDF