



Connect with IoT

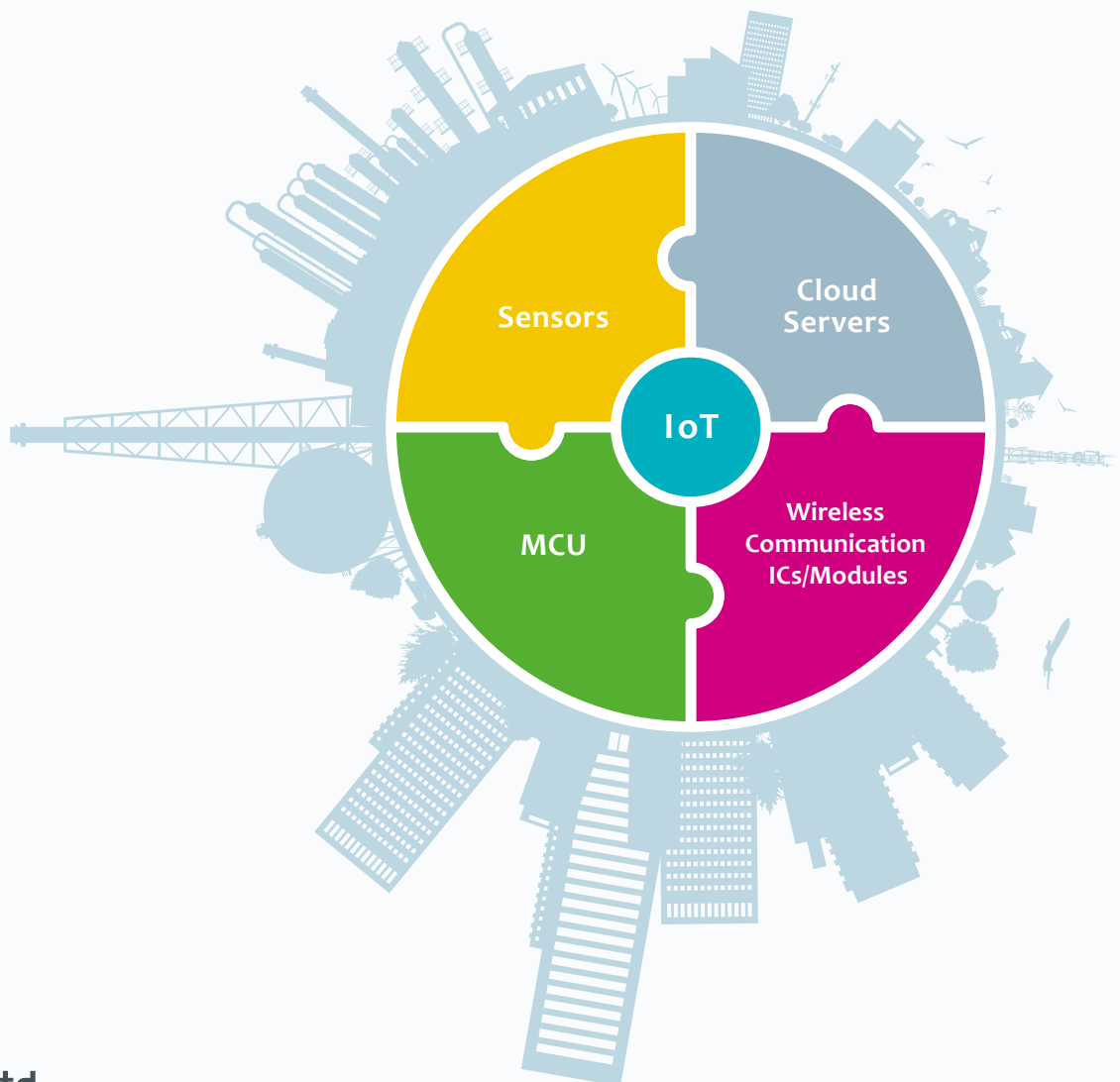
Start using in  
just **10** minutes

# 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.



Connect with IoT

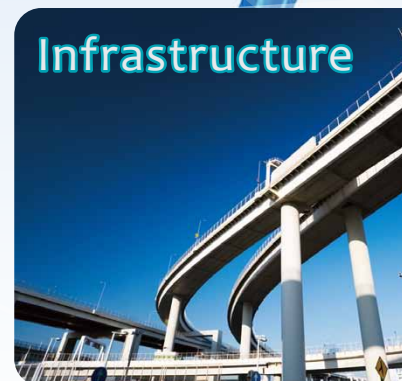
# IoT Initiatives

Achieving IoT, in which a wide range of devices are connected to the Internet, requires sensors for detecting environmental and physical conditions, MCUs for processing sensor information, and networks for transmitting and sharing the data.

The ROHM Group has been committed to proposing solutions and developing products for constructing sensor networks.

For example, proprietary sensor technologies are used to achieve long-term sensing operation in machine health monitoring and social infrastructure applications. Providing the capability of monitoring and detecting abnormal sensor information will make it possible to prevent breakdowns and accidents before they occur. We also believe that sensor networks will lead to the realization of new systems and applications.

ROHM will continue to leverage its experience, expertise, and technologies to contribute to safer, more comfortable living through IoT.



# Environment



# Building



# Agriculture



# Security



The ROHM Group



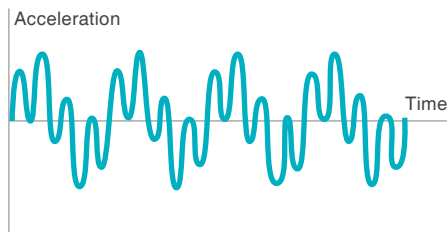
# Connect with IoT

Typically, symptoms arise before a machine breaks down. In these cases, ROHM believes failures and breakdowns can be prevented through constant monitoring for abnormalities in order to prevent sudden machine stoppages.

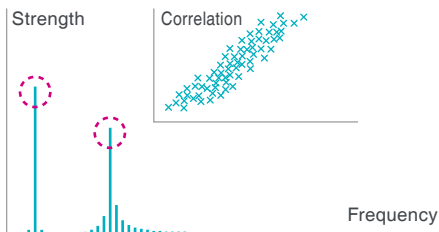


## Algorithm-Based Analysis

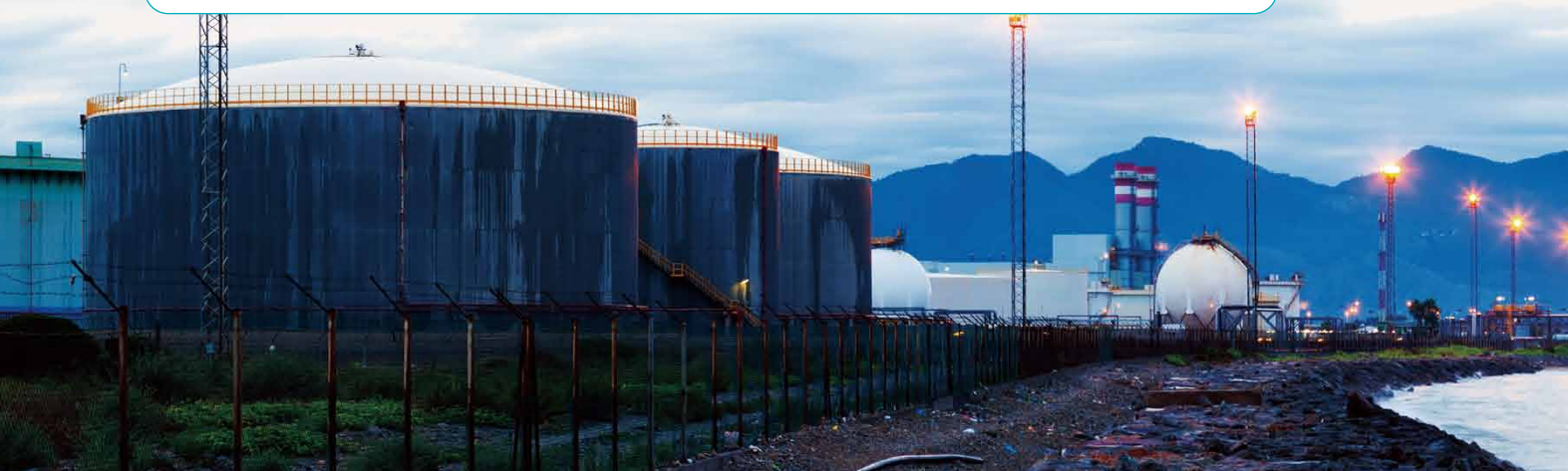
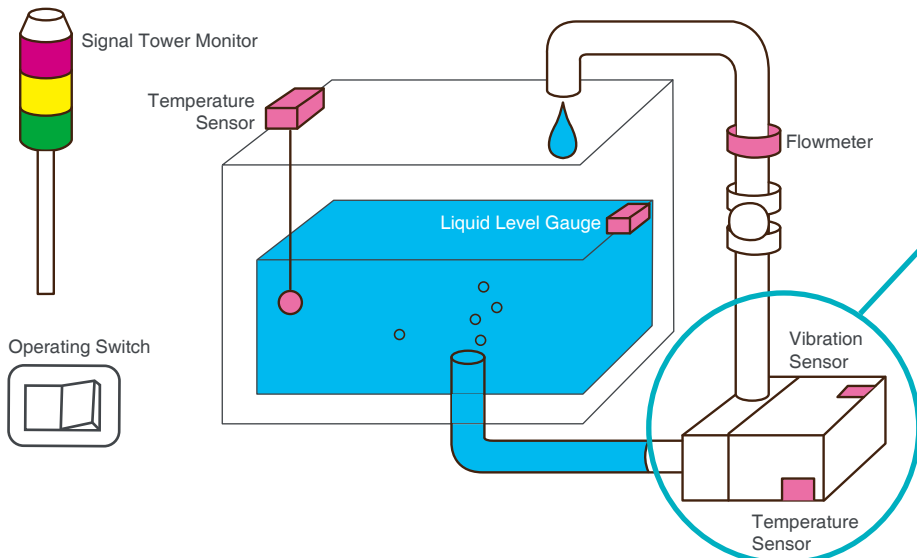
### Sensor Signal



### Analysis



## Monitoring



# IoT Solutions

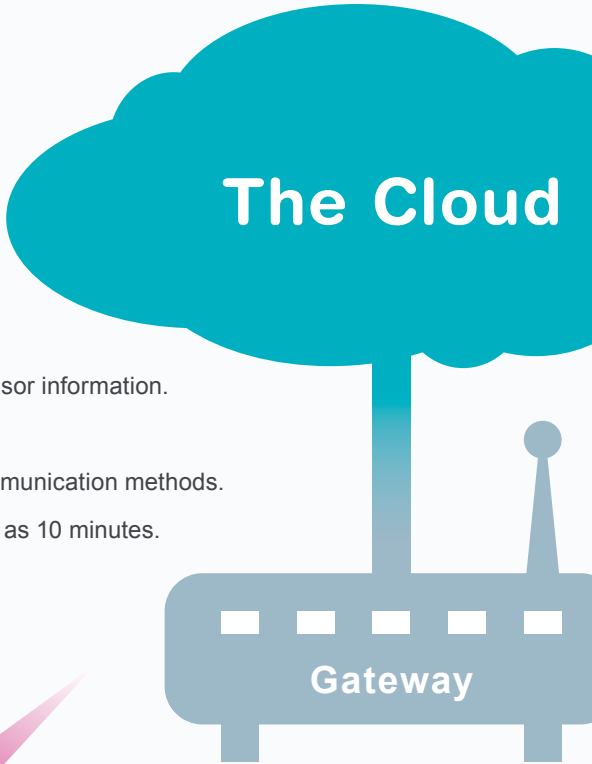
When introducing IoT, the first step is to acquire sensor data from various devices and use a network to collect this data.

However, many challenges exist in collecting, processing, and transmitting sensor information.

ROHM offers a variety of sensors that make it easy to achieve IoT along

with a development kit designed to acquire sensor data utilizing optimized communication methods.

The development kit is designed to implement IoT and can be set up in as little as 10 minutes.



Communication Distance  
**up to 500m**



## Optimized for a Wide Range of Fields

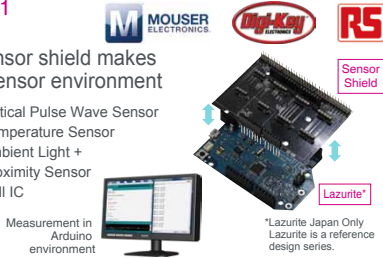
The SensorShield-EVK-001 evaluation kit is capable of long-distance communication with low power consumption, making it suitable for applications requiring transmission over wide spaces such as factories and the outdoors.

### IoT Solutions

#### SensorShield-EVK-001 Evaluation Kit

Arduino-compatible sensor shield makes it easy to configure a sensor environment

- Accelerometer
- Gyroscope
- Geomagnetic
- Pressure Sensor
- 10-Axis Motion Module
- Color Sensor
- Optical Pulse Wave Sensor
- Temperature Sensor
- Ambient Light + Proximity Sensor
- Hall IC



#### BP35C2 USB Dongle

USB dongle with Wi-SUN compatible firmware



BP35C2 USB Dongle  
Operating Temp. Range:  
-20°C to +50°C

#### Surface Mount Wi-SUN Module BP35C0 Built In

- Integrated System IC: ML7416N (LAPIS Semiconductor)
- 920MHz Band Transmission/Reception Type
- ARIB STD-T108 Compliant
- Supply Voltage: 2.6 to 3.6V (Single Power Supply)
- Host CPU I/F: UART
- Operating Temp. Range: -30°C to +85°C

Frequency	Target Country/Region	SMD Type Part No.	USB Dongle Type Part No.
920MHz	Japan (ARIB STD-T-108)	BP35C0	BP35C2
915MHz	North America (FCC PART 15)	Under Development	Under Development
868MHz	EU, India (ETSI EN 300 220)	Under Development	Under Development

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

### Application Examples: IT agriculture, smart factories

Sensors can be used for



Communication Distance  
**10 to 100m**



## Control Using a PC

ROHM offers modules that integrate a TCP/IP protocol stack with authentication and encryption (supplicant and WPS), allowing for easy connection with Wi-Fi compatible devices.

### IoT Solutions

#### BP359C Evaluation Board

FCC (North America) and Japan Radio Law certified  
Immediately start sensor evaluation and development wireless LAN modules

- Built-In RS-232C I/O
- USB-UART Conversion
- Supports USB Bus Power

#### Wireless LAN Module Lineup



Only the BP359B is Japan Radio Law certified.

### Application Examples: Sensor control from a PC or tablet

Sensors can be used for



## ROHM Group Sensor Devices

### Motion Sensors



Accelerometer Gyroscope Geomagnetic Pressure

### Environmental Sensors



Color Pulse Temperature Ambient Light Proximity Infrared Hall Soil

### Sensor I/F



Capacitive Switch Touch Screen Motion Detection

Communication Distance  
up to 100m



## Batteryless EnOcean Kit

EnOcean's ultra-low-power communication device features a wire-free, batteryless design that eliminates the need for regular maintenance (i.e. battery replacement) and allows mounting virtually anywhere. The fact that no wiring is required (for power) makes it suitable for use in hotels, institutions, and places with important (cultural) assets.

### IoT Solutions

#### EDK Series Evaluation Kit

Programming kit ideal for firmware/application development, prototyping, and as a teaching tool

#### Included Items (i.e. EDK 400J)

- PTM 210J (Switch Module)
- USB 400J (USB Receiver Module)
- PTM 430J (Circuit Board for Switch Module)
- ECO 200 (Electromagnetic Induction Generator Element for Switch Module)
- STM 431J (Temperature Sensor Module)
- STM 400J (Wireless Energy Harvesting Module)\*1
- EOP 350 (Programming Board)\*2
- USB Cable (for Connecting the EOP 350 to a PC)



\*Representative image

\*1: The STM 400 in the EDK 400J is mounted on a dedicated board for connecting to the EOP 350.  
\*2: Used when writing firmware for STM 431J and STM 400J.

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

Requires purchase of the EDK Series.

- Library files
- Peripheral functions manual
- Sample source code

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

Software bundle that performs program writing, product settings, and chip calibration.

#### Keil Integrated Development Environment (µVision)

In conjunction with Dolphin V4 API/Suite (S/W), makes it possible to carry out a series of firmware (F/W) development tasks such as original firmware coding, compiling, and writing.

#### Dolphin View

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

Frequency	Target Country/Region	EDK Series
928.35MHz	Japan (ARIB STD-T-108)	EDK 400J
868.300MHz	North America (FCC PART 15)	EDK 350U
902.875MHz	EU, India (ETSI EN 300 220)	EDK 350

The frequency each product supports will vary depending on country/region

Communication Distance  
up to 10m



## Control Using a Smartphone

These ultra-low-power modules integrate peripheral components required for operation, such as antennas, and have received radio certification not only in Japan, but in the US (FCC), Canada (IC), and the EU (CE) as well.

### IoT Solutions

#### MK71251-xxx-USB-EK USB Dongles

#### Multiple development tools offered

- GUI tools enables easy setting using a PC
- BLE Tool facilitates development and communication using a smartphone
- Smartphone app Beacon Tool provided for beacon evaluation



### Application Examples: Sensor control using a smartphone

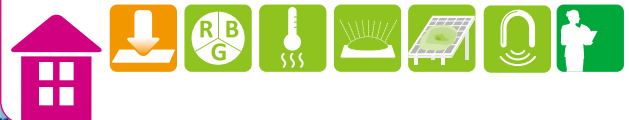
#### Sensors can be used for



\*Bluetooth® is a registered trademark of Bluetooth® SIG

### Application Examples: HEMS, BEMS

#### Sensors can be used for



\*EnOcean® is a registered trademark of EnOcean® GmbH.



# Sensor Shield

SensorShield-EVK-001



ROHM's sensor shield is an evaluation kit that allows users to combine and operate 10 high-performance sensors. The sensor expansion board supports open MCU platforms such as Arduino Uno and mbed\*. A dedicated site offers a variety of materials for download, including manuals and development software, enabling initial set development of modules with sensing and wireless capability.

## Sensor Kit Lineup

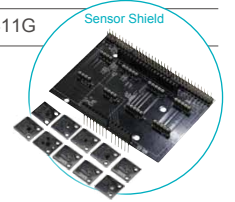
Sensor	Part No.	Sensor	Part No.
Accelerometer	KX022-1020	Color Sensor	BH1745NUC
Pressure Sensor	BM1383AGLV	Optical Pulse Wave Sensor	<b>New</b> BH1790GLC-EVK-001
Geomagnetic	BM1422GMV	Temperature Sensor	BD1020HFV
Gyroscope	<b>New</b> KXG03-EVK-001	Ambient Light + Proximity Sensor	RPR-0521RS
10-Axis Motion Module	<b>New</b> IMU-10DOF-EVK-001	Hall IC	BD7411G

A variety of materials (i.e. documents, software) are available for download from ROHM's sensor shield web page.

## Sensor Shield Web Page

<http://www.rohm.com/web/global/sensor-shield-support>

\*Refers to a prototyping MCU board and development environment supplied by ARM.



# Sensor Medal

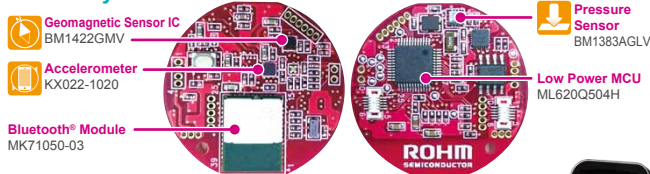
ROHM's Sensor Medal is a wireless sensor evaluation kit that integrates multiple ROHM Group motion sensors. It can instantly detect the wearer's activity or the location/movement of equipment.

The energy efficient design is ideal for IoT devices, while the built-in low-power MCU makes it easy to evaluate sensor data by downloading a dedicated application for smartphones and tablets.

## Application Examples

- Movement/fall detection (acceleration, barometric pressure, gyro)
- Metal detection (geomagnetic field)
- Altitude measurement (barometric pressure)
- Activity monitoring (acceleration, barometric pressure)
- eCompass (geomagnetic field, acceleration)
- Muscular strength measurement (acceleration)

## Board Layout



## Supporting Materials

Documents: Circuit diagrams, manuals

Software: Evaluation app

Compatible with iOS and Android™ 4.3 or later (Min. screen size: 7in.)

Verified device: 2013 Nexus 7

Easily verify operation using a smartphone or tablet



## Applications

Application and sensor loggers that chronologically display the measurements of each installed sensor are available (software compatible with Android™).

In addition, developing firmware and algorithms makes it possible to achieve a variety of applications by combining the measurements of each sensor.

## Web Page

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

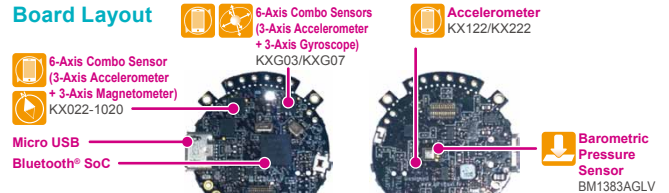
**URL (Japanese Only)**

<http://www.rohm.co.jp/web/japan/sensor-medal-support>

\*Android™ is a registered trademark of Google Inc.



## Board Layout



## Applications

Python/C/C++/C# and other programming education

## Web Page

Technical details, Software download, Where to buy :

**URL**

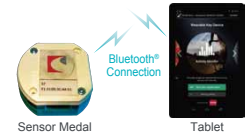
<https://www.iprotoxi.fi/index.php/services/iprotoxi-aistin-blue>



## North America

### Embedded Devices

- Accelerometer
- Geomagnetic
- Gyroscope
- Barometric Pressure
- Bluetooth® Low Energy IC
- Low Power MCU



## Web Page

All information is available on the below websites.

**URL**

<http://www.kionix.com/iot-evaluation-and-development-kit>



# Online Distributors

(Single units available for purchase)



**URL:** <http://www.mouser.com/>



**URL:** <http://www.digikey.com/>



**URL:** <http://www.rs-components.com/>



# ROHM IoT Catalogs

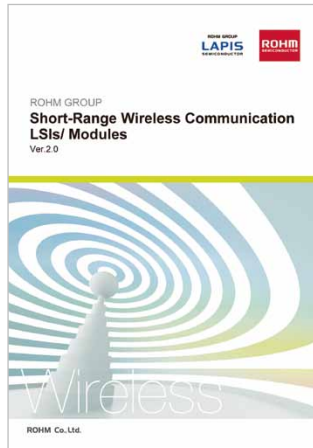
In addition to this ROHM IoT Solutions pamphlet, Short-Range Wireless Communication LSIs/Modules and Sensor Catalogs are offered.



## Sensor Catalog

Contains detailed information on ROHM Group sensor products.

The broad lineup ranges from environmental sensors that can quickly detect ambient conditions to motion sensors capable of accurately detecting the orientation and movement of objects.



## Short-Range Wireless Communication LSIs/Modules

Includes product lineups and detailed descriptions.

ROHM offers a wide variety of short-range wireless communication ICs and modules covering the Sub-GHz to 2.4GHz bands, allowing users to select the ideal product/protocol (i.e. IEEE802.15.4, specified low power wireless, Bluetooth®) based on set requirements.

- 1) The information contained in this document is provided as of November 1st, 2016.
- 2) The information contained herein is subject to change without notice. Before you use our Products, please contact our sales representative (as listed below) and verify the latest specifications.
- 3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors. Therefore, in order to prevent personal injury or fire arising from failure, please take safety measures such as complying with the derating characteristics, implementing redundant and fire prevention designs, and utilizing backups and fail-safe procedures. ROHM shall have no responsibility for any damages arising out of the use of our Products beyond the rating specified by ROHM.
- 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 does not grant you, explicitly or implicitly, any license to use or exercise 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.
- 6) The Products are intended for use in general electronic equipment (i.e. AV/OA devices, communication, consumer systems, gaming/entertainment sets) as well as the applications indicated in this document.
- 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 (i.e. cars, ships, trains), primary communication equipment, traffic lights, fire/crime prevention, 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.
- 10) ROHM shall have no responsibility for any damages or injury arising from non-compliance with the recommended usage conditions and specifications contained herein.
- 11) ROHM has used reasonable care to ensure the accuracy of the information contained in this document. However, ROHM does not warrant that such information is error-free and ROHM shall have no responsibility for any damages arising from any inaccuracy or misprint of such information.
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## ROHM Sales Offices

Contact us for further information about the products.

<b>Santa Clara</b>	+1-408-720-1900	<b>Germany</b>	+49-2154-921-0	<b>Dalian</b>	+86-411-8230-8549	<b>India</b>	+91-80-4125-0811
<b>Atlanta</b>	+1-770-754-5972	<b>Stuttgart</b>	+49-711-7272370	<b>Shanghai</b>	+86-21-6072-8612	<b>Kyoto</b>	+81-75-365-1218
<b>Boston</b>	+1-978-371-0382	<b>France</b>	+33 (0) 1 40 60 87 30	<b>Shenzhen</b>	+86-755-8307-3008	<b>Yokohama</b>	+81-45-476-2121
<b>Chicago</b>	+1-847-368-1006	<b>United Kingdom</b>	+44-1-908-272400	<b>Hong Kong</b>	+852-2740-8262		
<b>Denver</b>	+1-303-708-0908	<b>Oulu</b>	+358-400-726124	<b>Taiwan</b>	+886-2-2500-6956		
<b>Detroit</b>	+1-248-348-9920	<b>Spain</b>	+34-9375-24320	<b>Singapore</b>	+65-6436-5100		
<b>San Diego</b>	+1-858-625-3600	<b>Hungary</b>	+36-1-950-5859	<b>Philippines</b>	+63-2-807-6872		
<b>Mexico</b>	+52-33-3123-2001	<b>Russia</b>	+74 95 739 4174	<b>Thailand</b>	+66-2-254-4890		
<b>Brazil</b>	+55-11-3539-6320	<b>Seoul</b>	+82-2-8182-700	<b>Malaysia</b>	+60-3-7931-8155		

Catalog No.59P7037E-B 11.2016 ROHM © PDF

R1096A

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