Connect with IoT

Sensor Catalog Vol.3.3

ROHM SEMICONDUCTOR

ROHM Co.,Ltd.

ROHM Sensors

To provide greater convenience, safety, and comfort in the consumer sector, ROHM developed a variety of sensor products based on a wide range of technologies, from piezoelectric thin-film deposition technology created by leveraging high reliability semiconductor expertise along with silicon deep etching and multilayer filter technologies to wafer bonding and advanced packaging technologies, offering the industry's broadest lineup of sensor variants.

Our expansive portfolio includes motion sensors that accurately detect position and movement, field sensors capable of real-time monitoring of ambient conditions, and interface devices designed to amplify, analyze, and process sensor data as well as sensor control MCUs. We also offer a lineup of communication ICs (i.e. Sub-GHz) and specified low power wireless modules, together with Bluetooth® and wireless LAN modules. Combining these solutions allows designers to configure sensor systems optimized to application requirements, making it possible to obtain information from virtually anywhere. This is expected to open up new markets and possibilities.

Strengths of ROHM Group Sensors

Supplying innovative sensor products through technological synergy across the entire group

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 data.
The ROHM Group has been committed to proposing solutions and developing products for constructing sensor networks that leverage cutting-edge technologies across the entire group, including both LAPIS Semiconductor and Kionix. And going forward, we will continue to utilize our experience and expertise to contribute to the creation of a more prosperous society.

IoT

Table of Contents

Motion Sensing Devices

Motion sensors detect motion and can even recognize different types of movement. This enables more intuitive operation when used as an input interface.

Accelerometer Classification

Acceleration

Free Fall

Orientation Detection (Vertical/Horizontal

Anticipated Applications
- Smartphones
- Digital Cameras

Recommended Part Numbers
KX122-1037
KX124-1051
KXTJ3-1057
New KX003-1077

Tilt Detection

Anticipated Applications
- Projectors (For keystone correction)

Recommended Part Numbers
KXTJ3-1057
New KX003-1077

Vibration/Motion

Vibration Detection

Anticipated Applications
- Activity Trackers (For counting the number of steps)
- Washing Machines (For monitoring abnormal vibration)

Recommended Part Numbers
KX122-1037
KX124-1051
KX126-1063
New KX127-1068
KXCJB-1041
KX112-1042
KX224-1053
KX222-1054

Motion Detection (e.g. fall)

Anticipated Applications
- Automatic Power ON-OFF (For saving energy)
- Sports Coaching (For tracking motion trajectory)
- Gaming Consoles (For input operation)

Recommended Part Numbers
KX122-1037
KX124-1051
KX112-1042
KXTJ3-1057
New KX003-1077

Free Fall Detection

Anticipated Applications
- HDD Protection

Recommended Part Numbers
KX122-1037
KX124-1051
KX112-1042

Shock

Shock Detection

Anticipated Applications
- Surveillance Cameras (For reporting)
- Security-Related Systems

Recommended Part Numbers
KX122-1037
KX124-1051
KX112-1042
KX224-1053
KX222-1054

Kionix

Accelerometers

Acceleration

Kionix supplies a wide range of accelerometers optimized for a variety of applications. Ultra-low current consumption combined with improved shock resistance and superior temperature characteristics result in industry-leading* performance. In addition, various detection algorithms are offered, including motion wake-up and step counter(pedometer).

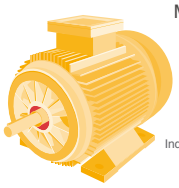
* : ROHM April 2019 study

Features

- 32g models available
- Ultra-thina(t=0.45mm) package types
- Ultra-low current consumption: 10μA(ODR=50Hz), 0.9μA(standby)
- Up to 16bit resolution
- Multiple algorithms built-in, including wakeup, pedometer, tap, free fall, and orientation detection
- AEC-Q100 qualified

Applications

- User Interface
- Power Management
- Active/ Passive Monitoring
- Device Optimization Function
- Tilt Detection
- Gesture Recognition
- Pedometer/Activity Monitoring
- Motion Control UI
- Smartphones/ Portable Devices
- Wearable Tech
- Health & Fitness
- Notebook PCs
- Gaming/Virtual Reality Systems



Industrial Motors

Key Fobs

3-Axis Accelerometer(AEC-Q100 qualified)

Part No.	Axis	Full-Scale Range	I/F Output	Current Consumption (μA)	Size(mm), No. of Pins, and Package	Features
New KX123-6000	3	User-selectable 2g, 4g, 8g	Digital SPI/I²C	1.8 to 145	3×3×0.9, 16pin, LGA	AEC-Q100 qualified, Operating temperature : −40 to +85°C, 2KB FIFO/FILO buffer, Wide ODR range : 0.781Hz to 25.6kHz, Directional Tap/Double-Tap™, Free fall, Device orientation detection

3-Axis Accelerometers

Part No.	Axis	Full-Scale Range	I/F Output	Current Consumption (μA)	Size(mm), No. of Pins, and Package	Features
KX122-1037	3	User-selectable 2g/4g/8g	Digital SPI/I²C	1.8 to 145	2×2×0.9, 12pin, LGA	2KB FIFO/FILO buffer, Wide ODR range : 0.781Hz to 25.6kHz, Directional Tap/Double-Tap™, Free fall, Device orientation detection
KX124-1051	3	User-selectable 2g/4g/8g	Digital SPI/I²C	1.8 to 145	3×3×0.9, 16pin, LGA	2KB FIFO/FILO buffer, Wide ODR range : 0.781Hz to 25.6kHz, Directional Tap/Double-Tap™, Free fall, Device orientation detection
KX126-1063	3	User-selectable 2g/4g/8g	Digital SPI/I²C	1.8 to 145	2×2×0.9, 12pin, LGA	Pedometer function, 2KB FIFO/FILO buffer, Wide ODR range : 0.781Hz to 25.6kHz, Directional Tap/Double-Tap™, Free fall, Device orientation detection, V_{DD}=Pin 7
New KX127-1068	3	User-selectable 2g/4g/8g	Digital SPI/I²C	1.8 to 145	2×2×0.9, 12pin, LGA	Pedometer function, 2KB FIFO/FILO buffer, Wide ODR range : 0.781Hz to 25.6kHz, Directional Tap/Double-Tap™, Free fall, Device orientation detection, V_{DD}=Pin 9
KXCJB-1041	3	User-selectable 2g/4g/8g	Digital I²C	1.7 to 135	3×3×0.45, 10pin, LGA	Low current consumption, User-configurable wakeup function, Ultra-thin
KX112-1042	3	User-selectable 2g/4g/8g	Digital SPI/I²C	1.8 to 145	2×2×0.6, 12pin, LGA	2KB FIFO/FILO buffer, Wide ODR range : 0.781Hz to 25.6kHz Directional Tap/Double-Tap™, Free fall, User-configurable wakeup function, Thin
KXTJ3-1057	3	User-selectable 2g/4g/8g/16g	Digital I²C	1.5 to 155	2×2×0.9, 12pin, LGA	User-configurable wakeup function, V_{DD}=Pin 7
New KX003-1077	3	User-selectable 2g/4g/8g/16g	Digital I²C	1.5 to 155	2×2×0.9, 12pin, LGA	User-configurable wakeup function, V_{DD}= Pin 9
KX224-1053	3	User-selectable 8g/16g/32g	Digital SPI/I²C	1.8 to 145	3×3×0.9, 16pin, LGA	2KB FIFO/FILO, wide band ODR range 0.781Hz to 25.6kHz, mechanical resonance frequency(−3dB): 8kHz(XY), 5.1kHz(Z)
KX222-1054	3	User-selectable 8g/16g/32g	Digital SPI/I²C	1.8 to 145	2×2×0.9, 12pin, LGA	2KB FIFO/FILO, wide band ODR range 0.781Hz to 25.6kHz, mechanical resonance frequency(−3dB): 8kHz(XY), 5.1kHz(Z)
KXTC9 series	3	2g to 6g	Analog	170 to 310	3×3×0.9, 10pin, LGA	Factory programmable internal low-pass filter
New KX220 series	3	to 40g	Analog	170 to 310	3×3×0.9, 10pin, LGA	Factory programmable internal low-pass filter

6-Axis Combo Sensor

(3-Axis Accelerometer +3-Axis Magnetometer)

Acceleration Geomagnetic

Kionix also offers 6-axis combo sensors integrating a 3-axis accelerometer with a 3-axis magnetometer that delivers high performance with low current consumption. This makes them ideal for portable applications.

Features

- Compact 3×3×0.9mm LGA package
- Low current consumption in all modes
- Accelerometer Full-Scale Range : 2g/4g/8g/16g/32g/64g
- Output data rate: 0.781Hz to 25.6kHz
- Resolution : 16bit
- Integrated 384 Byte FIFO buffer
- Excellent temperature characteristics
- High impact resistance(10,000g for 0.2ms)

Applications

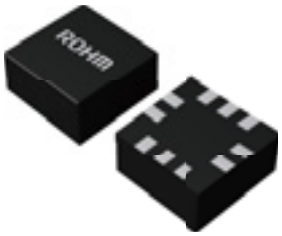
- User Interface
- Power Management
- Active/Passive Monitoring
- Device Optimization Function
- Tilt Detection
- Gesture Recognition
- Pedometer/Activity Monitoring
- Motion Control UI
- Wearable Tech
- Mobile Phones
- Portable Devices

6-Axis Combo Sensor(3-Axis Accelerometer+3-Axis Magnetometer)

Part No.	Axis	Accelerometer Full-Scale Range	I/F Output	Current (μA)	Geomagnetic Sensor Range (μT)	Operating Temperature (°C)	Size(mm), No. of Pins, and Package	Features
KMX62-1031	6	User-selectable 2g/4g/8g/16g	Digital I²C	1.6 to 395	±1,200	−40 to +85	3×3×0.9, 16pin, LGA	eCompass solution, Magnetic field change detection, Free fall detection
New **KMX63-1055**	6	User-selectable 8g/16g/32g/64g	Digital I²C	1.6 to 395	±1,200	−40 to +85	3×3×0.9, 16pin, LGA	eCompass solution, Magnetic field change detection, Supports high g

Geomagnetic Sensor IC

Geomagnetic



MLGA010V020A
(2.0×2.0×Max.1.0mm)

ROHM's BM1422AGMV is a geomagnetic sensor IC that combines an MI sensor capable of detecting magnetic fields in 3 directions with a control IC into a compact package.
The MI sensor features significantly lower current consumption and noise compared with conventional methods, making it suitable for not only for standard ecompass applications but sets requiring even higher accuracy as well.

Features

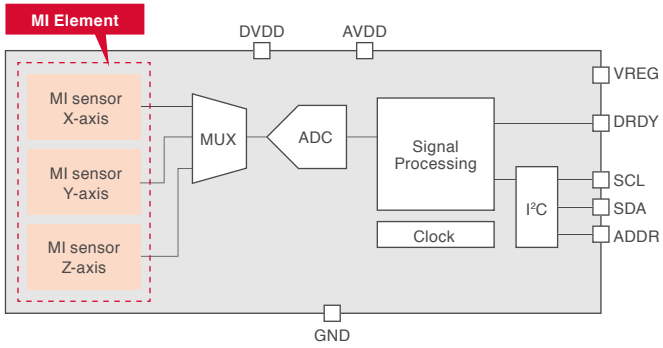
- MI-type 3-axis magnetic sensor
- 12bit/14bit digital output
- I²C interface
- Supply voltage : 1.7V to 3.6V
- Current consumption : 150μA(Typ.@100Hz)
- Measurable input magnetic field range: ±1,200μT
- Magnetic sensitivity : 0.042μT/LSB(Typ.)
- Operating temperature : −40 to +85˚C

Applications

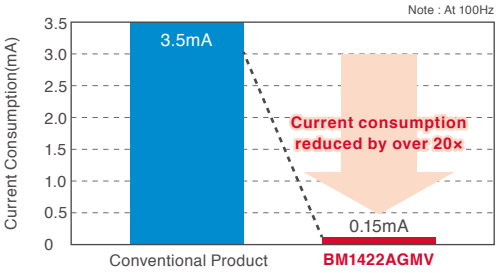
- Smartphones
- Tablets
- Wearable Devices
- Indoor Navigation
- Electronic Compass
- Parking Systems

Parking Systems

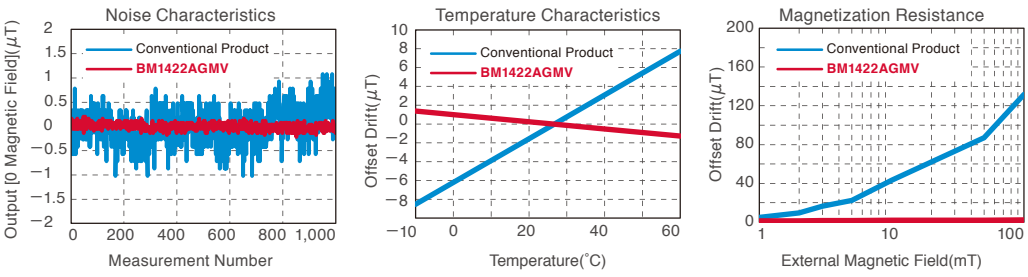
Block Diagram



Ultra-low current consumption ideal for mobile devices



Excellent noise, temperature, and magnetization characteristics enable high accuracy detection

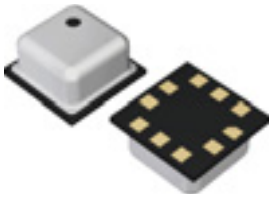


Geomagnetic Sensor IC

Part No.	Supply Voltage (V)	Current Consumption (μA)	Magnetic Sensitivity (μT/LSB)	Input Magnetic Field Range (μT)	Operating Temperature (˚C)	Package
BM1422AGMV	1.7 to 3.6	150	0.042	±1,200	−40 to +85	MLGA010V020A

Pressure Sensor IC

Pressure



CLGA10V020A
(2.0×2.0×Max.1.0mm)

ROHM offers a piezoresistive-type barometric sensor IC that carries out internal temperature correction using a proprietary compensation algorithm covering both high and low temperatures, making it easy to obtain high accuracy barometric pressure data.
This provides notification of atmospheric pressure changes by detecting altitude differences in activity meters and wearables along with advanced detection for indoor navigation in smartphones and tablets.

Features

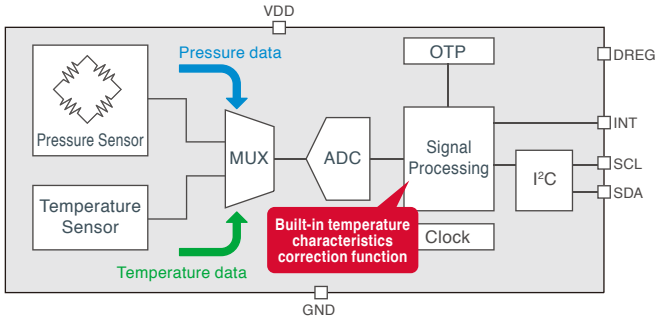
- Piezo-resistive pressure sensor
- Detection range: 300hPa to 1,300hPa
- Built-in temperature compensation function
- I²C interface
- Compact package

Applications

- Smartphones
- Wearable Devices
- Activity Trackers

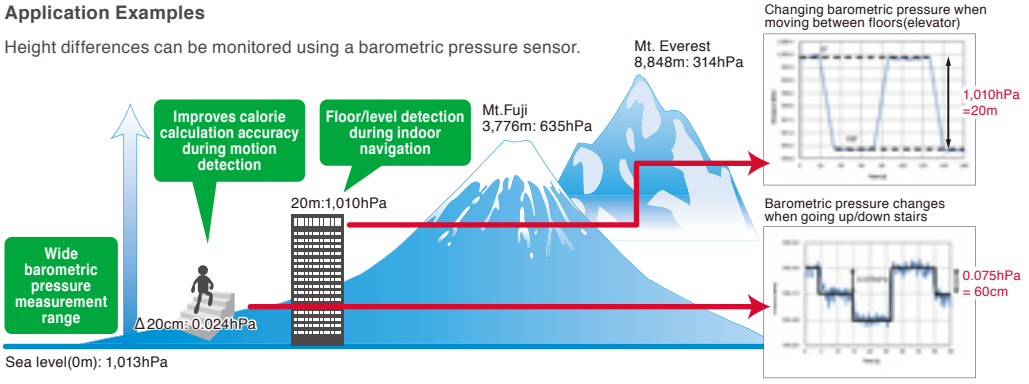
Block Diagram

Integrated temperature compensation function results in high accuracy relative pressure (altitude) characteristics, from low to high temperature.

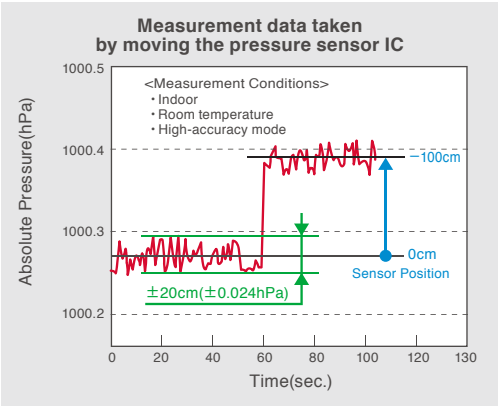


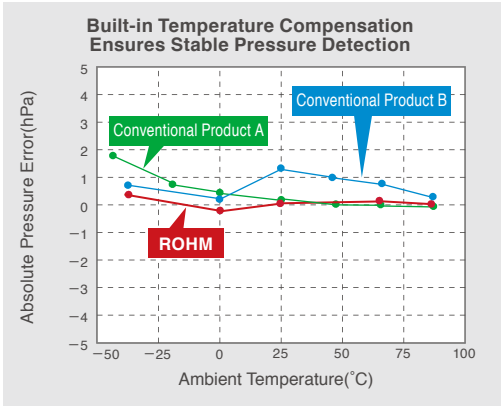
Application Examples

Height differences can be monitored using a barometric pressure sensor.



Pressure Measurement Example





Digital Barometric Pressure Sensor IC with Built-in Temperature Compensation

Part No.	Supply Voltage (V)	Pressure Range (hPa)	Relative Pressure Accuracy(hPa)	Absolute Pressure Accuracy(hPa)	Average Current (μA)	I/F	Operating Temperature (˚C)	Package
BM1386GLV	1.7 to 3.6	300 to 1,300	±0.12	±1	3.0	I²C	−40 to +85	CLGA10V020A

Laser Diode

ROHM high power infrared laser diodes are optimized for a variety of applications, including motion sensing.
These lasers emit high-power infrared radiation and detect infrared rays reflected by an object through a receiving block, making it possible to detect the motion and position of an object with a high degree of accuracy.

VCSEL* (surface emission) type Infrared High Output Laser

★VCSEL : Vertical Cavity Surface Emitting Laser diode

3020PKG

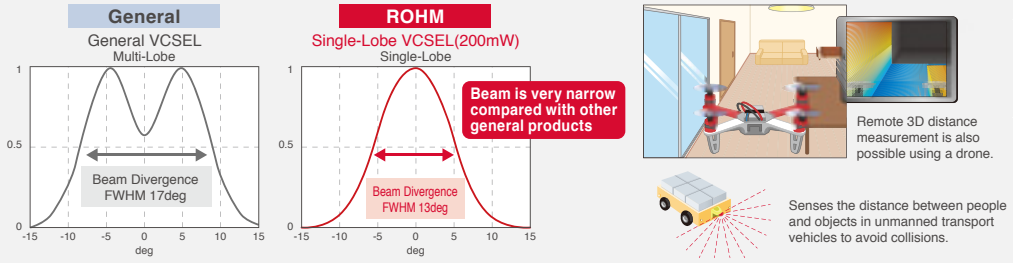
2010PKG

VCSEL* is characterized by laser beam emission perpendicular to the top surface, achieved by configuring the resonator perpendicular to the substrate of the semiconductor element.

Features
- 200mW to 2W lineup
- Compact low profile package

Applications
- Motion Sensors
- 3D Distance Sensors

Narrow beam characteristics ideal for 1D ranging



VCSEL (surface emission) type

Part No.	Wavelength λp (nm)	Electrical Optical Characteristics (Ta=+25˚C)					Condition	Package
		P_O (mW)	V_F (V)	I_{TH} (mA)	η (W/A)	FWHM		
☆ **RLD85SAY6**	850	200	2.0	70	0.85	13˚(Single Lobe)	If=300mA(Tp=1msec)	2010PKG
☆ **RLD85SAY7**	850	1,000	2.0	300	0.85	25deg(Clear glass Lid Type)	If=1.5A(1MHz Duty10%)	3020PKG
☆ **RLD85SAY8**	850	2,000	2.0	600	0.85	60×45deg,72×55deg(Diffuser Type)	If=3.0A(1MHz Duty10%)	3020PKG
☆ **RLD94SAQ6**	940	200	2.0	70	0.85	13˚(Single Lobe)	If=300mA(Tp=1msec)	2010PKG
☆ **RLD94SAQ7**	940	1,000	2.0	300	0.85	25deg(Clear glass Lid Type)	If=1.5A(1MHz Duty10%)	3020PKG
☆ **RLD94SAQ8**	940	2,000	2.0	600	0.85	60×45deg,72×55deg(Diffuser Type)	If=3.0A(1MHz Duty10%)	3020PKG

☆ : Under Development

CAN type Infrared High Output Laser

ϕ5.6mm

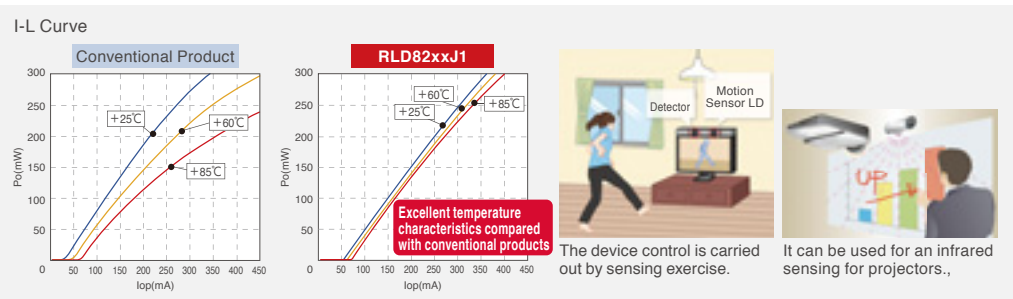
Infrared high output CAN type lasers feature high reliability proven over many years.

Features
- High power of 200mW, Kink-free via CW drive
- High-efficiency operation with excellent temperature characteristics
- MTTF>40,000hrs at 200mW(+60˚C) drive

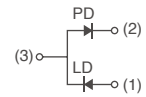
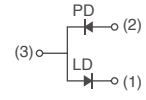
Note : CW : Continuous wave(unmodulated)
Kink : Bend after the threshold in the current vs. optical output characteristics curve

Applications
- Motion Sensors
- 3D Distance Sensors

High-efficiency Operation with Excellent Temperature Characteristics



CAN type

Part No.	Wavelength λp (nm)	Absolute Maximum Ratings (Tc=+25˚C)			Electrical Optical Characteristics (Tc=+25˚C)							Condition P_O (mW)	Equivalent Circuit
		P_O (mW)	V_R (V)	Topr Max.(˚C)	I_{TH} (mA)	Iop (mA)	η (W/A)	Vop (V)	Im (mA)	θ⊥ (deg.)	θ// (deg.)		
RLD82PZJ1	822	220	2	+60	50	255	0.95	2.4	0.30	17.0	9.5	200	
RLD84PZJ2	842	220	2	+60	50	255	0.95	2.4	0.30	17.0	9.5	200	
RLD85PZJ4	852	220	2	+60	50	255	0.95	2.4	0.30	17.0	9.5	200	
☆**RLD94PZJ5**	942	285	2	+65	55	325	0.75	2.2	0.90	30.0	35.0	200	
☆**RLD94PZJ7**	942	220	2	+60	50	255	0.95	2.4	0.30	17.0	9.5	200	
RLD82NZJ1	822	220	2	+60	50	255	0.95	2.4	0.30	17.0	9.5	200	
RLD84NZJ2	842	220	2	+60	50	255	0.95	2.4	0.30	17.0	9.5	200	
RLD85NZJ4	852	220	2	+60	50	255	0.95	2.4	0.30	17.0	9.5	200	
☆**RLD94NZJ5**	942	285	2	+65	55	325	0.75	2.2	0.90	30.0	35.0	200	
☆**RLD94NZJ7**	942	220	2	+60	50	255	0.95	2.4	0.30	17.0	9.5	200	

☆ : Under Development

Regarding Safety
(VCSEL/CAN type Laser Diodes)

These products are intended for use in general electronic equipment.
Since laser light emitted from laser diodes can cause injury(i.e. burns), please refrain from looking directly at the light-emitting block or through a lens or fiber when the product is in operation.

If you intend to use these products in equipment and devices that require an extremely high level of reliability, and whose malfunction or failure may directly cause loss of human life, please consult with a ROHM sales representative in advance.

Field Sensing Devices

Environmental sensors detect physical quantities, such as ambient light and temperature, and convert them into electrical signals. For example, sensors are used to monitor ambient conditions both inside and outside of devices in order to optimize operation, contributing to greater comfort, safety, and energy savings.

Color Sensor IC

Color

ROHM color sensor IC leverage original infrared removal technology and calculation methods to achieve the industry's highest* infrared rejection characteristics, reducing the effects of infrared rays to less than 1/10th that of competitor products. Unlike conventional color sensor IC, brightness and color temperature can be detected even in dark(low transmittance) optical windows that make accurate detection difficult due to infrared rays.

Detecting the color temperature and brightness enables output of a more natural image to the display. This allows users to acquire the color temperature in digital cameras during shooting to improve the quality of photographed images.

∗ : ROHM April 2019 study

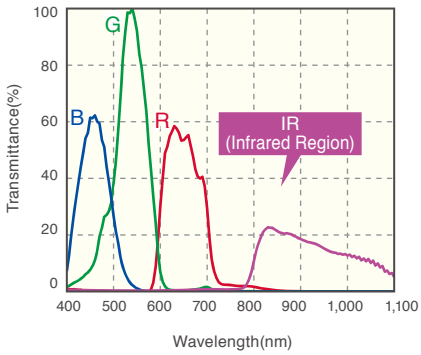
Features

- Not susceptible to infrared rays
- Broad light detection range: (0 to 80,000lx)
- High accuracy brightness and color temperature detection even with dark optical windows

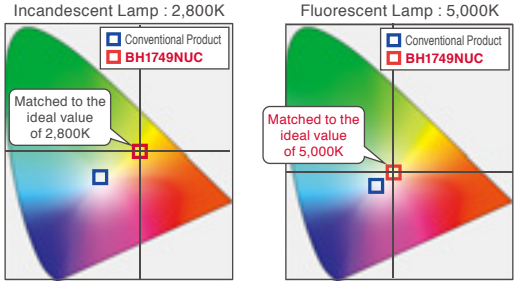
Applications

- Smartphones
- Tablets
- Notebook PCs
- LCD TVs
- Digital Cameras
- Display-equipped Devices

Spectral Sensitivity(BH1749NUC)



Color Temperature Detection Comparison Under Dark Optical Windows



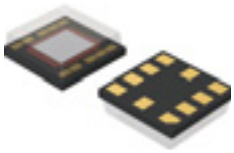
BH1749NUC can detect the ideal color temperature under a variety of lighting conditions

16bit Serial Output type Digital Color Sensor IC

Part No.	Supply Voltage (V)	λP(nm)				Brightness Measurement Range(lx)	High Sensitivity	IR Cut	I/F	Operating Temperature (°C)	Package
		Red	Green	Blue	IR						
BH1749NUC	2.3 to 3.6	630	540	460	825	0 to 80,000	✓	✓	I²C	−40 to +85	WSON008X2120

Optical Sensor for Heart Rate Monitor

Optical Heart Rate Monitor



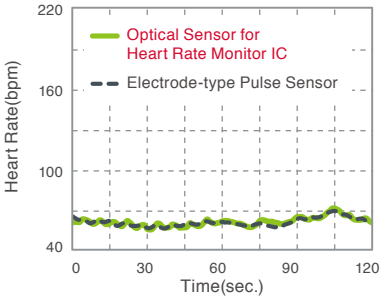
WLGA010V28
(2.8×2.8×Max.1.0mm)

ROHM's optical heart rate sensor ICs integrate an optical filter optimized for pulse detection in the sensor block to minimize the effects of ambient light such as infrared and red rays. This makes it possible to obtain high quality pulse signals, even outdoors. In addition, leveraging optical sensor technology cultivated over many years allowed ROHM to improve sensitivity and achieve a low-power heart rate sensor system that contributes to longer operating time in wearable devices with limited battery capacity. The BH1792GLC features high-speed 1,024Hz sampling that allows it to measure complex vital signs such as stress and vascular age. And an infrared sensor is built in to detect when attached to the user, simplifying system design.

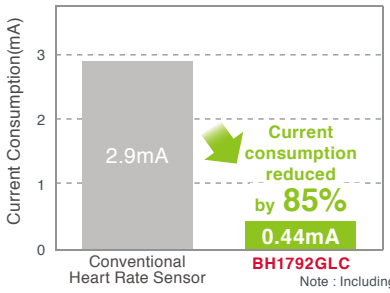
Features
- Superior noise removal characteristics
- Low power consumption
- High-speed 1,024Hz sampling(BH1792GLC)

Applications
- Smartphones
- Earphones
- Wearable Devices
- Tablets
- Smart Watches

Pulse Measurement Results(At Rest)



Current Consumption Comparison(During Heart Rate Measurement)



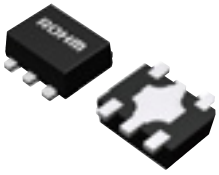
Note : Including LED drive current

Optical Sensor for Heart Rate Monitor ICs

Part No.	Analog Supply Voltage(V)	IO Supply Voltage(V)	Sampling Frequency (Hz)	Red/ Infrared Cut	I/F	Operating Temperature(°C)	Package
BH1790GLC	2.5 to 3.6	1.7 to 3.6	32/64	✓	I²C	−20 to +85	WLGA010V28
BH1792GLC	2.5 to 3.6	1.7 to 3.6	32/64/128/256/1024	✓	I²C	−20 to +85	WLGA010V28

Temperature Sensor ICs

Temperature



HVSOF5
(1.60×1.60×Max.0.60mm)

ROHM temperature sensor ICs integrate a temperature sensing element, constant current circuit, and high-accuracy reference supply voltage on a single chip. This eliminates the need for troublesome circuit design and ensures compatibility with a variety of applications requiring temperature detection, including PCs, LCD TVs, and gaming

Features

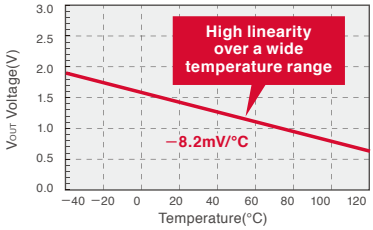
(BD1020HFV)
- Linear output temperature sensor
- Excellent temperature sensitivity(−8mV/˚C Typ.)
- High accuracy(±1.5˚C@Ta=+30˚C)
- Low current consumption(4.0μA Typ.)

(BH1900NUX)
- Digital output temperature sensor
- High temperature accuracy(±3.0˚C@Ta=−20 to +85˚C)
- I²C interface

(BDJxxx0HFV series)
- Soft start with power down function
- Integrated temperature sensor analog output
- Low current consumption(7.5μA Typ.)

Applications
- Mobile Phones
- Tablets
- DSCs
- DVCs
- Audio Systems

VOUT Voltage vs Temperature(BH1020HFV)



Analog Output Temperature Sensor IC

Part No.	Supply Voltage(V)	Temperature Accuracy(°C) Ta=+30°C	Temperature Accuracy(°C) Ta=−30, +100°C	Temperature Sensitivity(mV/°C)	Output Voltage(V) (Ta=+30°C, VDD=3V)	Current Consumption(μA)	Operating Temperature(°C)	Package
BD1020HFV	2.4 to 5.5	±1.5	±2.5	−8.2	1.3	4.0	−30 to +100	HVSOF5

Digital Output Temperature Sensor IC

Part No.	Supply Voltage(V)	Temperature Accuracy(°C) Ta=−20 to +85°C	Current Consumption(μA)	I/F	Operating Temperature(°C)	Package
BH1900NUX	2.7 to 3.6	±3.0	75	I²C	−30 to +95	VSON008X2030

Temperature Sensor IC with Low Current Thermistor(Temp. Switch) Output

Part No.	Supply Voltage(V)	Detection Temp.(˚C)	Detection Temp. Accuracy(˚C)	Current Consumption (Operation/Power Down)(μA)	Output type	Operating Temperature(˚C)	Package
New **BDJxxx0AHFV series**	2.4 to 5.5	60/70/80	±2.5	7.5/0.3	Open drain(Active L)	−30 to +100	HVSOF5

Ambient Light Sensor ICs

Ambient Light

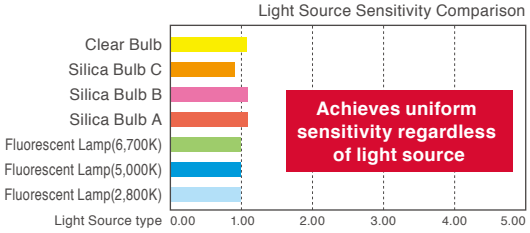
WSOF6
(1.60×3.00×Max.0.75mm)

ROHM ambient light sensor ICs can measure brightness over a wide range, from dark to direct sunlight, and output brightness data that can be used to adjust the brightness of LCD screens in electronic equipment. Optimizing screen brightness makes it possible to improve visibility while reducing set power consumption.

The lineup includes both current output and digital output types that support a variety of application requirements.

ROHM Ambient Light Sensor ICs

Light Source Sensitivity Comparison



ROHM products limit differences in output sensitivity caused by different light sources to 10%

Features

- Broad lineup includes current output analog and 16bit serial digital ambient light sensor ICs
- Compatible with a variety of light sources
- Wide light detection range

Applications

- Mobile Phones (Feature Phones)
- Tablets
- Notebook PCs
- LCD TVs
- Digital Cameras
- Display-equipped Devices

Notebook PCs

Analog Current Output type Ambient Light Sensor ICs

Part No.	Supply Voltage (V)	Sensitivity Variation (%)	Brightness Measurement (lx)	High Sensitivity	IR Cut	I/F	Operating Temperature (°C)	Package
BH1603FVC	2.4 to 5.5	±15	0 to 100,000	–	–	Linear Current Output(Source)	−40 to +85	WSOF6
BH1620FVC	2.4 to 5.5	±15	0 to 100,000	–	–	Linear Current Output(Source)	−40 to +85	WSOF5
BH1680FVC	2.4 to 5.5	±15	0 to 50,000	✓	✓	Linear Current Output(Source)	−40 to +85	WSOF5
BH1682FVC	2.3 to 5.5	±3μA	0 to 55,000	–	✓	Logarithmic Current Output(Source)	−40 to +85	WSOF5

Digital 16bit Serial Output type Ambient Light Sensor ICs

Part No.	Supply Voltage (V)	Sensitivity Variation (%)	Brightness Measurement (lx)	High Sensitivity	IR Cut	I/F	Operating Temperature (°C)	Package
BH1721FVC	2.4 to 3.6	±15	0 to 65,000	–	–	I²C	−40 to +85	WSOF5
BH1730FVC	2.4 to 3.6	±15	0 to 65,000 (1/128 lx step)	✓	–	I²C	−40 to +85	WSOF6
BH1726NUC	2.3 to 3.6	±15	0 to 30,000 (1/512 lx step)	✓	✓	I²C	−40 to +85	WSON008X2120

Combination Ambient Light/ Proximity Sensor


Ambient Light


Proximity

ROHM's Combination Ambient Light/Proximity Sensor combines an infrared LED, brightness sensor, and proximity sensor into a single package.
It is designed to improve visibility and reduce set power consumption.

Features

- Integrated package
- Digital output (I^2C interface)

Applications

- SLR digital camera displays (viewfinder/LCD switching)
- Displays in handheld terminals and electronic payment devices (battery powered)
- Various optical switches
  Lighting(ON/OFF)
  Automatic Doors(OPEN/CLOSE)


SON
(Surface Mount type)

Combination Ambient Light/Proximity Sensor

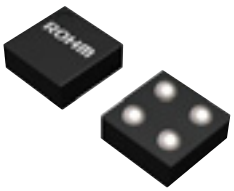
Part No.	Supply Voltage (V)	Sensitivity Variation (%)	Brightness Measurement (lx)	High Sensitivity	IR Cut	I/F	Operating Temperature (°C)	Package
RPR-0521RS	2.5 to 3.6	±40	0 to 43,000	✓	–	I^2C	−25 to +85	SON (Surface Mount type)

ROHM Ultra-Compact Hall IC series

ROHM ultra-compact Hall IC series integrates a high-sensitivity Hall element and processing circuit into a single chip, allowing them to be used to detect the presence of a magnet(magnetic field) in open/close switches in panels. This non-contact sensing method prevents deterioration due to frequent open/close operation along with malfunctions caused by the introduction of foreign materials.
Three series are offered based on magnetic field sensing and detection output(omnipolar detection, polarity discrimination, and bipolar latch types). Please select the Hall IC most suitable for application requirements.

Omnipolar Hall ICs

Hall



UCSP35L1
(0.8×0.8×Max.0.4mm)

Omnipolar detection hall ICs typically operate by turning the output ON(Active Low) upon detection of a magnetic field, regardless of polarity(S-/N-pole). And since the magnet used for omnipolar detection is not limited to either S- or N-pole, magnet management (i.e. marking) can be eliminated. In addition, omnipolar detection Hall ICs with polarity discrimination feature two outputs, one for detecting S-pole and the other for N-pole magnetic field detection, making it possible to distinguish the polarity of magnetic field.

Features

- Offered in a range of sensitivity levels
- Multiple packages types
- S-/N-pole determination possible(polarity discrimination type)

Applications

- Tablets
- Smartphones

Omnipolar Hall ICs — Outputs ON(Active Low) upon detection of a magnetic field(S- or N-poles)

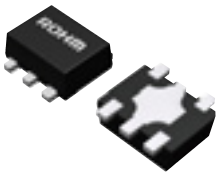
Part No.	Supply Voltage (V)	Operating Magnetic Flux Density(mT) S-pole	Operating Magnetic Flux Density(mT) N-pole	Pulse Drive Period (ms)	Power Supply Noise Immunity	Current Consumption (Avg.)(μA)	Output type	Operating Temperature (°C)	Package (mm)
BU52492NUZ	1.65 to 3.6	+2.4	−2.4	50	Normal	4.2	CMOS Output	−40 to +85	VSON04Z1114A 1.1×1.4, H=Max.0.4
BU52092GWZ	1.65 to 3.6	+2.4	−2.4	50	Normal	4.4	CMOS Output	−40 to +85	UCSP35L1 0.8×0.8, H=Max.0.4
BU52493NUZ	1.65 to 3.6	+4.1	−4.1	50	Normal	4.2	CMOS Output	−40 to +85	VSON04Z1114A 1.1×1.4, H=Max.0.4
BU52055GWZ	1.65 to 3.6	+4.1	−4.1	50	Normal	5.0	CMOS Output	−40 to +85	UCSP35L1 0.8×0.8, H=Max.0.4
BU52494NUZ	1.65 to 3.6	+6.3	−6.3	50	Normal	4.2	CMOS Output	−40 to +85	VSON04Z1114A 1.1×1.4, H=Max.0.4
BU52054GWZ	1.65 to 3.6	+6.3	−6.3	50	Normal	5.0	CMOS Output	−40 to +85	UCSP35L1 0.8×0.8, H=Max.0.4
BU52095GWZ	1.65 to 3.6	+9.5	−9.5	50	Normal	4.4	CMOS Output	−40 to +85	UCSP35L1 0.8×0.8, H=Max.0.4
BU52097GWZ	1.65 to 3.6	+15.0	−15.0	50	Normal	4.4	CMOS Output	−40 to +85	UCSP35L1 0.8×0.8, H=Max.0.4
BU52098GWZ	1.65 to 3.6	+24.0	−24.0	50	Normal	4.4	CMOS Output	−40 to +85	UCSP35L1 0.8×0.8, H=Max.0.4
BU52792GWZ	2.7 to 5.5	+2.4	−2.4	50	Normal	3.2	CMOS Output	−40 to +85	UCSP35L1 0.8×0.8, H=Max.0.4
BD7411G	4.5 to 5.5	+3.4	−3.4	−	Normal	2.0(mA)	CMOS Output	−40 to +85	SSOP5

Omnipolar(Polarity Discrimination) Hall ICs — Performs polarity discrimination via 2 outputs, one each for the S- and N-poles

Part No.	Supply Voltage (V)	Operating Magnetic Flux Density(mT) S-pole	Operating Magnetic Flux Density(mT) N-pole	Pulse Drive Period (ms)	Power Supply Noise Immunity	Current Consumption (Avg.)(μA)	Output type	Operating Temperature (°C)	Package (mm)
New BU52271NUZ	1.65 to 3.6	+1.7	−1.7	50	Normal	4.4	CMOS Output (2 Outputs : S-/N-pole)	−40 to +85	VSON04Z1114A 1.1×1.4, H=Max.0.4
New BU52472NUZ	1.65 to 3.6	+2.4	−2.4	50	High	4.4	CMOS Output (2 Outputs : S-/N-pole)	−40 to +85	VSON04Z1114A 1.1×1.4, H=Max.0.4
BU52272NUZ	1.65 to 3.6	+2.4	−2.4	50	Normal	4.4	CMOS Output (2 Outputs : S-/N-pole)	−40 to +85	VSON04Z1114A 1.1×1.4, H=Max.0.4
BU52072GWZ	1.65 to 3.6	+2.4	−2.4	50	Normal	4.4	CMOS Output (2 Outputs : S-/N-pole)	−40 to +85	UCSP35L1 0.8×0.8, H=Max.0.4
BU52273NUZ	1.65 to 3.6	+4.1	−4.1	50	Normal	4.4	CMOS Output (2 Outputs : S-/N-pole)	−40 to +85	VSON04Z1114A 1.1×1.4, H=Max.0.4
BU52073GWZ	1.65 to 3.6	+4.1	−4.1	50	Normal	4.4	CMOS Output (2 Outputs : S-/N-pole)	−40 to +85	UCSP35L1 0.8×0.8, H=Max.0.4
BU52274NUZ	1.65 to 3.6	+6.3	−6.3	50	Normal	4.4	CMOS Output (2 Outputs : S-/N-pole)	−40 to +85	VSON04Z1114A 1.1×1.4, H=Max.0.4
BU52074GWZ	1.65 to 3.6	+6.3	−6.3	50	Normal	4.4	CMOS Output (2 Outputs : S-/N-pole)	−40 to +85	UCSP35L1 0.8×0.8, H=Max.0.4
BU52075GWZ	1.65 to 3.6	+9.5	−9.5	50	Normal	5.0	CMOS Output (2 Outputs : S-/N-pole)	−40 to +85	UCSP35L1 0.8×0.8, H=Max.0.4
BU52077GWZ	1.65 to 3.6	+15.0	−15.0	50	Normal	5.0	CMOS Output (2 Outputs : S-/N-pole)	−40 to +85	UCSP35L1 0.8×0.8, H=Max.0.4
BU52078GWZ	1.65 to 3.6	+24.0	−24.0	50	Normal	5.0	CMOS Output (2 Outputs : S-/N-pole)	−40 to +85	UCSP35L1 0.8×0.8, H=Max.0.4

Bipolar Latch Hall IC

Hall



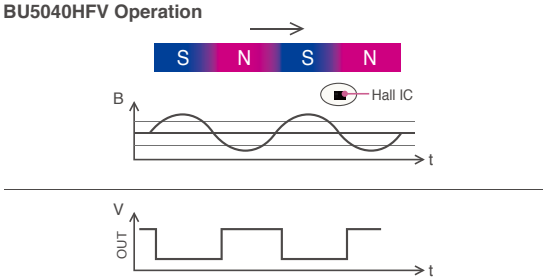
HVSOF5
(1.60×1.60×Max.0.60mm)

Bipolar Hall ICs detect changes in the magnetic field (i.e. when switching from the S-pole to N-pole and vice versa), enabling stable detection regardless of magnetic field strength(resulting in constant output pulse duty).
Bipolar Hall ICs are ideal for use as an interface between wheel keys and trackballs for menu selection, etc.

Features
- High-speed detection

Applications
- Wheel Keys
- Trackballs

BU5040HFV Operation



Bipolar Latch Hall IC Detects changes in polarity and switches output from High to Low(N-pole→S-pole) or Low to High(S-pole→N-pole)

Part No.	Supply Voltage (V)	Operating Magnetic Flux Density(mT)		Pulse Drive Period (ms)	Current Consumption (Avg.)(μA)	Output type	Operating Temperature (°C)	Package
		S-pole	N-pole					
BU52040HFV	1.65 to 3.3	+3.0	−3.0	0.5	200	CMOS Output	−40 to +85	HVSOF5

Contactless Current Sensor

Current

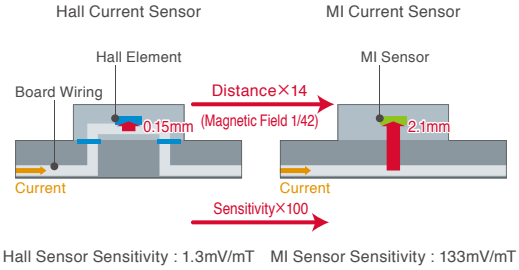
VQFN20QV3535
(3.5×3.5×Max.1.0mm)

ROHM's current sensor leverages MI technology featuring 100× greater sensitivity than conventional Hall sensors, making it possible to detect magnetic fields generated from current flowing through the substrate wiring. This enables measurement of the current flow completely without contact(drawing current within the IC package), significantly reducing power loss. In addition, the IC itself features low power consumption - ideal for battery-powered applications.

Features
- Ultra-high-sensitivity MI sensor technology
- Contactless design minimizes power loss
- Enables current monitoring with low power consumption
- Cancels magnetic field disturbances, allowing for a shieldless configuration
- Current Measurement Range : ±50A(ROHM Evaluation Board)

Applications
- Power Meters, Solar Power Systems, Power Storage Equipment

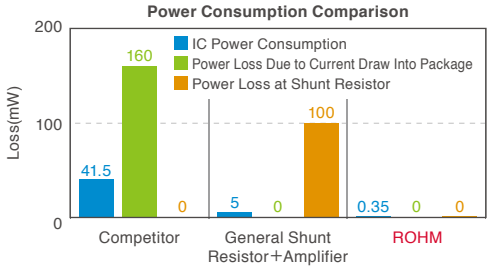
Current sensor structure utilizing ultra-high-sensitivity MI sensing technology



Hall Sensor Sensitivity : 1.3mV/mT MI Sensor Sensitivity : 133mV/mT

MI sensing technology enables current detection without drawing current into the package

Ultra-high-sensitivity detection utilizing MI sensing technology minimizes power consumption and loss



Contactless design minimizes power consumption by eliminating loss

Conditions: Conduction current : 10A, Shunt Resistance : 1mΩ

Contactless Current Sensor

Part No.	Supply Voltage (V)	Input Magnetic Field (μT)	Magnetic Field Sensitivity (μT/LSB)	Current Consumption (μA)	I/F	Operating Temperature (°C)	Package (mm)
New **BM14270MUV-LB**	2.7 to 5.5	±280	0.045	70	I²C	−40 to +125	VQFN20QV3535 3.5×3.5, H=Max.1.0

Transmission type Photointerrupters

ROHM transmission type photointerrupters are optical switches in which light emitting and receiving elements are aligned facing each other, and works by detecting light blockage when an object comes between both elements. Unlike mechanical switches, photointerrupters are contactless switches that improve reliability by preventing wear-and-tear due to abrasion(contact).

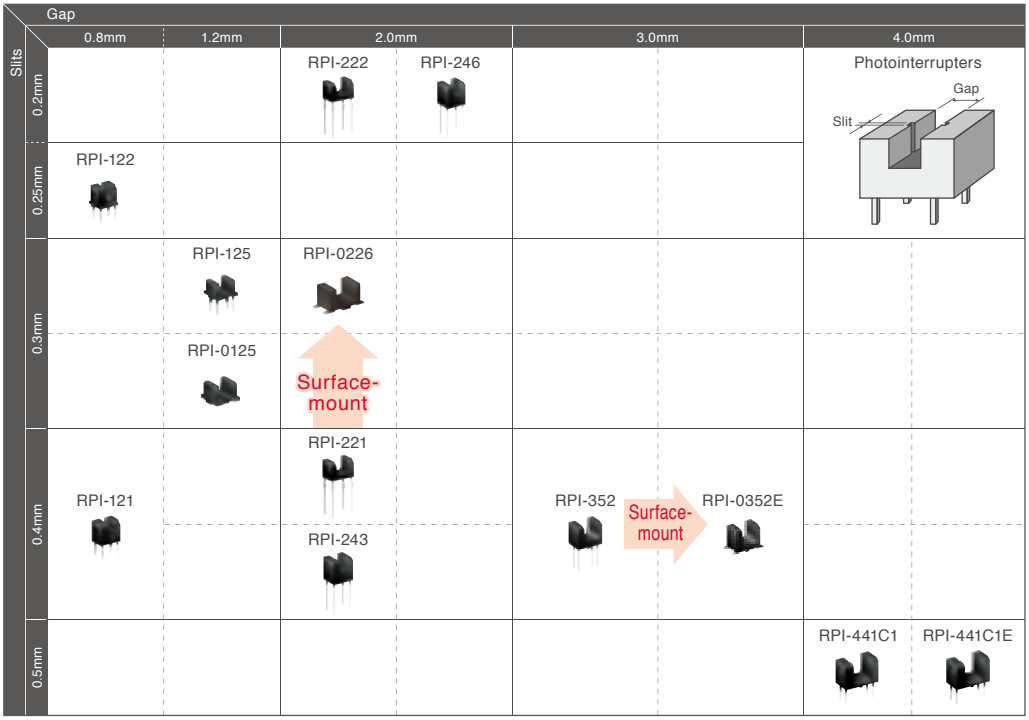
Features

- Offered in a wide range of package sizes, from small to large
- Expanding lineup includes energy-saving types

Applications

- Printers
- Office Equipment
- Motor Position Detection

Lineup



Linear Phototransistors Output

Package	Part No.	Standard Characteristics					
		Gap Width (mm)	Slit Width (mm)	I_C (mA)	V_{CE}(V)	I_F(mA)	tr, tf (μs)
Ultra-Compact Surface Mount type	**RPI-0125**	1.2	0.3	Min.0.45 Max.4.95	5.0	20	10
Compact Surface Mount type	**RPI-0226**	2.0	0.3	Min.0.1	5.0	5	50
Ultra-Compact type	**RPI-122**	0.8	0.25	Min.0.18 Max.1.08	0.7	3	10
	RPI-121	0.8	0.4	Min.0.7	5.0	20	10
	RPI-125	1.2	0.3	Min.0.45 Max.4.95	5.0	20	10
Compact type	**RPI-221**	2.3	0.4	Min.0.2	5.0	20	10
	RPI-222	2.0	0.2	Min.0.18 Max.0.95	5.0	10	10
	RPI-243	2.0	0.4	Min.0.5	5.0	20	10
	RPI-246	2.0	0.2	Min.0.35 Max.1.2	5.0	20	10
	RPI-352	3.0	0.4	Min.0.2	5.0	20	10
	RPI-441C1	4.0	0.5	Min.0.2	5.0	20	10
Energy Saving type	**RPI-0352E**	3.0	0.4	Min.0.18	5.0	10	10
	RPI-441C1E	4.0	0.5	Min.0.2	5.0	10	10

Infrared Light Emitting Diodes

ROHM infrared LEDs are ideal for optical transmission and remote control transmitter applications.
A variety of package types are offered, from lamp to surface mount types.

Features
- Parabolic structure ensures high output
- Expanded package lineup

Applications
- Infrared Communication Equipment
- Optical Sensor Transmission

SIR-34ST3F

Infrared Light Emitting Diodes

Package	Part No.	Features	Absolute Maximum Ratings	Standard Characteristics						
			I_F (mA)	I_E (mW/sr)	I_F(mA)	V_F (V)	I_F(mA)	λ_P (nm)	tr, tf (μs)	θ1/2 (deg.)
ϕ3 Resin	**SIR-34ST3F**	Optimized for remote control	100	10.5	50	1.3	100	950	1	27
	SIR-341ST3F	Compact, high power	75	18.1	50	1.3	50	940	1	16
ϕ5 Resin	**SIR-56ST3F**	Optimized for remote control	100	15.0	50	1.3	100	950	1	15
	SIR-563ST3F	High output Ideal for remote controls	100	21.0	50	1.34	50	940	1	15
	SIR-568ST3F	High speed LEDs for optical communication	100	38.0	50	1.6	50	850	fc=50MHz	13
Side View Resin type	**SIM-20ST**	General-purpose molded type	50	7.5	50	1.3	50	950	1	15
	SIM-22ST	General-purpose molded type	50	0.8	10	1.3	50	950	1	30
Surface Mount type (Top View)	**SIM-030ST**	Low profile(0.9mm)	100	25.0	100	1.7	100	870	0.1	20
	SIM-040ST	High output type	100	40.0	100	1.7	100	870	0.1	20

Phototransistors

ROHM offers both lamp and side-view type phototransistors featuring a spectral sensitivity in the infrared region.

Features
- Available in lamp and side view configurations

Applications
- Optical Communication Equipment
- Light Sensor Reception

RPT-38PB3F

Phototransistors

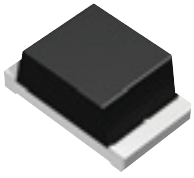
Package	Part No.	Features	Visible Light Filter	Absolute Maximum Ratings		Standard Characteristics					
				V_{CEO} (V)	P_C(Max.) (mW)	I_{CEO}(Max.) (μA)	V_{CE}(V)	I_C(Min.) (mA)	λ_P (nm)	tr, tf (μs)	θ1/2 (deg.)
ϕ3 Resin	**RPT-34PB3F**	Visible light filter	✓	32	150	0.5	10	2.0	800	10	36
	RPT-37PB3F	Visible light filter, Polarity discrimination	✓	32	150	0.5	10	2.0	800	10	36
	RPT-38PB3F	Visible light filter	✓	32	150	0.5	10	2.0	800	10	36
Side View Resin type	**RPM-20PB**	Visible light filter	✓	32	100	0.5	10	0.5	800	10	14
	RPM-22PB	Visible light filter, Wide directivity	✓	32	100	0.5	10	0.48	800	10	32

Photodiodes

ROHM's surface mount photodiode features spectral sensitivity in the infrared region.

Features
- High responsiveness ideal for high-speed communication

Applications
- Optical Communication Equipment
- Light Sensor Reception



RPMD-0100

Photodiodes

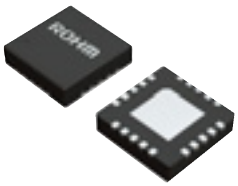
Package	Part No.	Features	Visible Light Filter	Absolute Maximum Ratings		Standard Characteristics				
				V_R (V)	P_D(Max.) (mW)	Photo Current (μA)	Dark Current (nA)	λ_P (nm)	tr, tf (ns)	θ1/2 (deg)
Surface Mount type (Top View)	**RPMD-0100**	Thin, Compact	✓	60	30	8	6 Max.	940	100	60

Interface

Differing from sensor elements, these devices are designed to amplify, analyze, and process output signals from sensors and control sensor operation. Maximizing the performance of each sensor element will make it possible to achieve new levels of functionality and applicability.

Capacitive Switch Controller ICs

Capacitive Switch



VQFN020V4040
(4.0×4.0×Max.1.0mm)

ROHM capacitive switch ICs utilize a proprietary capacitance detection circuit to achieve both high noise immunity and high sensitivity. Stable detection of minimal changes in capacitance allows for reliable sensing of finger contact, even when using thicker enclosures and protective films.

Features

- Achieves high noise immunity and sensitivity
- Built-in erroneous water detection prevention function
- Integrated noise, offset, and temperature drift cancellation functions
- Supports matrix configuration of sensor electrodes

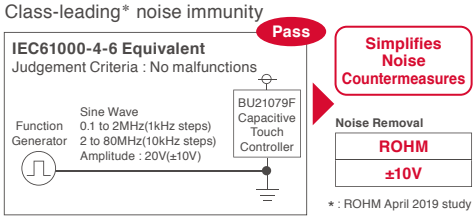
Applications

- Printers, TVs, Audio Players, and Other Consumer Products
- Home Appliances/Equipment (i.e. Refrigerators, AC, Air Purifiers)
- Wall AC/Lighting Switches, Industrial equipment

Control Panel Button

Clears stringent noise tests

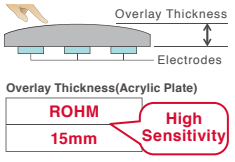
Class-leading* noise immunity



*: ROHM April 2019 study

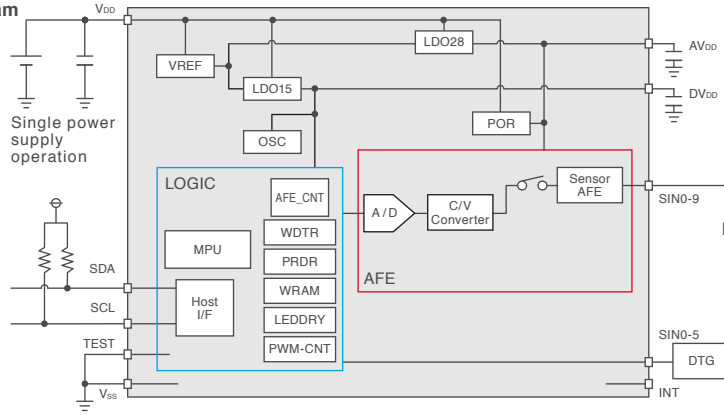
High sensitivity contributes to greater design flexibility

High sensitivity detection not affected by noise



Improved design flexibility makes it possible to add switches to curved surfaces

Block Diagram



Capacitive Switch Controller ICs

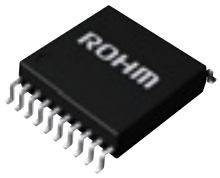
Part No.	Supply Voltage (V)	Capacitive Switch (ch)	LED Drive Pin(ch)	Erroneous Water Detection Prevention*	Matrix Control	I/F	Built-in MCU (bit)	Program Memory	Intermittent Operation	Package
BU21170MUV	3.0 to 5.5	5	5	Gen1	—	I²C	32	ROM	—	VQFN020V4040
BU21072MUV	3.0 to 5.5	10	6	Gen1	4×4	I²C	32	ROM	—	VQFN024V4040
BU21078MUV	3.0 to 5.5	12	8	Gen1	6×6	I²C	32	ROM	—	VQFN028V5050
BU21078FV	3.0 to 5.5	12	8	Gen1	6×6	I²C	32	ROM	—	SSOP-B28
BU21079F	3.0 to 5.5	8	—	Gen1	4×4	I²C	32	ROM	✓	SOP16
BU21077MUV	2.7 to 5.5	8	—	Gen1	4×4	I²C	32	RAM	✓	VQFN020V4040
☆ **BU21181FS**	3.0 to 5.5	18	—	Gen2	—	I²C	32	ROM	✓	SSOP-A32
New **BU21182FS**	3.0 to 5.5	20	—	Gen1	—	I²C	32	ROM	—	SSOP-A32

*Gen1: Electrode layout, countermeasures with dummy sensors, Gen2: Gen1 + New sensing algorithm

☆ : Under Development

Resistive Touchscreen Controller ICs

Touch Screen



SSOP-B20
(6.50×6.40×Max.1.15mm)

ROHM resistive touchscreen controller ICs are ideal for portables, printers, home appliances, car navigation systems, and more. Using in combination with existing 4-wire resistive touchscreens enables both 2-point and gesture detection.

Features

- 1- and 2-point detection controller ICs designed for 4-wire resistive touchscreens
- 2-point detection models are offered with and without a built-in CPU
- Ideal for consumer devices, such as mobile phones and printers, as well as automotive systems.

Applications

Touchscreen Display

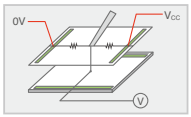
- Printers, Copiers, Electronic Dictionaries, and Other Consumer Electronics
- Vehicle Systems Including Car Navigation and Audio
- HMI Devices, Industrial Equipment

2-Point Touch Enabled in Existing Panels

Conventional System

Menu operation with button input(1-point)

Only one point can be detected with existing controllers

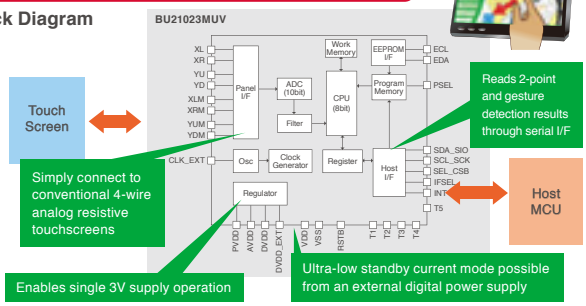


In existing 4-wire analog touchscreens, voltage is supplied in the X direction to determine the Y coordinate and vice versa, enabling one-point detection for each set of coordinates.

ROHM Resistive Touchscreen Controller IC

ROHM ICs enable 2-point gesture operation in existing resistive touch panels, providing greater usability and convenience

Block Diagram



Resistive type(Automotive-Grade : AEC-Q100 Qualified)

Part No.	Supply Voltage(V)	MCU	Resolution	Touch Detection	Standby Current(μA)	Operating Current(mA)	Host I/F	Operating Temp.(°C)	Automotive Grade AEC-Q100	Package
BU21024FV-M	2.7 to 3.6	8bit	1024×1024	2-point/1-point	60	4.0	SPI/I²C	−40 to +85	YES	SSOP-B28

Resistive type

Part No.	Supply Voltage(V)	MCU	Resolution	Touch Detection	Standby Current(μA)	Operating Current(mA)	Host I/F	Operating Temp.(°C)	Package
BU21027MUV	2.7 to 3.6	32bit	4096×4096	2-point/1-point	70	8.0	I²C	−20 to +85	VQFN020V4040
BU21029GUL	1.65 to 3.6	–	4096×4096	2-point/1-point	100	0.8	I²C	−20 to +85	VCSP50L2
BU21029MUV	1.65 to 3.6	–	4096×4096	2-point/1-point	100	0.8	I²C	−20 to +85	VQFN020V4040
BU21023GUL	2.7 to 3.6	8bit	1024×1024	2-point/1-point	60	4.0	SPI/I²C	−20 to +85	VCSP50L2
BU21023MUV	2.7 to 3.6	8bit	1024×1024	2-point/1-point	60	4.0	SPI/I²C	−20 to +85	VQFN028V5050
BU21025GUL	1.65 to 3.6	–	4096×4096	1-point	0.8	0.12	I²C	−30 to +85	VCSP50L2
BU21026MUV	1.65 to 3.6	–	4096×4096	1-point	0.8	0.12	I²C	−30 to +85	VQFN020V4040

Human Presence Sensor IC

Presence Detection

SSOP-B14
(6.00×6.40×Max.1.15mm)

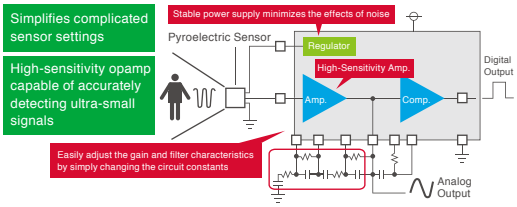
ROHM's human presence sensor IC is a pyroelectric infrared sensor amplifier equipped with a detection function, high-sensitivity amp for amplifying small input signals, and constant voltage source that supplies stable voltage to the sensor. Integrating multiple optimized functions into a single chip saves space along with standby power. In addition, the sensitivity can be customized based on application requirements by simply changing the circuit constants.

Features

- Built-in small-signal Amplifier
- Integrated sensor signal output comparator
- Internal voltage regulator

Applications

- Lighting Switches
- Security Systems
- TVs/PC Display



Pyroelectric Infrared Sensor Amplifier

Part No.	Supply Voltage(V)	Drain Voltage(V)	Amplifier1/Amplifier2 Gain (dB)	Output type	Package
BD9251FV	2.97 to 6.00	2.3	Max.46	Analog/CMOS Output	SSOP-B14

Wireless Communication

These days, many devices around us are linked to other devices in a variety of ways, and this situation is only expected to expand in the future to meet the needs for lower costs, greater energy savings, and increased convenience.
From the sub-GHz to the 2.4GHz band, a variety of products are offered, including modules equipped with ROHM Group ICs optimized to meet a variety of demands.

Smart Sensing & Smart Wireless

Smart Wireless and network sensor solutions from ROHM

Sensing

Accelerometer, Magnetometer, Pressure, Color, Optical Heart Pulse Monitor, Temperature, Ambient Light, Proximity

Hall, Current, Capacitive Switch, Touch Screen, Motion Detection, Terahertz

MCU

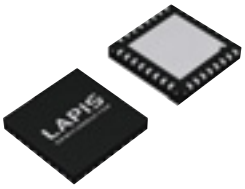
Low Power MCU

Wireless

Wi Fi | IEEE 802.15.4 | Bluetooth | IEEE 802.15.4k sigFox | Wi SUN | enocean

Cloud

Specified Low Power Radio LSIs (Sub-GHz Band)



WQFN32

LAPIS Semiconductor specified low power wireless LSIs have been adopted in a variety of applications both domestic and abroad, such as telemetry, fire alarms, home security, industrial remotes, and smart meters. In addition, we are developing new LPWA products for IoT, and are considering expanding our lineup to include overseas specifications. We support customer product development that satisfies all laws and regulations for both transmission and reception.

Features

- IEEE compliance enables interconnectivity
- Support for 2 diversity ensures stable reception(ML7396x, ML7406, ML7345)
- Address filter reduces device power consumption

Applications

- Telemetry
- Home Security
- Fire Alarms
- Industrial Remote Controls
- Smart Agriculture
- Asset Tracking

Specified Low Power Wireless LSIs(Data Transceiver LSIs)

Part No.	Supply Voltage(V)	Compliant Standards	Frequency Band(MHz)	Modulation Method	FEC Mode	Control I/F	Transmission Rate(kbps)	Transmission Output(mW)	Reception Sensitivity	Operating Temp.(℃)	Package Code
ML7066GD	2.1 to 3.6	ARIB STD-T67, RCR STD-30	426/ 429	Binary FSK	—	Synchronous serial (Control) DIO(DATA)	1.2, 2.4, 4.8[NRZ] (3-step setting function)	1/ 10	−116dBm [BER<1%]*1	−25 to +65	P-VQFN48-0707-0.50
ML7396DGD	1.8 to 3.6	ARIB STD-T108, EN300-220 FCC part15. 247/249	750 to 960	Binary (G)FSK (G)MSK	IEEE 802. 15.4g compliant	Synchronous serial (Control•DATA) DIO(DATA)	to 50, 100, 150, 200, 400	1/ 10/ 20	−107dBm [100kbps, BER=0.1%]*1	−40 to +85	P-VQFN40-0606-0.50
ML7344JyGD	1.8 to 3.6	ARIB STD-T67, RCR STD-30	160 to 510	Binary (G)FSK (G)MSK	—	Synchronous serial (Control) DIO(DATA)	15 or less	1/10/ 20	−117dBm [4.8kbps BER=0.1%]*1	−40 to +85	P-WQFN32-0505-0.50
ML7406yGD	1.8 to 3.6	EN300-220, EN13757-4	750 to 960	Binary (G)FSK (G)MSK	—	Synchronous serial (Control) DIO(DATA)	500 or less	1/ 10/ 20	−106dBm [100kbps BER=0.1%]*1	−40 to +85	P-WQFN32-0505-0.50
ML7345GD	1.8 to 3.6	ARIB STD-T67, ARIB STD-T108, RCR STD-30, EN300-220, EN13757-4:2013	160 to 960	Binary (G)FSK (G)MSK 4-level (G)FSK	—	Synchronous serial (Control) DIO(DATA)	100 or less	1/ 10/ 20	−119.5dBm [2.4kbps BER=1%]*1	−40 to +85	P-WQFN32-0505-0.50
ML7345DGD	1.8 to 3.6	ARIB STD-T67, ARIB STD-T108, RCR STD-30, EN300-220, EN13757-4:2013	315 to 960	Binary (G)FSK (G)MSK 4-level (G)FSK	—	Synchronous serial (Control) DIO(DATA)	100 or less	1/ 10/ 20	−119.5dBm [2.4kbps BER=1%]*1	−40 to +85	P-WQFN32-0505-0.50
ML7345CGD	3.3 to 3.6 (100mW)	Q/GDW 374.3	470 to 510	Binary (G)FSK (G)MSK 4-level (G)FSK	—	Synchronous serial (Control) DIO(DATA)	100 or less	20/ 100	−120dBm [2.4kbps BER=1%]*1	−40 to +85	P-WQFN32-0505-0.50
ML7414GD	1.8 to 3.6	ARIB STD-T67, ARIB STD-T108, Sigfox® RCR STD-30, EN300-220, EN13757-4: 2013	315 to 960	Binary (G)FSK (G)MSK 4-level (G)FSK BPSK (Only transmission)	IEEE 802. 15.4g compliant	Synchronous serial (Control) DIO(DATA)	100 or less	1/ 10/ 20	−106dBm [100kbps, BER=1%]*1	−40 to +85	P-WQFN32-0505-0.50

Multiband Wireless LSI

Part No.	Supply Voltage(V)	Compliant Standards	Frequency Band(MHz)	Modulation Method	FEC Mode	Control I/F	Transmission Rate(kbps)	Transmission Output(mW)	Reception Sensitivity	Operating Temp.(℃)	Package Code
ML7411GD	1.8 to 3.6	ARIB STD-T66, ARIB STD-T108, EN300-220, FCC part15	860MHz/ 915MHz/ 920MHz/ 2.4GHz	Binary (G)FSK (G)MSK 4-level (G)FSK	IEEE 802. 15.4g compliant	Synchronous serial (Control) DIO (DATA)	1.2 to 300	1/ 10/ 20	−108dBm [100kbps, BER=1%]*1 (860/920MHz) −95dBm [100kbps, BER=0.1%]*1 (2.4GHz)	−40 to +85	P-WQFN36-0606-0.50
New **ML7421GD**	1.8 to 3.6	ARIB STD-T66, ARIB STD-T67, ARIB STD-T108, RCR STD-30, EN300-220, FCC part15	433MHz/ 860MHz/ 915MHz/ 920MHz/ 2.4GHz	Binary (G)FSK (G)MSK 4-level (G)FSK	IEEE 802. 15.4g compliant	Synchronous serial (Control) DIO (DATA)	1.2 to 300	1/ 10/ 20	−106dBm (920MHz) −95dBm (2.4GHz) [100kbps BER=0.1%]*1	−40 to +85	P-WQFN36-0606-0.50

LPWA Wireless LSI(Data Transceiver LSI)

Part No.	Supply Voltage(V)	Compliant Standards	Frequency Band(MHz)	Modulation Method	FEC Mode	Control I/F	Transmission Rate	Transmission Output(mW)	Reception Sensitivity	Operating Temp.(℃)	Package Code
ML7404GD	1.8 to 3.6	ARIB STD-T67, ARIB STD-T108, RCR STD-30, ETSI EN300-220, EN13757-4:2013, Sigfox® IEEE802.15.4k	315 to 960	Binary (G)FSK (G)MSK 4-level (G)FSK BPSK DSSS	IEEE 802. 15.4k compliant	Synchronous serial (Control) DIO (DATA)	to 100kbps (xFSK) 80k to 200kcps (DSSS)	1/ 10/ 20	−119.5dBm [2.4kbps BER=1%]*1 (xFSK) −121dBm [200kcps, SF=64, PER=1%]*2(DSSS)	−40 to +85	P-WQFN32-0505-0.50-63

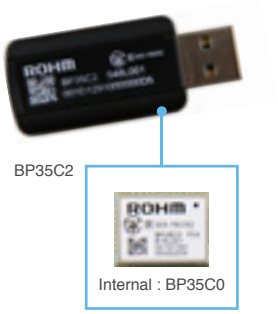
Specified Low Power Wireless(Sub-GHz) System LSI with Built-in MCU

Part No.	Supply Voltage(V)	Compliant Standards	Frequency Band(MHz)	Modulation Method	CPU Core	Memory Resources	Transmission Rate(kbps)	Transmission Output(mW)	Reception Sensitivity	Operating Temp.(℃)	Package Code
ML7416N	1.8 to 3.6	ARIB STD-T108	750 to 960	Binary (G)FSK (G)MSK	Cortex®-M0+	FLASH 512KB, RAM 64KB	to 50, 100, 150, 200, 400	1/ 10/ 20	−105dBm [100kbps BER=0.1%]*1	−40 to +85	P-LFBGA81-1010-1.00-MC
New **ML7436N**	1.8 to 3.6	ARIB STD-T66, ARIB STD-T67, ARIB STD-T108, RCR STD-30, EN300-220, FCC part15	433MHz/ 860MHz/ 915MHz/ 920MHz/ 2.4GHz	Binary (G)FSK (G)MSK 4-level (G)FSK	Cortex®-M3	FLASH 1MB, RAM 256KB	1.2 to 300	1/ 10/ 20	−106dBm (920MHz) −95dBm (2.4GHz) [100kbps BER=0.1%]*1	−40 to +85	P-TQFP48-0707-0.50

The above specified low power wireless LSIs(sub-GHz band) are halogen-free. For details, please contact a sales representative.
*1 : BER stands for Bit Error Rate. *2 : PER refers to Packet Error Rate.

ROHM GROUP
LAPIS SEMICONDUCTOR

Specified Low Power Radio Modules



BP35C2

Internal : BP35C0

The Wi-SUN(Wireless Smart Utility Network) international standard has attracted considerable attention in recent years among the 920MHz specified low power wireless band for use in smart communities(i.e. transportation infrastructure and smart meters) as well as the M2M and IoT markets due to its low power consumption and long communication distance.

Features

- 920MHz band specified low power radio module
- Class-leading* receiving sensitivity
- Built-in antenna eliminates the need for high frequency designs
- Pre-adjusted transmission power
- Japanese Radio Act certified
- MAC address included

＊: ROHM April 2019 study

Applications

- HEMS/BEMS/CEMS
- IoT/M2M
- Sensor Networks

Specified Low Power Radio Modules

Part No.	Supply Voltage (V)	Operating Temp. (°C)	Host CPU I/F	Compliant Standards	Onboard System LSI	Size (mm)	Package
BP35A1	2.7 to 3.6 (Single power supply)	−20 to +80	UART	Wi-SUN B Route	ML7396B (LAPIS Semiconductor)	22.0×33.5×4.0	Connector mounting type : 20pin, 0.5mm pitch
BP35C0	2.6 to 3.6 (Single power supply)	−30 to +85	UART	Wi-SUN B Route/ HAN	ML7416N (LAPIS Semiconductor)	15.0×19.0×3.0	SMD 1.27mm pitch, 28pin
BP35C2	4.5 to 5.5 (Single power supply)	−20 to +50	USB	Wi-SUN B Route/ HAN	ML7416N (LAPIS Semiconductor)	21.4×49.7×8.5	USB Dongle
New **BP35C0-J11**	2.6 to 3.6 (Single power supply)	−30 to +85	UART	Wi-SUN B Route/ HAN	ML7416N (LAPIS Semiconductor)	15.0×19.0×3.0	SMD 1.27mm pitch, 28pin

Usage Notes

ROHM specified low power wireless modules are wireless communication modules. When developing products using this module it is also necessary to develop application software. Many applications are supported by third parties. Sample code for demonstrating and evaluating our modules can be downloaded from our website. Also, please refer to our website for technical support.

Bluetooth® Modules

MK71351-NNN

LAPIS Semiconductor's Bluetooth® modules allow users to achieve Bluetooth Low Energy functionality featuring low power consumption operation in an easy-to-use form factor.

The antenna and peripheral devices required for operation are built in, and the modules are compliant not only with the Radio Law in Japan, but the FCC (US), SED (Canada), and CE (EU) as well.

In addition, Bluetooth® SIG End Product certification makes it easy to develop devices with embedded Bluetooth® functionality.

Features

- Bluetooth® Low Energy Single Mode compatible modules
- Ultra-low current consumption ideal for coin/ button battery-equipped devices: 2.9mA (transmission), 3.0mA (reception) [MK71351-NNN]
- Bluetooth® Core Spec. v4.2 compliant [MK71351-NNN]
- Preadjusted wireless characteristics
- Radio Law/FCC/ISED/CE certified with built-in antenna

Bluetooth® Modules

Part No.	Supply Voltage (V)	Compliant Standards	Host CPU I/F	Certifications	Module Specifications	Onboard Flash/ RAM	Operating Temp. (°C)	Size (mm)	Package Code
New **MK71351-NNN**	2.0 to 3.6	Bluetooth® core spec. v4.2 (Single mode)	UART SPI	Bluetooth® Certified Radio Certified : TELEC/FCC/ISED/CE	Role : Master/Slave Application Blank	Flash : 128KB RAM : 128KB	−40 to +85	9.7× 11.95× 2.1	M-FLGA33-9.7X11.95-0.75-9Y
MK71251-01	2.0 to 3.6	Bluetooth® core spec. v4.1 (Single mode)	(BACI*1) SPI (HCI*2) UART	Bluetooth® Certified : QDID : 77987(End Product) Radio Certified : TELEC/FCC/IC/CE	Role : Master/ Slave	Flash : — RAM : 28KB	−20 to +75	8.0× 11.0× 2.0	M-FLGA33-8.0X11.0-0.65-9Y
MK71251-02	2.0 to 3.6	Bluetooth® core spec. v4.1 (Single mode)	UART	Bluetooth® Certified : QDID : 77987(End Product) Radio Certified : TELEC/FCC/IC/CE	Role : Slave only Application Blank	Flash : — RAM : 28KB	−20 to +75	8.0× 11.0× 2.0	M-FLGA33-8.0X11.0-0.65-9Y
MK71251-02A					Role : Slave only Serial Communication Application				
MK71251-02B					Role : Slave only Beacon Application				

*1 : BACI(Bluetooth Application Controller Interface), LAPIS Semiconductor's original host I/F *2 : HCI(Host Control Interface), a Bluetooth® compliant I/F

Note : Purchase of MK71251 series requires confirmation and agreement on equipment, operating environment, application.

☆ : Under development(planned specifications are listed above)

ROHM GROUP
LAPIS
SEMICONDUCTOR

Wireless LAN Modules

BP3591

ROHM wireless LAN modules integrate all necessary authentication and encryption (supplicant and WPS) protocols.
Models incorporating the TCP/IP protocol stack are also offered, allowing the modules to handle all network processing.

Features
- IEEE802.11b/g/n wireless LAN modules
- Integrates ROHM's original baseband LSI
- Pre-adjusted transmission power
- Japanese radio Act certified

Applications
- Consumer Electronics
- Industrial Equipment

Wireless LAN Modules

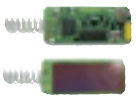
Part No.	Supply Voltage (V)	Operating Temp. (°C)	Host CPU I/F	Compliant Standards/ Module Specifications	Onboard System LSI	Size (mm)	Package*
BP3580	3.1 to 3.5 (Single power supply)	−40 to +85	USB/ SDIO/ UART	・IEEE802.11b/g/n	BU1805GU	17.0× 17.0× 2.3	Surface Mount type End face through-hole 1.27mm pitch, 48pin
BP3591	3.1 to 3.5 (Single power supply)	−40 to +85	USB/ SDIO/ UART	・IEEE802.11b/g/n ・Module incorporating the BP3580 and chip antenna	BU1805GU	24.0× 33.1× 4.7	Connector Mount type 0.5mm pitch, 34pin
BP3599	3.1 to 3.5 (Single power supply)	−40 to +85	USB/ SDIO/ UART	・IEEE802.11b/g/n ・BP3591 with built-in Flash memory ・Pre-installed firmware	BU1805GU	24.0× 33.1× 4.7	Connector Mount type 0.5mm pitch, 34pin
BP3595	3.1 to 3.5 (Single power supply)	−40 to +85	USB/ SDIO/ UART	・IEEE802.11b/g/n ・Compact version of the BP3591	BU1805GU	15.3× 27.6× 2.6	Connector Mount type 0.4mm pitch, 30pin
BP359B	3.1 to 3.5 (Single power supply)	−40 to +70	USB/ SPI/ UART	・IEEE802.11b/g/n ・BP3591 with integrated MCU and flash memory ・Pre-installed firmware	BU1805GU	24.0× 33.1× 4.7	Connector Mount type 0.5mm pitch, 34pin

* : All packages are proprietary ROHM designs

Usage Notes
ROHM wireless LAN modules are wireless communication modules. When developing products using this module it is also necessary to develop application and device drivers. The device drivers are available on our website as sample code(Linux). Other OS and applications are supported by third parties. For technical support on these products, please refer to ROHM's website.

EnOcean® Modules

Switch Modules
PTM 210J



Temperature Sensor Modules
STM 431J

USB Receiver Modules
USB 400J

EnOcean® modules combine ultra-low power communication elements with power generating devices that utilize energy harvesting technology (i.e. light, electromagnetic induction). Their wire-free, batteryless design enables installation virtually anywhere and eliminates the need for periodic maintenance. In addition, interconnectivity allows for easy mounting and retrofitting.

Features
- Wireless batteryless communication using energy harvesting technology
- Japanese Radio Act certified

Applications
- Existing HEMS/BEMS
- Machine Health Sensing Devices
- Healthcare Monitoring Systems

EnOcean® Modules

Product Name	Part No.		Supply Voltage	Operating Temp. (°C)	Package Size (mm)
	928.35MHz (Japan)	868.30MHz (Europe, China)			
Switch Modules	**PTM 210J**	**PTM 210**	Supply from internal ECO 200	−25 to +65	40.0×40.0×11.2
Circuit Boards for Switch Modules	**PTM 430J**	**PTM 330**	Supply from external ECO 200	−25 to +65	26.2×21.15×3.5
Electromagnetic Induction Generator Element for Switch Modules	**ECO 200**		Electromagnetic induction power generation 120μJ min. at 2V	−25 to +65	29.3×19.5×7.0
Magnet Contact Modules	**STM 429J**	**STM 329**	Solar power generation	−20 to +60	64.8×16.0×5.4
Temperature Sensor Modules	**STM 431J**	**STM 331**	Solar power generation	−20 to +60	64.8×16.0×8.4
Humidity Sensor Module	**HSM 100**		Supply from STM 431J	−20 to +60	18.0×13.0×3.5
Energy Harvesting Wireless Modules	**STM 400J**	**STM 300**	2.1 to 5.0V (2.5V startup voltage)	−25 to +85	22.0×19.0×3.1
Programmable Wireless Transceiver Modules	**TCM 410J**	**TCM 310**	2.6 to 5.0V	−25 to +85	22.0×19.0×3.1
USB Receiver Modules	**USB 400J**	**USB 300**	(via USB)	−20 to +50	70.0×23.0×9.0

Note : EnOcean® products are available in multiple frequency bands to support the radio laws in different countries.
Therefore, it is necessary to select the EnOcean® product according to the frequency band of the country used(destination).

Usage Notes
EnOcean® modules are wireless communication modules. When developing products using this module it is also necessary to develop application software. Applications are supported by third parties. For technical information on these products, please refer to EnOcean's GmbH website.

Sensor Control

The ROHM Group offers a broad variety of MCUs optimized for sensor and system control.

MCU

LAPIS Semiconductor MCUs utilize original low power technology cultivated over many years to achieve class-leading* performance. Advanced CMOS MCUs equipped with a proprietary RISC-type 16bit CPU U16 Core and 32bit ARM® Cortex®-M0+ are available. We also supply a range of products that meet customer demands, including ultra-low power models and 'tough' MCUs strong against noise and high temperature environments.

* : LAPIS Semiconductor April 2019 study

ML620Q503H/ ML620Q504H

P-TQFP48-0707-0.50

High performance 16bit CMOS MCUs integrating LAPIS Semiconductor's RISC-type 16bit CPU U16 Core. These MCUs improve processing power while advancing the low-power technology of 8bit U8 Core products. In addition, current consumption can be reduced by optimally combining 3 power down modes. And we support a range of system requirements through a variety of peripherals.

Features

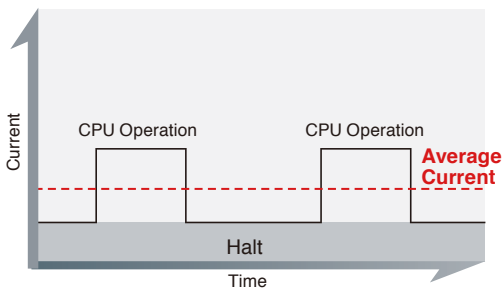
- Multiple power down modes enable optimized power consumption
- Extensive peripherals support a variety of system requirements

Applications

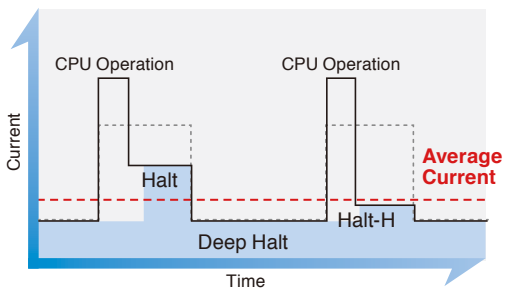
- Sensor Nodes, Wireless Modules, etc.
- Battery Powered Devices Such as Electronic Shelf Labels
- Consumer Electronics, Home Appliances, Industrial Equipment

Optimally combine multiple power down modes to further reduce power consumption

U8 CORE Conventional



U16 CORE ML620Q503H/ML620Q504H



[16bit ML620Q500] Standard 16bit U16 Core MCUs

Part No.	Operating Conditions					ROM/RAM		Functions/Features											Package
	Operating Voltage (V)	Operating Freq.(Max.) Low Speed Clock	Operating Freq.(Max.) High Speed Clock	Current Consumption (Typ. @HALT)	Operating Temp. (°C)	ROM Capacity (KB)	RAM Capacity (KB)	Port	8bit Timer	PWM	WDT	ADC (Method)	Serial Port I²C	Serial Port SSIO	Serial Port UART	Serial Port USB	External Interrupts	Others	
ML620Q503H/ ML620Q504H	1.8 to 5.5	32.768 kHz (Internal RC/Crystal/ External)	16 MHz	0.45 μA	−40 to +85	32/ 64	2/6	38	8 (16 bit ×4)	16 bit ×4	1	24bit×2 (RC) 12bit×12 (Sequential)	2	2	2	—	8	Analog comparator ×2/ Melody : buzzer	P-TQFP 48-0707 -0.50

ROHM GROUP LAPIS SEMICONDUCTOR

ML630Q464/ ML630Q466

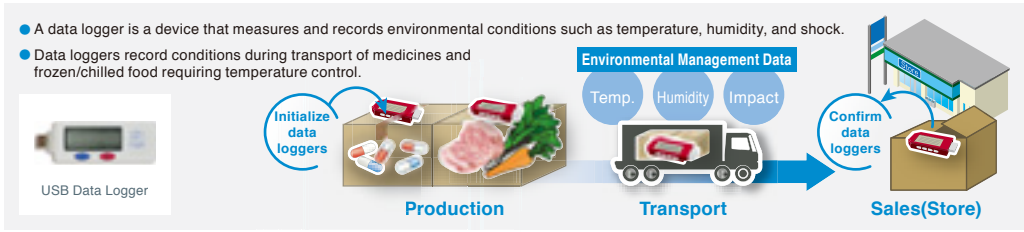
P-TQFP100-1414-0.50

These high performance low power CMOS MCUs with embedded 32bit CPU Core ARM® Cortex®-M0+ are ideal for USB data loggers in cold chain applications. Built-in USB 2.0 compatibility, PDF generation function, and LCD driver enable safe data transfer and storage of log data.

Features
- Low power consumption
- Built-in USB device function
- Comprehensive software support (i.e. PDF generation algorithm)

Applications
- USB Data Loggers
- Sensors, Wireless Devices
- Data Loggers for Industrial Equipment

Using data loggers to record environmental conditions during transport



[32bit ML630Q400] 32bit MCUs with Built-in ARM® Cortex®-M0+ and USB/LCD Drivers

Part No.	Operating Conditions					ROM/RAM		Functions/Features											Package
	Operating Voltage (V)	Operating Freq.(Max.) Low Speed Clock	Operating Freq.(Max.) High Speed Clock	Current Consumption (Typ.@HALT)	Operating Temp. (°C)	ROM Capacity (KB)	RAM Capacity (KB)	Port	8bit Timer	PWM	WDT	ADC (Method)	Serial Port I²C	Serial Port SSIO	Serial Port UART	Serial Port USB	External Interrupts	Others	
ML630Q464/ ML630Q466	1.8 to 5.5	32.768 kHz (Internal RC/ Crystal)	16 MHz	0.8 µA	−40 to +85	64/ 128	8/ 16	38	8 (16 bit ×4)	16 bit ×4	1	24bit ×2 (RC) 12bit ×12 (SA type)	2	2	2	1	8	AES/DMA/ RTC/ Random number generator/ Analog Comparator×2/ 1kHz timer	P-TQFP 100-1414 -0.50

ROHM GROUP LAPIS SEMICONDUCTOR

ML62Q1000 series

P-SSOP16

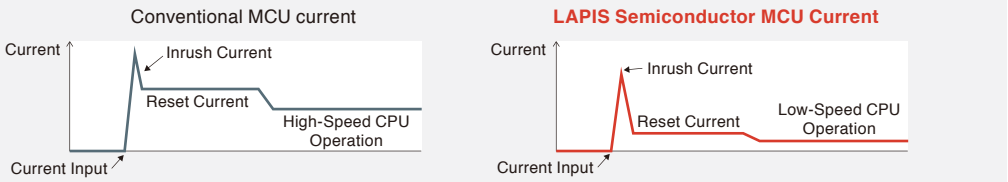
P-TQFP100-1414-0.50

High performance 16bit MCUs equipped with U16 Core. These products inherit the noise immunity and temperature resistance of our 'tough' MCUs. A variety of peripherals and high processing performance are provided while maintaining low power consumption. ROM capacity ranges from 16KB to 256KB, and models with built-in LCD driver are available.

Features
- Reduced power consumption at startup
- Various peripherals
- Broad lineup(16 to 100pin/16 to 512KB ROM)
- Multiple safety functions(i.e. strong noise immunity, 105°C compatibility, 13 safety functions such as memory check, crystal oscillation strong against leakage)

Applications
- Sensors, Wireless Devices
- Home Appliances, Industrial/Residential Equipment

Suppresses current during power ON, ensuring worry-free use in systems with low current capacity



[16bit ML62Q1000 series] 16bit MCUs with Built-in Standard U16 Core and LCD Drivers

Part No.	Operating Conditions					ROM/RAM		Functions/Features											Package
	Operating Voltage (V)	Operating Freq.(Max.) Low Speed Clock	Operating Freq.(Max.) High Speed Clock	Current Consumption (Typ.@HALT)	Operating Temp. (°C)	ROM Capacity (KB)	RAM Capacity (KB)	Port	8bit Timer	PWM	WDT	ADC (Method)	Serial Port I²C	Serial Port SSIO	Serial Port UART	Serial Port USB	External Interrupts	Others	
ML62Q1000 series	1.6 to 5.5	32.768 kHz (internal RC/ crystal)	24 MHz	2.8 to 3.4 µA	−40 to +105	16 to 256	4 to 16	12 to 92	8 to 16 (16 bit ×4 to 8)	16 bit × 4 to 8	1	10 bit ×6 to 16 (SA type)	2 to 3	2 to 6	SSIO Common	—	8 to 12	DMA/ 8bit DAC/ Analog comparator ×2/ Melody : buzzer	P-SSOP 16 to P-TQFP 100

ROHM GROUP LAPIS SEMICONDUCTOR

Evaluation Kits

The ROHM Group provides evaluation kits and development tools that support application and software development

ROHM Sensor Medal

ROHM's sensor medal is a wearable device that utilizes proprietary human sensing technology. Multiple sensors instantaneously sense the wearer's movement, activities, and location, and can communicate with information terminals.

Features

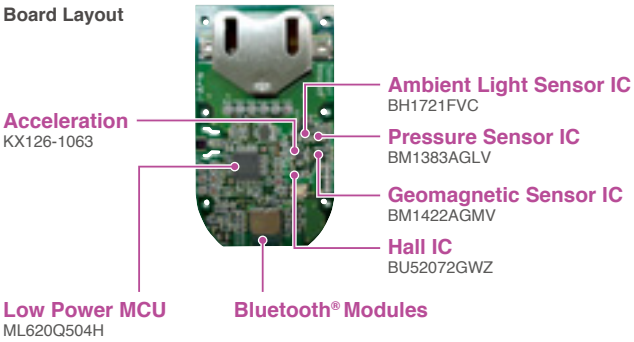
- Ideal for initial development using multiple sensors
- Provides distinctive sensor applications
- Low power consumption

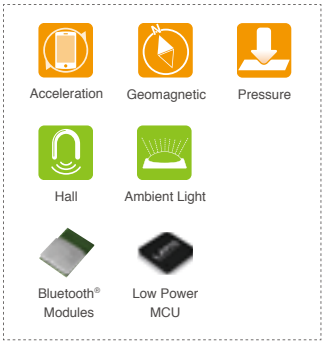
Applications

- Wearable Devices
- High-performance Smart Watches
- Machine Health Monitoring Devices

SensorMedal-EVK-002*

Board Layout





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

ROHM Sensor Shield Evaluation Kit

(SensorShield-EVK-003)

ROHM sensor evaluation kits integrate a variety of ROHM Group sensors. The included sensor expansion boards are compatible with Arduino Uno/Lazurite. Support materials such as manuals and app notes, along with development software, can be downloaded from a dedicated website to facilitate development of applications using various sensors.

Features

- Broad sensor lineup
- Sensor expansion board compatible with Arduino Uno and Lazurite
- Supporting materials, including documents and development software, are available online

Applications

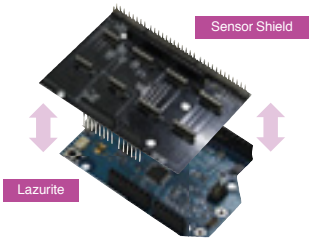
- Sensor Evaluation and Initial Set Development
- Internet of Things(IoT)
- Electronic Circuits and Training Materials

Broad Sensor Module Lineup

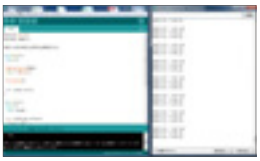
Sensors	Part No.	Overview
Acceleration	**KX224-1053**	±32g Max., wide detection band(xy : 8kHz, z : 5.1kHz), for consumer and industrial markets
Pressure Sensor	**BM1383AGLV**	Pressure range : 300hPa to 1,100hPa, built-in temperature compensation function
Geomagnetic Sensor	**BM1422AGMV**	Current consumption : 150μA, magnetic sensitivity : 0.042μT/LSB
Color Sensor	**BH1749NUC**	Wide light detection range : 0.0125 to 80,000lx
Optical Sensor for Heart Rate Monitor	**BH1790GLC**	Superior infrared light removal characteristics, supports low V_F LEDs, low power consumption
	BH1792GLC*	High sampling(1,024Hz), low power consumption
Temperature Sensor	**BD1020HFV**	Analog output temperature sensor, temperature sensitivity : −8.2mV/°C typ.
Ambient Light Proximity Sensor	**RPR-0521RS**	Digital output : I²C I/F, brightness measurement range : 0 to 43,000lx
Hall IC	**BD7411G**	Bipolar detection type
☆ **Current Sensor**	**BM14270MUV-LB**	Current consumption: 70μA(@20SPS), contactless type, measurement range: −50A to +50A

Please check the website for the latest lineup and development updates.
☆ : Under Development(as of March 2019)
* : Purchased separately

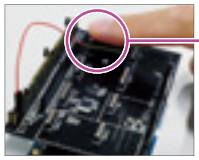
Arduino Uno/Lazurite Usage Example

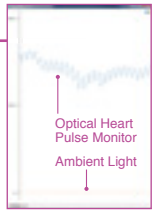


Sensor Evaluation Application



Optical Heart Rate Sensor Application


Optical Heart Rate Sensor



Sensing Operation Screen

Add-On Boards for Sony® SPRESENSE™

(SPRESENSE-SENSOR-EVK-701, SPRESENSE-BLE-EVK-701)

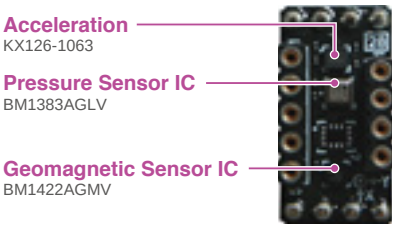
The SPRESENSE-SENSOR-EVK-701 sensor add-on board adds a broad range of sensor capabilities along with SPRESENSETM's GPS reception and high resolution audio codec functions, facilitating the development and evaluation of advanced IoT applications. In addition to the included accelerometer, geomagnetic sensor, and barometric pressure sensor, sensors that detect heart rate, color, temperature, Hall effect, and other quantities can be added via extension connector.
The SPRESENSE-BLE-EVK-701 Bluetooth® low energy Add-On Board adds Bluetooth® low energy functionality to the SPRESENSE™, enabling connection with Bluetooth®-compatible equipment. A pattern antenna is also built in, and the Bluetooth®-certified circuit has been optimized to comply with all major radio regulations in Japan(TELEC), the US(FCC), and EU(CE). In addition, software for Arduino and NuttX along with a smartphone app are included, facilitating communication evaluation.

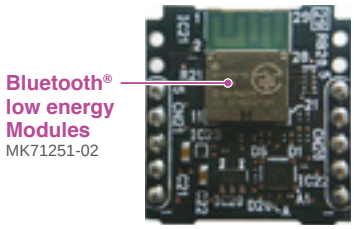
Features

- Ideal for the development of products equipped with GPS, motion sensors, and/or high resolution audio
- Open source software(i.e. for Arduino, NuttX) provided
- Includes an antenna and supports Bluetooth® functionality under a variety of radio standards

Applications

- GPS Trackers
- Drones
- Other IoT Equipment





Lazurite series

(Basic/
Sub-GHz/
920J/
mini writer(Type B)/
920J Xbee shield/
Pi Gateway)

LAPIS Semiconductor's Lazurite series is a reference design series that allows anyone to easily develop prototypes and begin set development for IoT applications. Sample programs for ROHM sensors are also available.

Features

- Immediately begin development by connecting to a PC and launching Lazurite IDE
- Low power consumption(even with the prototype) prolongs battery life
- Built-in specified low power radio(920MHz band) IC

Applications

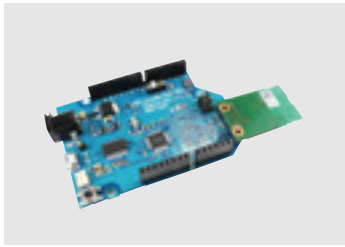
- IoT/M2M(Environmental/ Agricultural/Infrastructure Monitoring)
- Electronic Kits

Lazurite Basic

A low power Arduino-compatible MCU board developed using open source. Software development is made possible by installing the dedicated Lazurite IDE(free of charge) on a PC.

Lazurite Sub-GHz

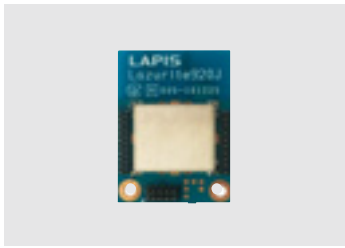
16bit MCU development board featuring 920MHz specified low power wireless communication. Software development is enabled by downloading Lazurite IDE and connecting the board to a PC via USB. APIs that are mostly compatible with Arduino are supported, allowing Arduino design resources to be utilized. In addition, intermittent operation reduces power consumption, making them ideal for battery-powered devices.



Lazurite 920J

Lazurite mini series

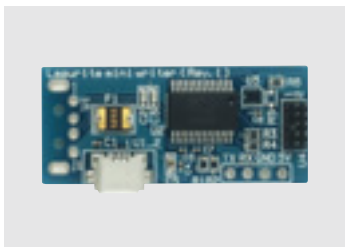
Lazurite 920J is an SD-card-sized(32mm×24mm) ultra-compact 920MHz specified low power wireless MCU board that supports a wide voltage range(1.8V to 5.5V) for greater applicability. Compatible with Lazurite Sub-GHz software, it features the same IO terminals with a 1.27mm pitch. In addition, program writing is possible using Lazurite mini writer(sold separately).



Lazurite mini writer(Type B)

Lazurite mini series

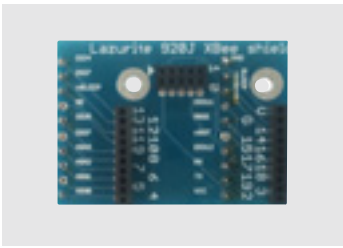
Lazurite mini writer(Type B) is a writer for the Lazurite mini series of MCU boards.
It connects to a PC using micro USB.
Programs for Lazurite IDE can be written by connecting to the Lazurite 920J MCU board using the supplied ribbon cable.



ROHM GROUP
LAPIS
SEMICONDUCTOR

Lazurite 920J Xbee shield

This shield board connects the Lazurite 920J to Arduino's general-purpose XBee® board. Using this board enables wireless 920MHz communication under the Arduino environment. Sample programs(sketches) can be downloaded from the dedicated Lazurite page.



Lazurite Pi Gateway

This expansion board for Raspberry Pi A+/B+ is equipped with a 920MHz specified low power wireless module. Operation is enabled by downloading Raspbian containing drivers for specified lower power control. Combining with Lazurite Sub-GHz makes it easy to configure wireless IoT/M2M systems.

Specifications

		Lazurite Basic/Sub-GHz
Power Supply	Supply Voltage	DC 7V to 15V/Micro
	Operating Voltage	3.3V/5V(Selectable)
CPU	Part No.	ML620Q504H
	ROM	64KB
	RAM	6KB
	Operating Frequency(During Operation/Standby)	16MHz/32.768kHz
Wireless Standards*	RF Band	920MHz
	Protocol	IEEE802.15.4e/g
	bit Rate	50kbps/100kbps
Current Consumption	During Operation/Standby	10mA/2mA

*: Lazurite Basic is not supported

ROHM GROUP
LAPIS SEMICONDUCTOR

Usage Notes

Currently, Lazurite series has been limited to support in Japanese.

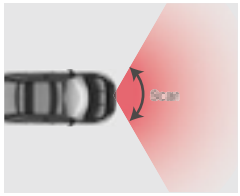
R&D

ROHM is focused on the development of new technologies with an eye towards the next generation, for example by offering breakthrough products and implementing R&D that strikes an optimized balance between materials, design engineering, production technology, and improved quality.

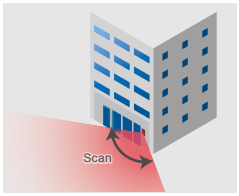
Photonic Crystal Laser Diodes

ROHM is developing a photonic crystal laser diode in order to achieve an all-solid-state beam scanning light source without a mechanical drive block. With an oscillation wavelength of 900nm, it is expected to be adopted for LiDAR* and security applications.

■ LiDAR* Light Source



■ Security Light Source



★ : Light Detection And Ranging

Features

- Beam direction can be controlled by the chip itself
- The divergence angle is as narrow as 0.2°, that is, a nearly parallel light can be obtained without using a lens
- The spectrum width is narrow, and the change in oscillation wavelength with respect to the change in ambient temperature is less than 1/3rd that of conventional laser diodes, making it ideal for sensors

Applications

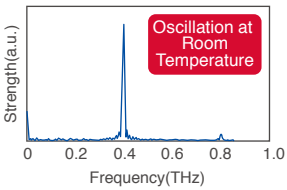
- Beam Scanning (LiDAR*/Security Light Sources)
- Sensors for Distance Measurement

Terahertz Wave Generating RTD*

★ : Resonant Tunneling Diode

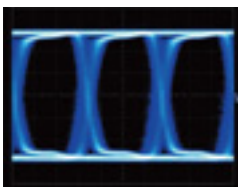
ROHM is developing compact terahertz semiconductor devices capable of room temperature operation. Terahertz devices are expected to be used in high-speed wireless communication, sensing, and imaging applications.

■ Oscillation Spectrum Example



■ Application Examples

Sensor/Imaging



Wireless Communication

Features

- Oscillation and detection elements operating at room temperature using a resonant tunneling diode
- Compact and simple terahertz device

Applications

- Ultra-high-speed Wireless Communication
- Security
- Food Inspection
- Machine Healthcare (Preventive Maintenance)

Key Features of Terahertz Waves

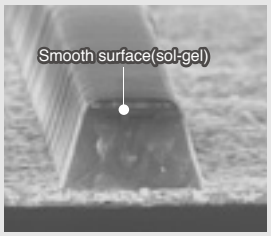
- Combines the linearity of light with the permeability of radio waves
- An inherent spectrum of multiple substances exist within the terahertz band
- Sensitive on moisture content
- Higher bandwidth than millimeter wave and microwave

ROHM Thin-Film Piezoelectric MEMS Service

ROHM has conducted R&D over many years, focusing on technological innovation using ferroelectrics. Utilizing in-house high reliability production equipment that leverages market-proven ferroelectric technology and a heterogeneous material management system allows ROHM to integrate thin-film piezoelectric MEMS and IC microfabrication technologies. In addition, joint development with customers will make it possible to achieve next-generation solutions featuring breakthrough miniaturization with unprecedented energy-savings and performance.

High-Performance Thin-Film Piezoelectric Deposition Technology

PZT Film Thickness Range	2.5%
Piezoelectric Constant d_{31}	−190pm/V
Relative Permittivity εr	1,000
Dielectric Loss, tanδ	0.02 to 0.03
Leakage Current	<1μA/cm²@40V



2μm line pattern

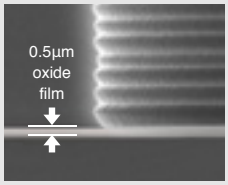
Original PZT sol-gel deposition technology makes it possible to achieve a uniform film thickness of 2.0μm±2.5%

100μm Ultra-Thin Wafer Handling and Bonding Technologies

- Bonding possible even at low temperatures(+60˚C)
- ±3μm alignment accuracy
- Fully automated system improves production efficiency

Silicon Deep Etching Technology

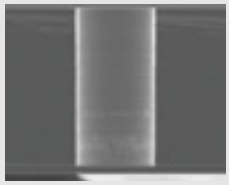
230:1



Oxide Film Selectivity

Si/SiO_2=230 selectivity stops the etching process at an oxide film thickness of 0.5μm

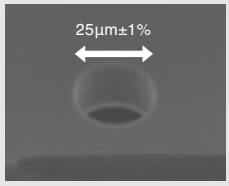
90±0.5°



Vertical Shape

Notch-free etching achieves a hole depth of 200μm at 90.5˚

25μm±1%



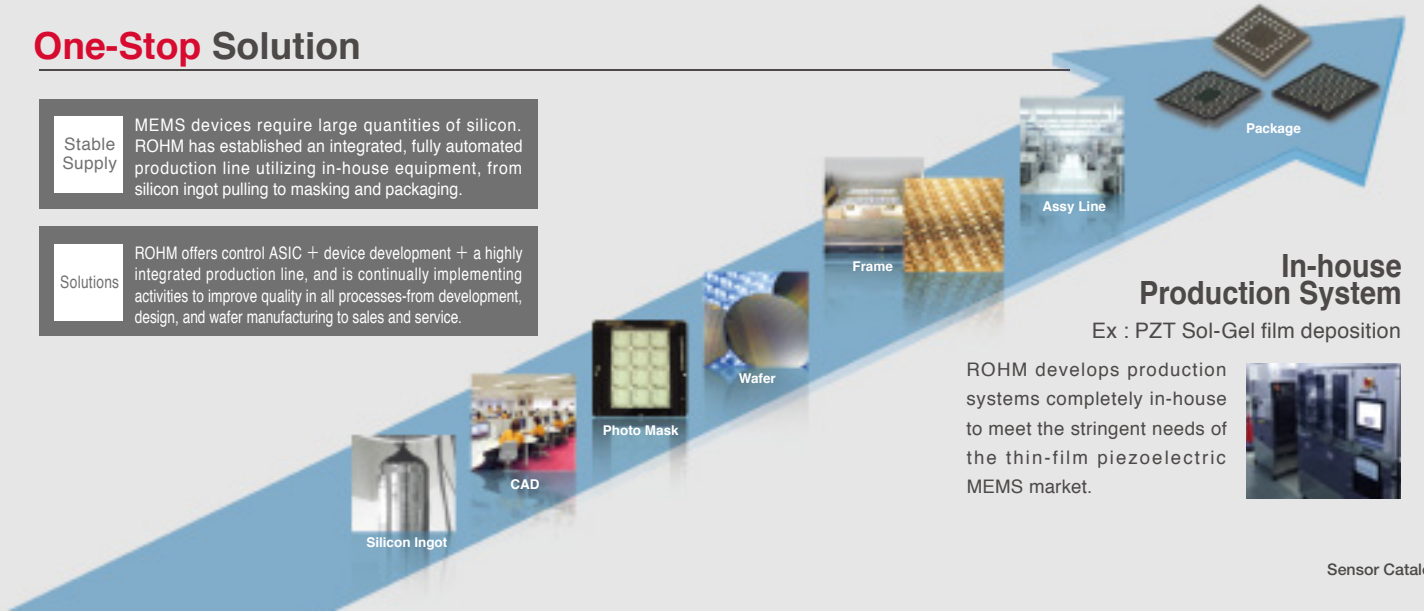
Dimensional Accuracy

Superior dimensional accuracy is ensured : 25±0.25μm(±1%)

One-Stop Solution

Stable Supply MEMS devices require large quantities of silicon. ROHM has established an integrated, fully automated production line utilizing in-house equipment, from silicon ingot pulling to masking and packaging.

Solutions ROHM offers control ASIC + device development + a highly integrated production line, and is continually implementing activities to improve quality in all processes-from development, design, and wafer manufacturing to sales and service.



In-house Production System

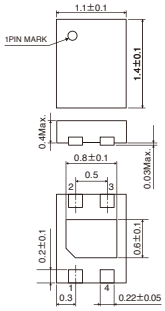
Ex : PZT Sol-Gel film deposition

ROHM develops production systems completely in-house to meet the stringent needs of the thin-film piezoelectric MEMS market.

Package List

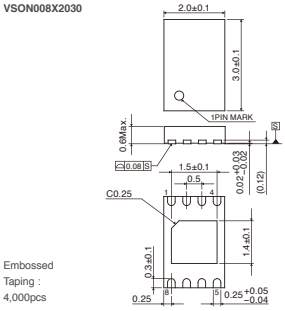
SON Packages

VSON04Z1114A



Embossed Taping : 5,000pcs

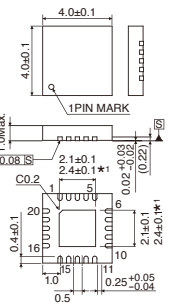
VSON008X2030



Embossed Taping : 4,000pcs

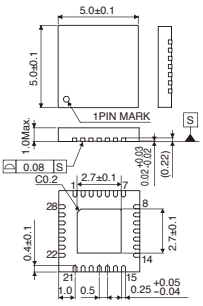
QFN Packages

VQFN020V4040
VQFN024V4040



Embossed Taping : 2,500pcs
★1: VQFN024V4040

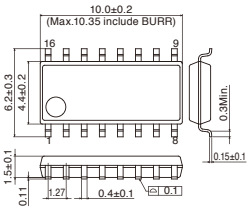
VQFN028V5050



Embossed Taping : 2,500pcs

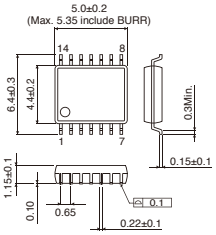
SOP Packages

SOP16



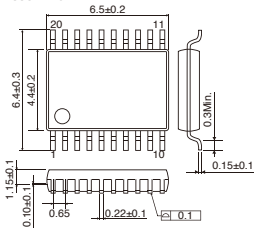
Embossed Taping : 2,500pcs

SSOP-B14



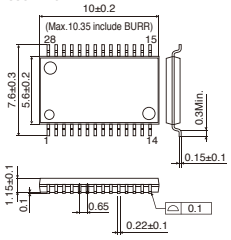
Embossed Taping : 2,500pcs

SSOP-B20



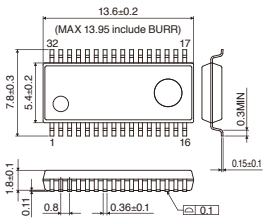
Embossed Taping : 2,500pcs

SSOP-B28



Embossed Taping : 2,000pcs

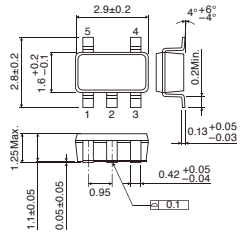
SSOP-A32



Embossed Taping : 2,000pcs

Small Package

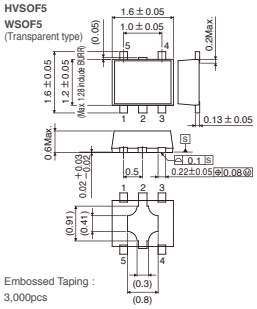
SSOP5



Embossed Taping : 3,000pcs

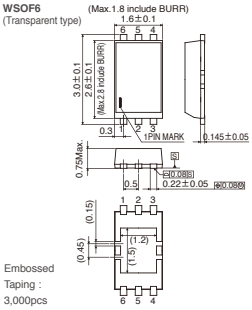
Non-Lead Packages

HVSOF5
WSOF5
(Transparent type)



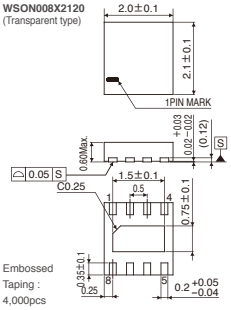
Embossed Taping : 3,000pcs

WSOF6
(Transparent type)
(Max.1.8 include BURR)



Embossed Taping : 3,000pcs

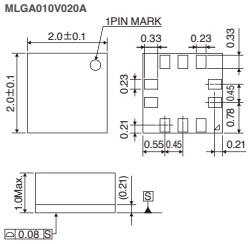
WSON008X2120
(Transparent type)



Embossed Taping : 4,000pcs

LGA Package

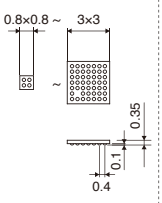
MLGA010V020A



Embossed Taping : 2,500pcs

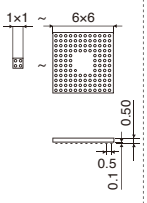
WL-CSP Packages

UCSP35L
(Pin Pitch : 0.4mm)



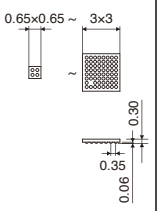
2.8mm□ and under : 3,000pcs
Over 2.8mm□ : 2,500pcs
Embossed Taping : 3,000pcs

VCSP50L
(Pin Pitch : 0.5mm)



2.8mm□ and under : 3,000pcs
Over 2.8mm□ : 2,500pcs
Embossed Taping : 3,000pcs

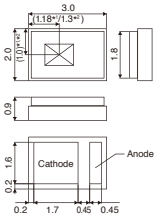
XCSP30L



Embossed Taping : 3,000pcs

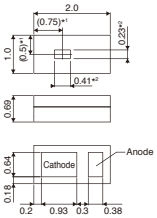
Laser Diode

3020PKG



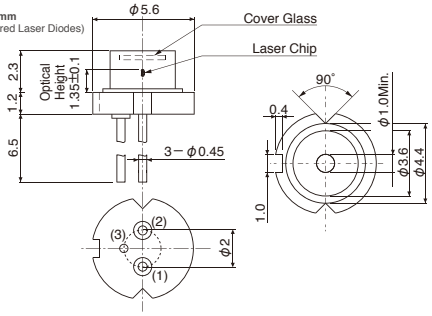
Embossed carrier tape : 2,000pcs
★1 : Light Source Center(2W class)
★2 : Light Source Center(1W class)

2010PKG



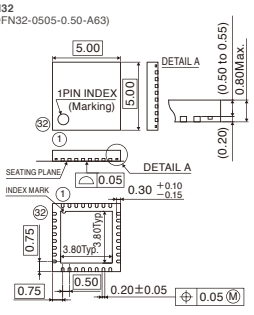
Embossed carrier tape : 2,000pcs
★1: Light Source Center
★2: Light Source Area

ϕ5.6mm
(Infrared Laser Diodes)

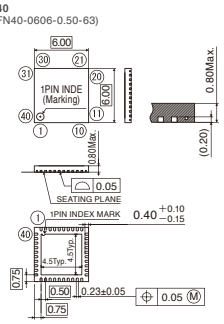


QFN Packages (LAPIS Semiconductor Product)

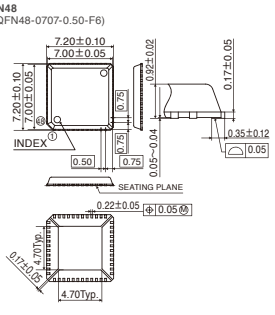
WQFN32
(P-WQFN32-0505-0.50-A63)



WQFN40
(P-WQFN40-0606-0.50-63)

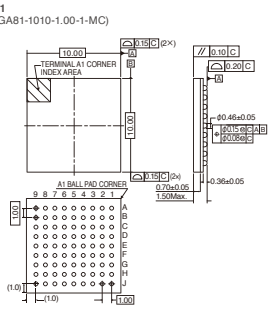


VQFN48
(P-VQFN48-0707-0.50-F6)



BGA Package (LAPIS Semiconductor Product)

BGA81
(P-LBGA81-1010-1.00-1-MC)



ROHM Group Locations

ROHM Group Locations (Japan)

Sales Offices

Kyoto	Nagoya	Matsumoto	Sendai
Tokyo	Fukuoka	Mito	Takasaki
Yokohama		Nishi-Tokyo	Utsunomiya

Manufacturing Facilities

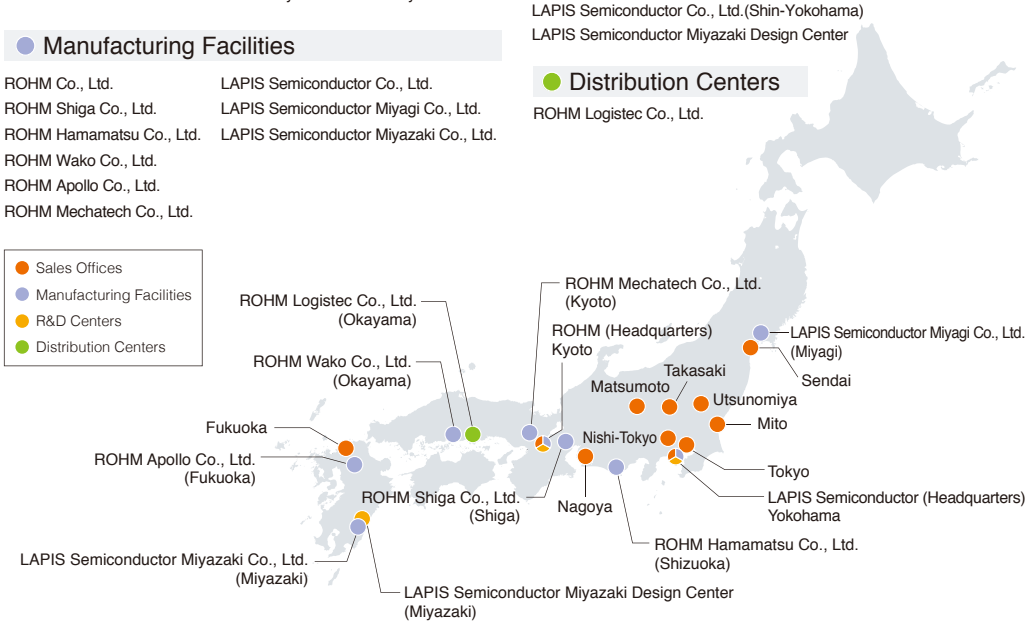
ROHM Co., Ltd.
ROHM Shiga Co., Ltd.
ROHM Hamamatsu Co., Ltd.
ROHM Wako Co., Ltd.
ROHM Apollo Co., Ltd.
ROHM Mechatech Co., Ltd.
LAPIS Semiconductor Co., Ltd.
LAPIS Semiconductor Miyagi Co., Ltd.
LAPIS Semiconductor Miyazaki Co., Ltd.

R&D Centers

Kyoto Technology Center (Head Office)
Kyoto Technology Center (Kyoto Ekimae)
Yokohama Technology Center
LAPIS Semiconductor Co., Ltd.(Shin-Yokohama)
LAPIS Semiconductor Miyazaki Design Center

Distribution Centers

ROHM Logistec Co., Ltd.



ROHM Group Locations (Global)

Sales Offices

ASIA	ROHM Semiconductor Korea Corporation
	ROHM Semiconductor (Beijing) Co., Ltd.
	ROHM Semiconductor (Shanghai) Co., Ltd.
	ROHM Semiconductor (Shenzhen) Co., Ltd.
	ROHM Semiconductor Hong Kong Co., Ltd.
	ROHM Semiconductor Taiwan Co., Ltd.
	ROHM Semiconductor Singapore Pte. Ltd.
	ROHM Semiconductor Philippines Corporation
	ROHM Semiconductor (Thailand) Co., Ltd.
	ROHM Semiconductor Malaysia Sdn. Bhd.
	ROHM Semiconductor India Pvt. Ltd.
AMERICA	ROHM Semiconductor U.S.A., LLC
	ROHM Semiconductor do Brasil Ltda.
EUROPE	ROHM Semiconductor GmbH

Manufacturing Facilities

ASIA	ROHM Korea Corporation
	ROHM Electronics Philippines, Inc.
	ROHM Integrated Systems (Thailand) Co., Ltd.
	ROHM Semiconductor (China) Co., Ltd.
	ROHM Electronics Dalian Co., Ltd.
	ROHM-Wako Electronics (Malaysia) Sdn. Bhd.
	ROHM Mechatech Philippines, Inc.
	ROHM Mechatech (Thailand) Co., Ltd.
AMERICA	Kionix, Inc.
EUROPE	SiCrystal GmbH

R&D Centers

ASIA	Korea Technical Center
	Beijing Technical Center
	Shanghai Technical Center
	Shenzhen Technical Center
	Taiwan Technical Center
	India Technical Center/India Design Center
AMERICA	Americas Technical Center (Santa Clara)
EUROPE	Europe Technical Center
	Finland Software Development Center

QA Centers

ASIA	Korea QA Center
	Shanghai QA Center
	Shenzhen QA Center
	Taiwan QA Center
	Thailand QA Center
AMERICA	America QA Center
EUROPE	Europe QA Center

- Android™ is a registered trademark of Google Inc.
- Arduino is a registered trademark of Arduino LCC and Arduino SRL
- ARM® and Cortex® are registered trademarks of ARM Limited(or one of its subsidiaries) in the EU and other countries.
  mbed™ is a trademark of ARM Limited(or one of its subsidiaries) in the EU and other countries.
- The Bluetooth® word mark and logo are registered trademarks owned by Bluetooth SIG, Inc, and are used under license.
  All other trademarks and trade names are the property of their respective owners.
- Raspberry Pi is a trademark of Raspberry Pi Foundation.
- Sigfox® is a registered trademark of SIGFOX S.A.
- XBee® is a trademark or registered trademark of Digi International in the US and other countries.
- EnOcean® is a registered trademark of EnOcean GmbH.
- Directional Tap/Double-Tap™ are trademarks of Kionix.
- U8 Core is LAPIS Semiconductor's original 8bit RISC-type CPU. U16 is LAPIS Semiconductor's original 16bit RISC-type CPU.
- uEASE and nanoEASE are LAPIS Semiconductor's on-chip debug emulators.

ROHM Sales Offices

Contact us for further information about the products.

Santa Clara	+1-408-720-1900	**Stuttgart**	+49-711-7272370	**Beijing**	+86-10-8525-2483	**India**	+91-80-4125-0811
Atlanta	+1-770-754-5972	**Nuremberg**	+49-911-810452-26	**Shanghai**	+86-21-6072-8612	**Kyoto**	+81-75-365-1077
Boston	+1-781-565-1138	**France**	+33 (0) 1 40 60 87 30	**Shenzhen**	+86-755-8307-3008	**Yokohama**	+81-45-476-2121
Chicago	+1-847-368-1006	**United Kingdom**	+44-1-908-272400	**Hong Kong**	+852-2740-6262		
Detroit	+1-248-348-9920	**Finland**	+358-400-726 124	**Taiwan**	+886-2-2500-6956		
San Diego	+1-858-625-3600	**Spain**	+34-9375-24320	**Singapore**	+65-6436-5100		
Mexico	+52-33-3123-2001	**Hungary**	+36-1-950-5859	**Philippines**	+63-2-807-6872		
Brazil	+55-11-3539-6320	**Italy**	+39-039-5783432	**Thailand**	+66-2-254-4890		
Germany	+49-2154-921-0	**Seoul**	+82-2-8182-700	**Malaysia**	+60-3-7931-8155		

Catalog No.61P7512E 06.2019 PDF

R1049A

ROHM Co., Ltd.
21 Saiin Mizosaki-cho, Ukyo-ku,
Kyoto 615-8585 Japan
TEL : +81-75-311-2121 FAX : +81-75-315-0172

www.rohm.com

ROHM SEMICONDUCTOR