

Sensors ICs

Portfolio Overview



Sense the future!



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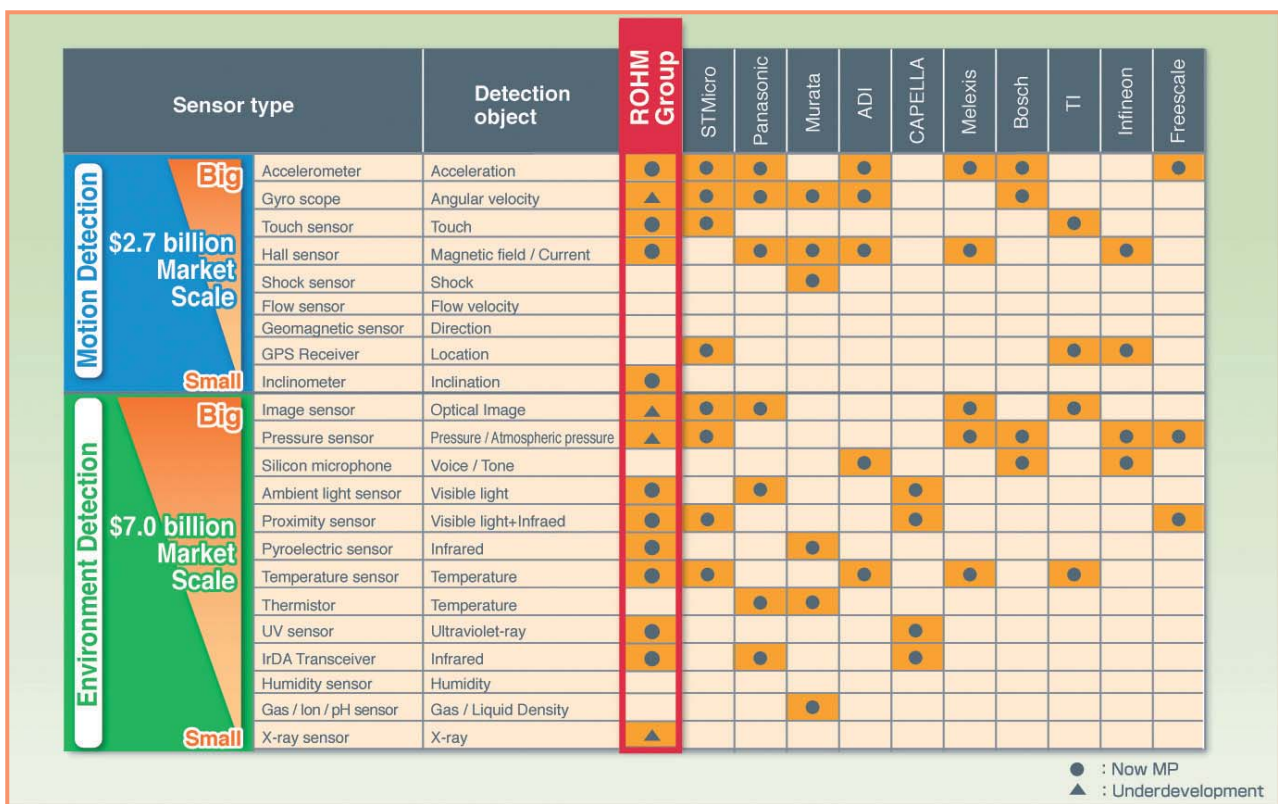
1. ROHM Technology for Sensors

A World of Sensors

A sensor is a device which receives and responds to a signal or stimulus. Here, the term "stimulus" means a property or a quantity that needs to be converted into electrical form. Hence, sensor can be defined as a device which receives a signal and converts it into electrical form which can be further used for electronic devices.

Sensors are used in everyday objects such as touch-sensitive elevator buttons and lamps which dim or brighten by touching the base. There are also innumerable applications for sensors of which most people are never aware. Applications include cars, machines, aerospace, medicine, manufacturing and robotics.

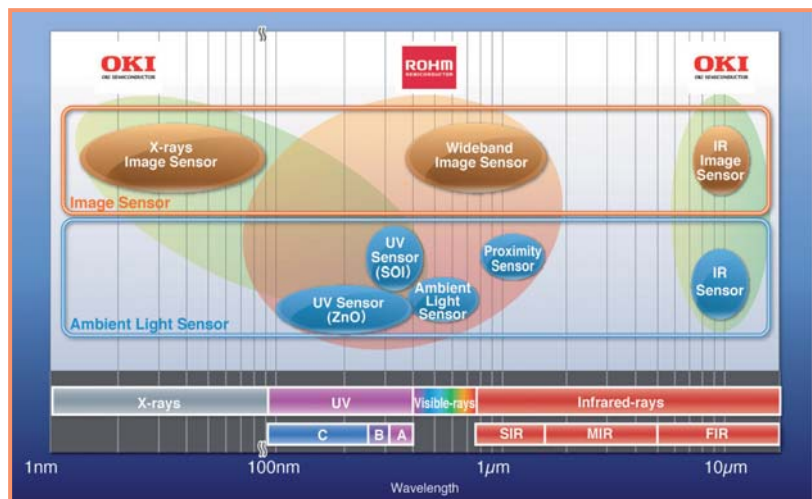
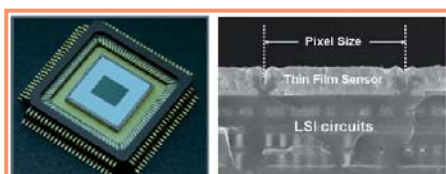
Since integration of OKI Semiconductor and recent acquisition of Kionix (major supplier of accelerometer sensor), ROHM group can offer a wide range of sensors for various type of applications. ROHM becomes the global leader in supplying sensor solutions with a vast variety of devices including, but not limited to, hall-effect sensors, temperature sensors, ambient light sensors, light-receiving sensors that receive infrared-, ultraviolet-, X- rays, bio-sensors for medical use, and gyro sensors and accelerometers.



Light Sensor Technology Example

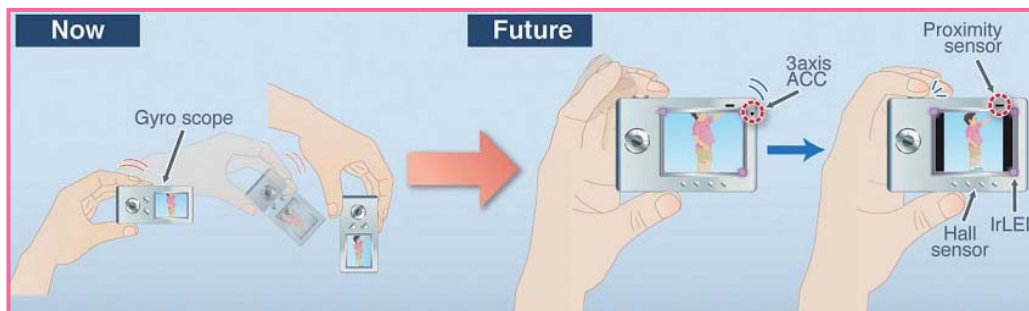
Light Sensor Technology of ROHM Semiconductor and OKI Semiconductor offer several types of sensors based on light detection such as Image Sensor, Light Sensor, Proximity Sensor.

The chart on the right shows ROHM group technologies for various light wavelengths, from X-rays & UV up to Infrared, across visible light by human eye.



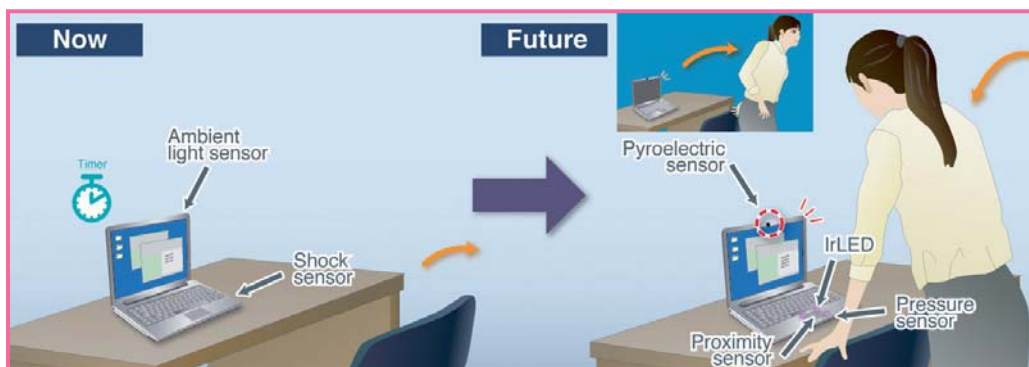
Digital Still Camera

Today, using gyro sensor it is possible to rotate the picture when the DSC is turned in portrait or landscape position. In the future, the combination of 3-axis accelerometer with Proximity sensor, the DSC will be able to automatically rotate & resize the picture on the screen.



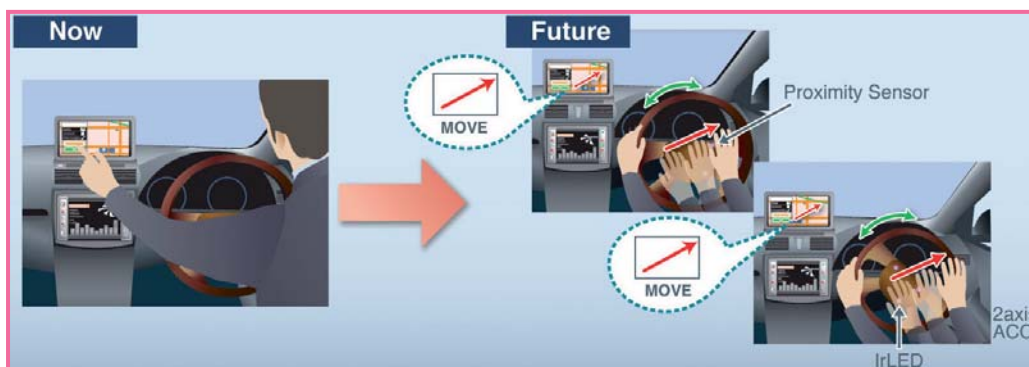
Laptop PC

Today more and more laptop PCs are equipped with ambient light sensor in order to reduce power consumption by adjusting the brightness of LCD backlight with ambient light conditions. In the future, pyroelectric sensor can detect the presence of human and shut down the PC when user leave the room.



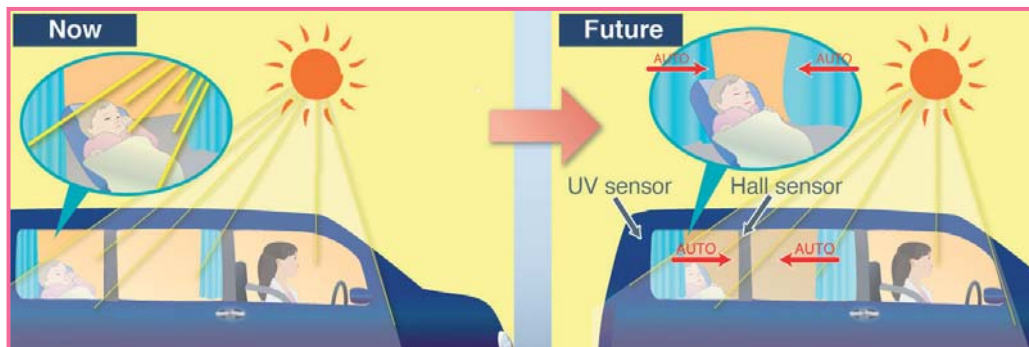
Car Navigation

Although it is not allowed, some drivers sometimes play with navigation system while driving. This is a real cause of accident. In the future, 2-axis accelerometer combined with proximity sensor can detect that driver is moving the wheel unintentionally. Driver can be informed and accident can be avoided.



Automotive Accessories

Detection of sunlight by ambient light sensor can allow to close curtains automatically. Hall sensor detect the end position of curtains in order to stop the motor's action.



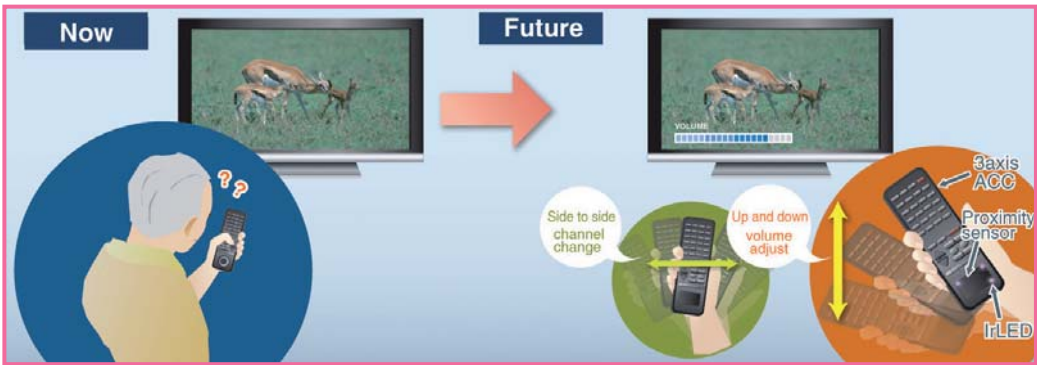
Smart phone

Mobile phone integrates more and more sensors. Actual trend is mobile phones with touch screen. In the future, simple movement & actions can simplify user interface by implementing proximity sensor, 3-axis accelerometer, UV sensor...



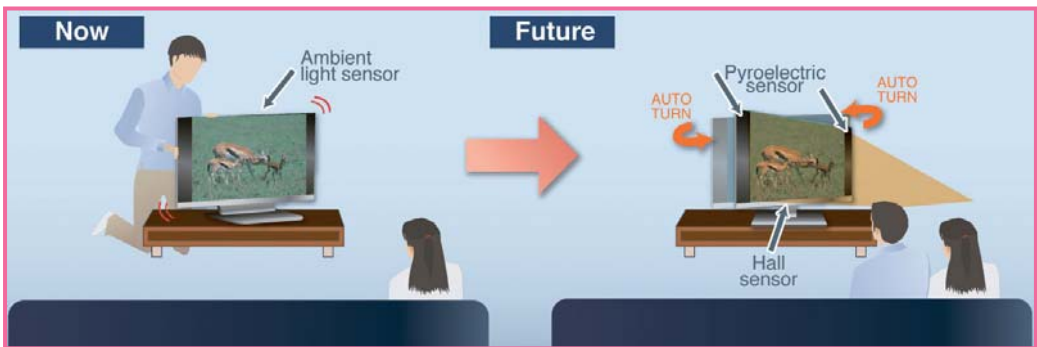
Remote Control for TV

Today more and more laptop PCs are equipped with ambient light sensor in order to reduce power consumption by adjusting the brightness of LCD backlight with ambient light conditions. In the future, pyroelectric sensor can detect the presence of human and shut down the PC when user leave the room.



FDP TV

Today more and more LCD TVs are equipped with ambient light sensor in order to reduce power consumption by adjusting the brightness of LCD backlight with ambient light conditions. In the future, pyroelectric sensor can detect the presence of human and rotate automatically the screen. Hall sensor can detect end position in order to stop motor at the correct position.



ROHM ambient light sensor (ALS) ICs are designed to control the brightness of LED backlit LCD displays, or LED lighting based on ambient light availability and brightness for optimum visibility and energy saving.

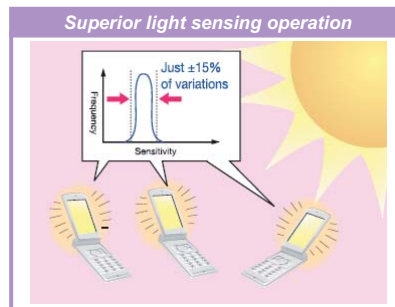
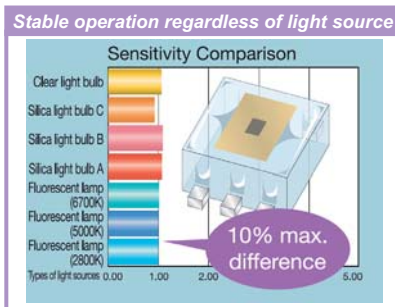
Wide range of applications

The compact ROHM ALS ICs are ideal choice for:

- LCD equipped portable devices such as mobile phone, digital cameras, PDAs, Notebook PCs, Car navigation system as well as any devices with LCD display such as video entry phone, LCD TVs, LCD monitors/displays....
- Lighting equipments such as interior public lighting, home/office lighting...

Improved Visibility with Lower Power Consumption

Adjusting the light/backlight intensity to compensate for variations in ambient light level can save 50% or more of the total power required to operate some portable electronic devices or to participate to reduce CO₂ emissions. To provide superior performance, backlight brightness control must be done in a uniform way over a wide range of ambient light conditions and types of light source. ROHM ALS ICs feature industry-leading performance that combines stable operation regardless of the light source (from incandescent to sunlight) with superior light sensing accuracy.

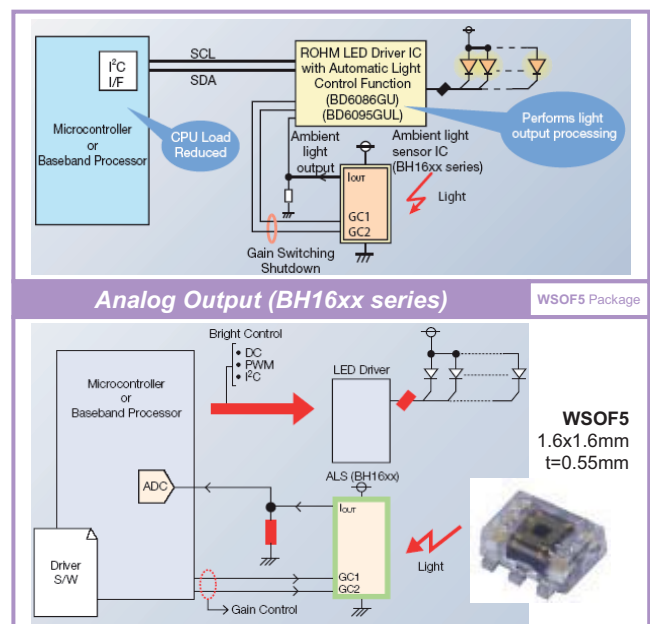
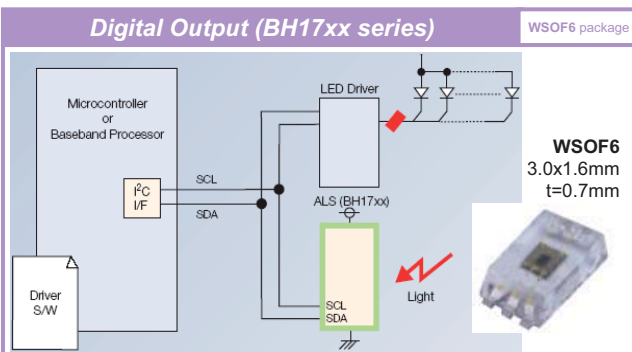


Analog or Digital output for easier integration

ROHM ALS ICs are available in both analog and digital output configurations in ultra small package W50F5 (1.6x1.6x0.55mm) or W50F6 (3.0x1.6x0.7mm).

Analog ALS ICs (BH16xx series) have an output current proportional to light (current sourcing) with a measurement range from 0 to 100,000 lux. As shown in below typical application circuit, an external resistor converts output current to a voltage to be inputted to MCU ADC which in turn controls the LED drivers. Direct connection to ROHM LED driver with ALS I/F is also possible.

Digital ALS ICs (BH17xx series) output a 16-bit (0 to 65,535 lux) digital signal over I²C (2-wire) bus interface to MCU.



LCD Backlighting

Using ALS to control the intensity of LCD backlighting for a wide range of applications



Public Lighting

Using ALS to turn on and off streetlights and other sources of exterior and interior illumination.



Camera Lighting

Using ALS to control the intensity IR lighting of security or web Cameras.



Examples of Applications for ALS ICs

Analog Output ALS ICs

BH16xx Series

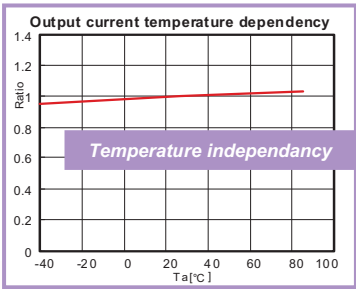
BH16xx Series of ALS ICs combine a number of innovations to provide exceptional performance over a wide range of applications.

ROHM's proprietary trimming process and use of multiple photodiodes with different junction depth provides a stable output with little variation between various light sources.

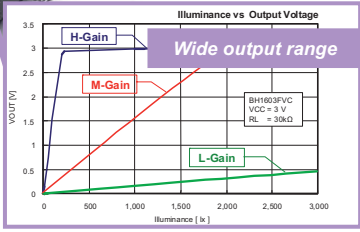
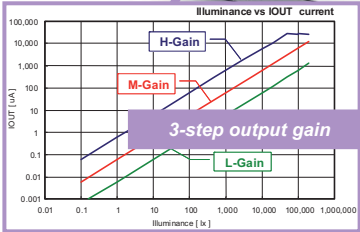
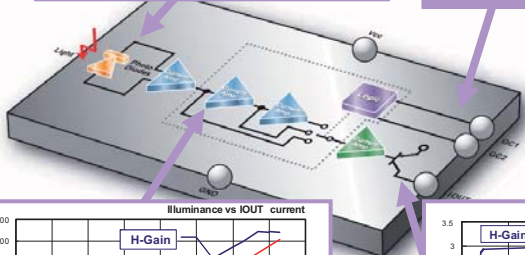
Three levels of gain enable the designer to make the appropriate trade-off between backlight intensity and power consumption.

A logic- enabled shutdown function is also provided to further enhance power efficiency.

In addition, the current source output supports full rail-to-rail voltage operation, further improving control sensitivity to variations in light intensity.



GC2	GC1	MODE	Function
0	0	Shutdown	IOUT OUTPUT disabled
0	1	H-Gain Mode	60uA@100 lx
1	0	M-Gain Mode	6uA@100 lx
1	1	L-Gain Mode	0.6uA@100 lx



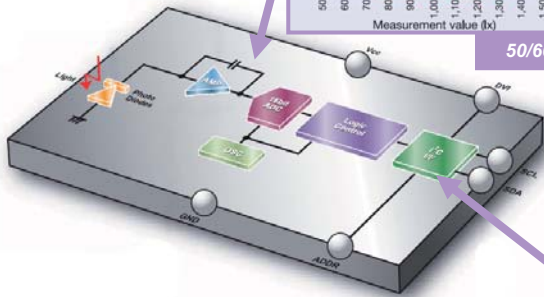
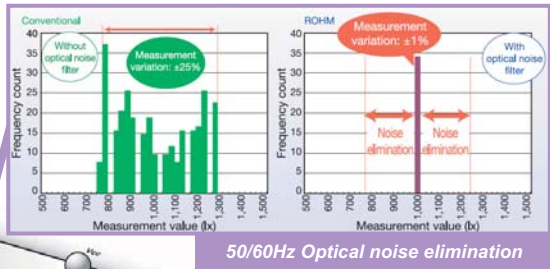
Digital Output ALS ICs

BH17xx Series

BH17xx Series of ALS ICs employ the same proprietary trimming and multiple photodiodes with different junction depth to ensure uniform light sensitivity.

The device's 16-bit analog to digital converter (ADC) produces 1 lux resolution over a range from 0 to 65,535 lux.

The I²C output is designed for direct connection to the system's microcontroller. Two measurement resolution levels are provided, allowing design trade-off between sampling time and performance. For example, with high resolution sampling, optical noise like fluorescent lamp flicker can be filtered. Low resolution reduces the sampling time for applications like GPS systems where light level changes are dynamic.



Wide I²C input voltage
ROHM's I²C bus compatible with 1.65V and Vcc (3.6V max) enabling operation in systems with multiple power supplies

Line-up table

Part No	Output Type	Supply Voltage [V]	Sensitivity Variations [%]	Output Sensitivity Gain	Illuminance Measurement Range [lx]	Temperature Operating Range [°C]	Package
BH1600FVC	Analog Current (source)	2.4-3.6	±35	2 step	0-50,000	-30 to +85	WSOF6
BH1603FVC		2.4-5.5	±15	3 step	0-100,000	-40 to +85	WSOF6
BH1620FVC		2.4-5.5	±15	3 step	0-100,000	-40 to +85	WSOF5
BH1621FVC		2.4-5.5	±15	2 step	0-100,000	-40 to +85	WSOF5
BH1710FVC	Digital I2C I/F	2.4-3.6	±38	-	0-65,000	-30 to +85	WSOF6
BH1715FVC		2.4-3.6	±15	-	0-65,000	-40 to +85	WSOF6
BH1721FVC		2.4-3.6	±15	-	0-65,000	-40 to +85	WSOF5
BH1750FVI		2.4-3.6	±20	-	0-65,000	-40 to +85	WSOF6I
BH1751FVI		2.4-3.6	±20	-	0-65,000	-40 to +85	WSOF6I
BH1780GLI	Digital High Speed 3.4Mbps I2C I/F	2.3-3.0	±20	-	0-65,000	-40 to +85	WLGA04
BH1771GLC	Digital I2C I/F + Proximity Sensor	2.3-3.1	±15	-	0-65,000	-40 to +85	WLGA010

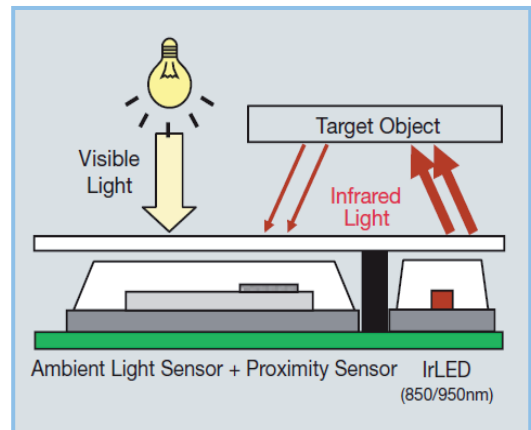
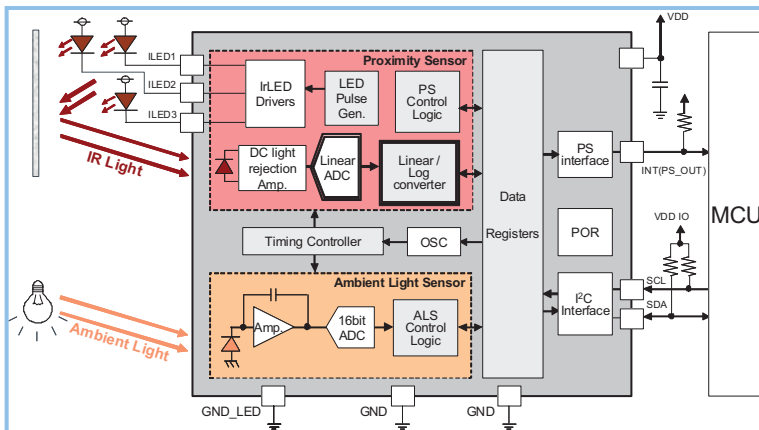
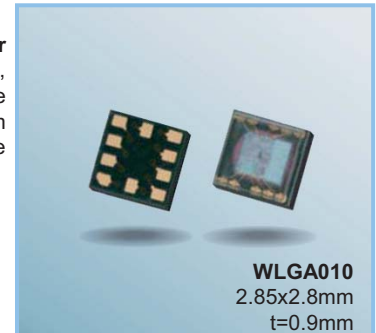
4. Proximity Sensor and Low Profile Infrared SMD LED

BH1771GLC – Product Outline

The **BH1771GLC** integrates an **optical proximity sensor** and **digital ambient light sensor (ALS)** on a single chipset. The proximity sensor can detect objects from 1cm to 10cm away, making touchless motion possible. Simply wave an object, such as a hand or a pen, above the sensor to initiate various operations (e.g scroll). The ALS features a wide detection range, from darkness to direct sunlight, allowing adjustment of brightness of LCD and keypad in portable applications to match ambient conditions for optimum visibility with minimal power consumption.

Single-chip design for device miniaturization

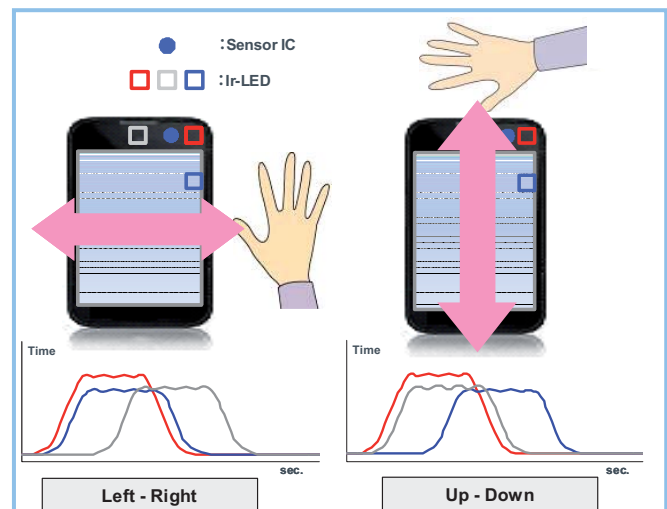
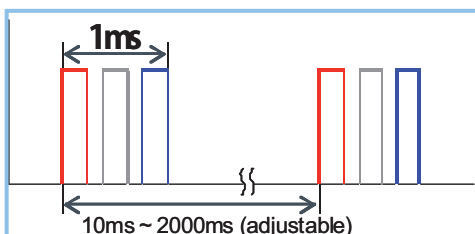
The internal proximity sensor utilizes a 3ch LED driver designed to drive up to 3 infrared LEDs located near the sensor. The phase difference of the reflected light (time-divided pulses) from each LED is detected to determine the direction of movement of the reflecting object (e.g. human hand or pen). This makes touchless operation possible – in a compact form factor.



Touchless Motion Feature

The BH1771GLC incorporates a proximity sensor with 3ch LED driver. Connect 3 infrared LEDs in order to detect both motion and brightness.

The IR LEDs are illuminated in a time division based method. The phase difference allows to detect left $\leftrightarrow$ right motion and up $\leftrightarrow$ down motion.



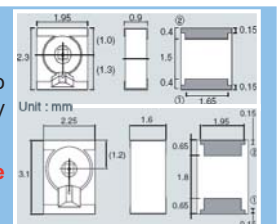
Recommended IR LED for Proximity Sensor:

ROHM's SIM-030ST
 $\lambda=870\text{nm}$, $I_E=30\text{mW/sr}$ (at $I_F=100\text{mA}$)
 or
ROHM's SIM-040ST
 $\lambda=870\text{nm}$, $I_E=40\text{mW/sr}$ (at $I_F=100\text{mA}$)

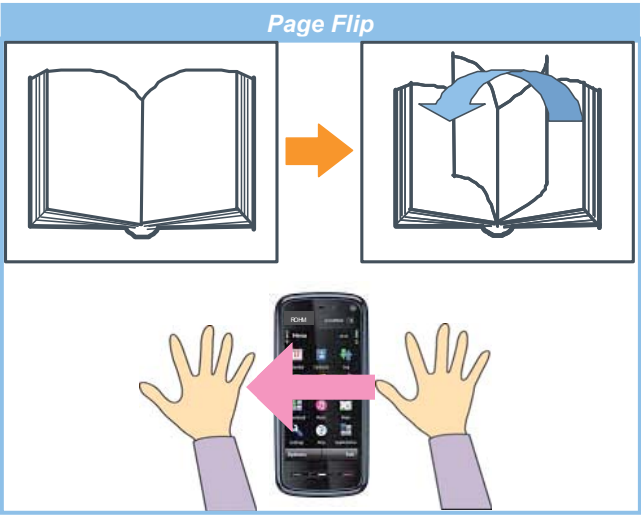
ROHM's Infrared SMD LED

ROHM's optical sensors serve as eyes to monitor changes of any motions, and comply with customers' day-to-day diversifying requests.

SIM-030ST infrared LED has **Ultra Low Profile (0.9mm)**.

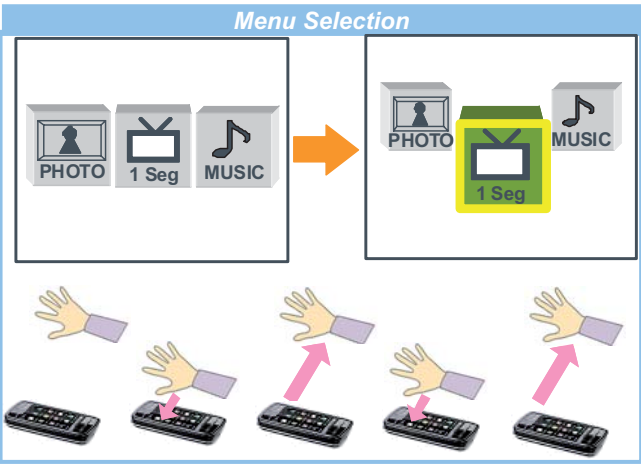


Examples of Touchless Motion Detection with Proximity Sensor



E-book

Right → Left motion detection can be used for e-book in order to go to the next (or previous) page, without the need of touching any buttons.

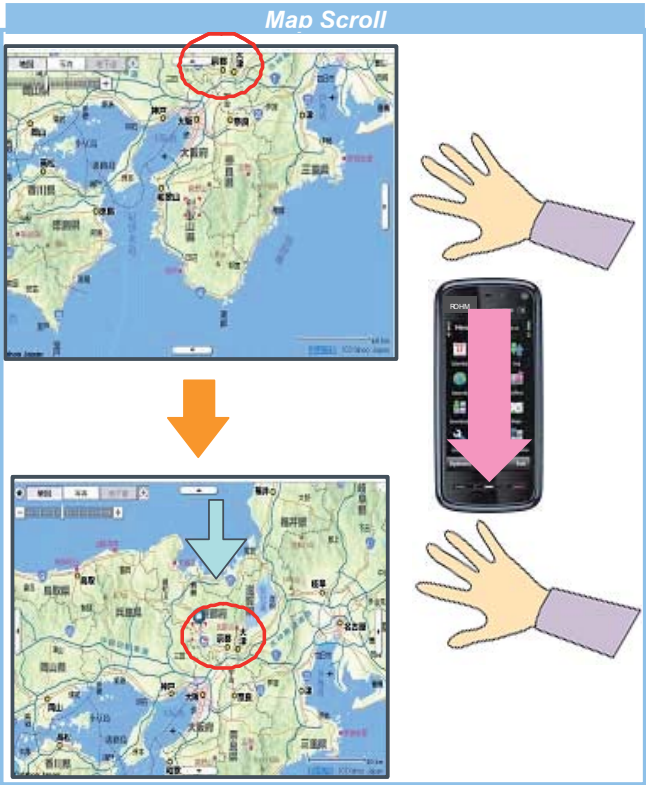


Remote Control

Right ⇔ left motion detection can be used for the scrolling of icons which are displayed on the TV. Approaching the hand very close can also allow to press and make a selection inside the menu. This application works with a combination of motion detection and azimuth strength of detection.

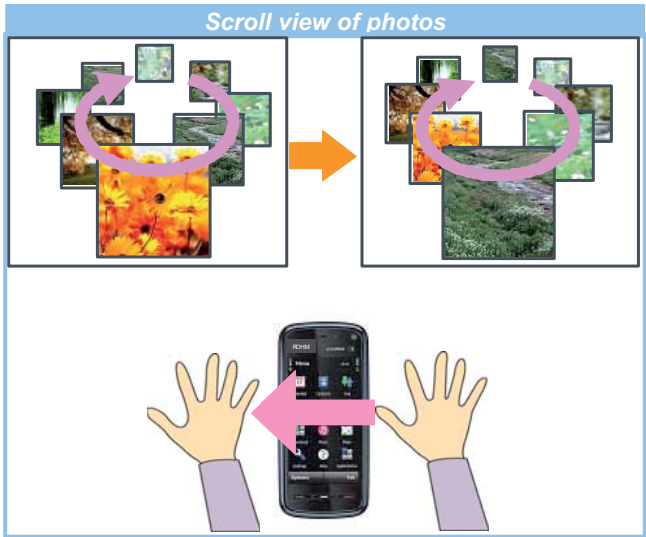
Navigation System

Right ⇔ left or up ⇔ down motion detection can be used for the scrolling and navigation on a map.



Digital Still Camera

Right ⇔ left motion detection can be used for the fluent & easy scrolling view of photos which have been taken.



ROHM's ultra-compact Hall ICs feature high sensitivity on a single chip. Uses include magnet (magnetic field) detection as well as positional detection. The contactless method prevents damage/degradation due to the introduction of foreign materials or wear and tear. 3 types of Hall ICs are offered, based on the detection method and type of output (bipolar, polarity discrimination, monopolar). In addition, a Hall IC capable of detecting alternating magnetic fields is offered. The BD7411G is now available, featuring high reliability 5V operation in an easy-to-use SSOP5 ($\leftrightarrow$ SOT23-5) package.

Bipolar Detection Type

Bipolar detection Hall ICs send an output when either pole (S or N) is detected. Both types of magnets can be used, simplifying parts management.

Discrimination Type

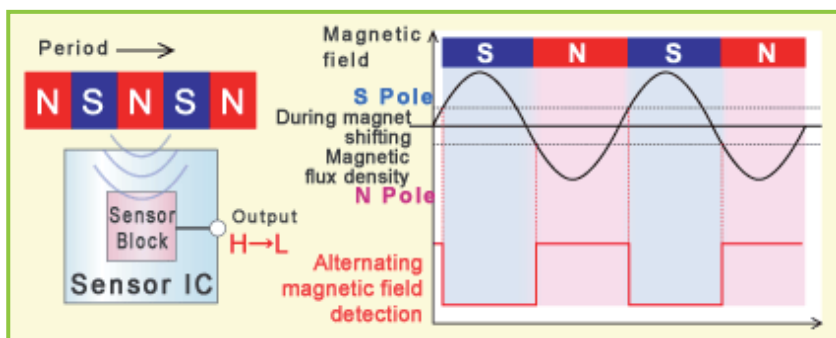
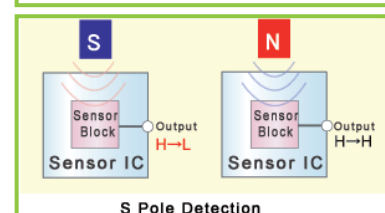
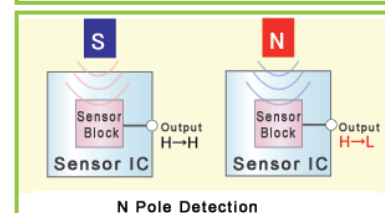
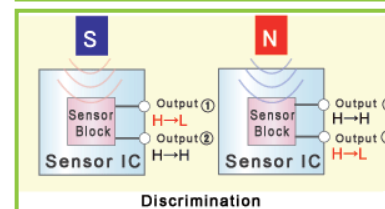
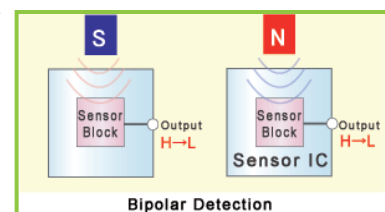
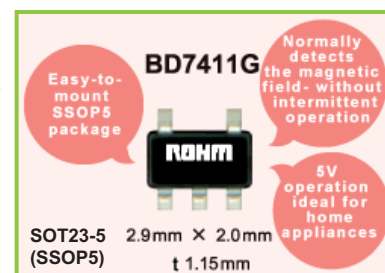
Discrimination type Hall ICs integrate a special circuit featuring two outputs, one for each pole. Discrimination is possible using output logic.

Monopolar Detection Type

Monopolar type Hall ICs detect only one pole (S or N) and output a signal once detected. It consumes less power than bipolar detection types, since detection is performed only with one pole.

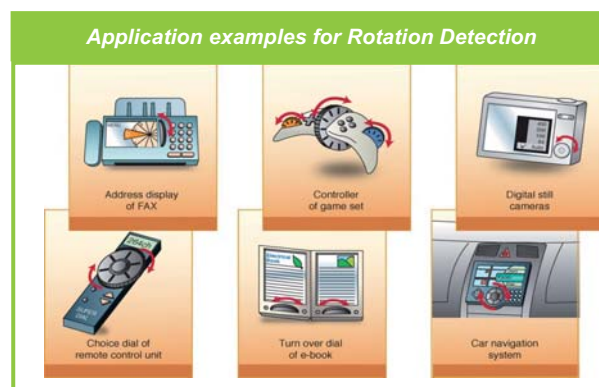
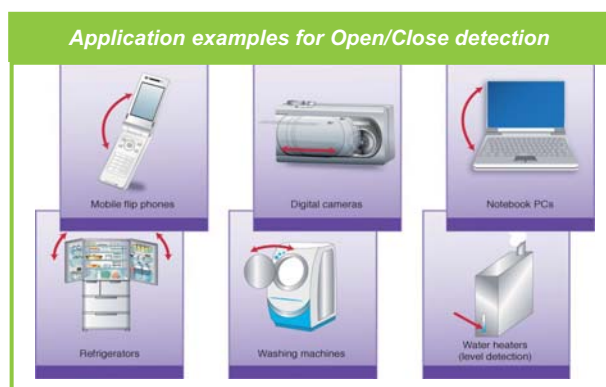
Bipolar Latch Detection Type

BU52040HFV, alternating detection type Hall ICs sense changes in the magnetic field (from N to S or vice versa). Detection is based on the change in magnetic flux and not on the field strength (the output duty pulse is uniform), making it ideal for menu interface applications such as wheel keys and track balls.



Various Applications

Hall Sensor ICs can be used in various applications such as Home appliances (Microwave oven, Coffee machine, Rice Cooker...), White goods (Washing machine...), portable electronic equipments (Mobile phones, Digital Camera...), printer/copy/fax/scanner machines, Computers (Laptop, Accessories such as mouse...), Automotive (BD7430G under development, supporting 24V)...



CMOS output

In conventional Hall Sensors ICs current flows through the external resistor during magnetic field detection, resulting in large overall current consumption. ROHM's Hall ICs feature CMOS output, eliminating the need for external resistor, allowing direct connection to the microcontroller. This reduces set current consumption in the application circuit while contributing to increased space savings.

Intermittent Operation

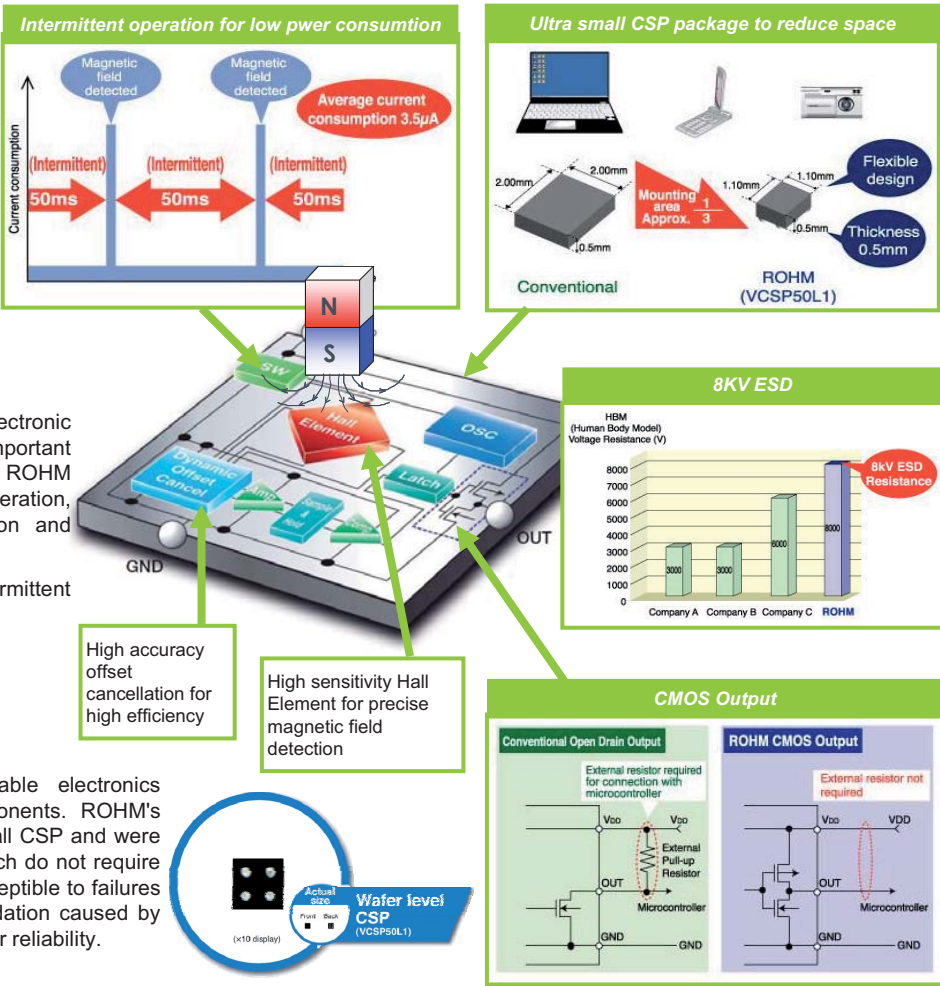
Maximizing the battery life of electronic devices is one of the most important considerations. In response to this, ROHM Hall ICs feature intermittent operation, resulting in low power consumption and longer battery life.

Average Current Consumption: (Intermittent operation cycle: 50ms typ.)

- 3.5µA (BU52012, BU52013)
- 6.5µA (BU52002, BU52003)

Ultra-small CSP package

Current and next-generation portable electronics necessitating more compact components. ROHM's Hall ICs are available in an ultra-small CSP and were designed for magnetic switches, which do not require mechanical contact and are not susceptible to failures due to foreign substances or degradation caused by repeated switching, resulting in higher reliability.



Line-up table

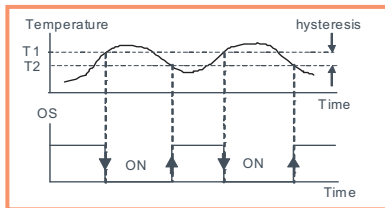
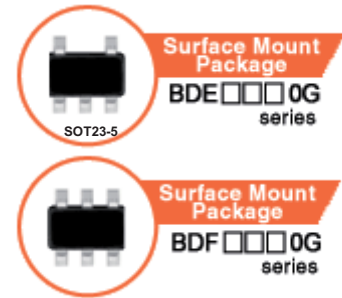
Type		Part No	Power Supply	Operate Point	Hysterisis	Period	Supply Current	Output terminal	Package
Dual pole detection		BU52001GUL	2.4 ~ 3.3V	+/-3.7mT	0.8mT	50ms	8µA	1	VCSP50L1
		BU52011HFV	1.65 ~ 3.3V	+/-3.0mT	0.9mT	50ms	5µA	1	HVSOF5
		BU52015GUL	1.65 ~ 3.3V	+/-3.0mT	0.9mT	50ms	5µA	2	VCSP50L1
		BU52021HFV	2.4 ~ 3.6V	+/-3.7mT	0.8mT	50ms	8µA	1	HVSOF5
		BU52025G	2.4 ~ 3.6V	+/-3.7mT	0.8mT	50ms	8µA	1	SSOP5 (SOT23-5)
		BU52051NVX	1.65 ~ 3.3V	+/-3.0mT	0.9mT	50ms	5µA	1	SSON004X1216
		BD7411G	4.5~5.5V	+/-3.4mT	0.8mT	-	3mA	1	SSOP5 (SOT23-5)
		BD7430G*	4.5~24V	+/-5.0mT	1.0mT	TBD	4.0mA	1	SSOP5 (SOT23-5)
Unipolar detection	S pole detection	BU52002GUL	2.4 ~ 3.3V	+/-3.7mT	0.8mT	50ms	6.5µA	1	VCSP50L1
		BU52012HFV	1.65 ~ 3.3V	+/-3.0mT	0.9mT	50ms	3.5µA	1	HVSOF5
	N pole detection	BU52003GUL	2.4 ~ 3.3V	+/-3.7mT	0.8mT	50ms	6.5µA	1	VCSP50L1
		BU52013HFV	1.65 ~ 3.3V	+/-3.0mT	0.9mT	50ms	3.5µA	1	HVSOF5
Dual pole detection (Bipolar detection output)		BU52004GUL	2.4 ~ 3.3V	+/-3.7mT	0.8mT	50ms	8µA	2	VCSP50L1
		BU52014HFV	1.65 ~ 3.3V	+/-3.0mT	0.9mT	50ms	5µA	2	HVSOF5
Bipolar latch		BU52040HFV	1.65 ~ 3.3V	+/-3.0mT	6.0mT	0.5ms	200µA	1	HVSOF5
		BD7420G*	4.5~24V	+/-2.2mT	4.4mT	TBD	4.0mA	1	SSOP5 (SOT23-5)

* Under Planning

Thermostat Type

Temperature control is becoming increasingly important for stable performance as electronic products become more miniaturized and operate at greater speeds. In particular, power supply and motor circuits that generate heat require temperature detection in order to prevent shorts or malfunctions and possibly damage.

ROHM's temperature sensor ICs feature a high accuracy reference voltage supply, comparator, constant current circuit, and a temperature detection element into a single chip, eliminating troublesome circuit design. Temperature detection capability is enabled by simply connecting the IC to the set substrate, saving space.



Analog Output Type

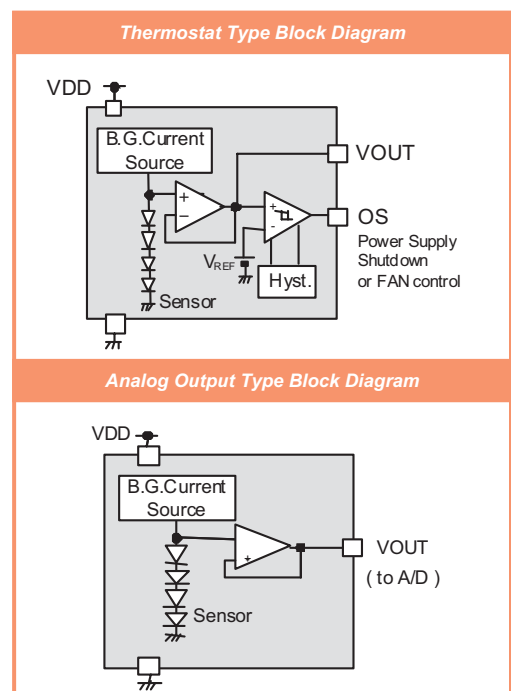
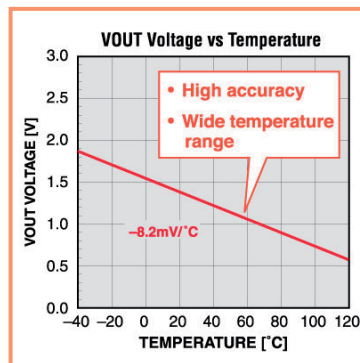
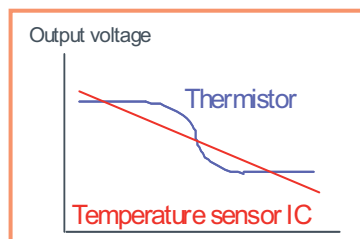
Temperature is often measured with thermistor. However, thermistor characteristic is not fully linear and measurement range is quite narrow, which affect temperature measurement accuracy and requires filter, which increase the number of external components and the space on the PCB.

ROHM's temperature Sensor IC with analog output, BD1020HFV, feature a high accuracy plus a wide temperature range without external components, making the solution very easy to integrate. Analog output can be connected to microcontroller ADC.

Very high accuracy:
 $\pm 1.0^{\circ}\text{C}$ ($T_a = 30^{\circ}\text{C}$)
 $\pm 2.0^{\circ}\text{C}$ ($T_a = -30 \sim +100^{\circ}\text{C}$)

Very low supply current: $4.0\mu\text{A}$ (typ.)

Ultra compact package: $1.6 \times 1.6 \times 0.6\text{mm}$



Line-up

Analog Output Temperature Sensor IC

Family	Supply Voltage (V)	Supply Current (uA)	Temp. Sensitivity (mV/°C)	Analog Output voltage (@30°C)(V)	Package
BD1020HFV	2.4 to 5.5	4	-8.2	1.3	HVSOF5

Thermostat Temperature Sensor IC with changeable detect temperature

Family	Supply Voltage (V)	Supply current (uA)	Temp. Sensitivity (mV/°C)	Analog Output voltage (@30°C) (V)	Package	Detect temperature (°C)
BDExxx0G	2.9 to 5.5	16	-10.68	1.753	SSOP5	-20, ..., 120

Thermostat Temperature Sensor IC with low Current Consumption

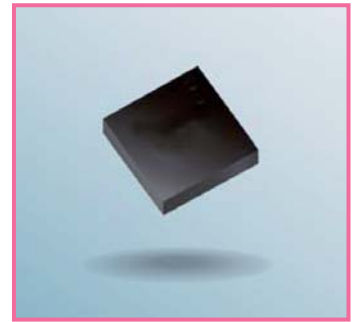
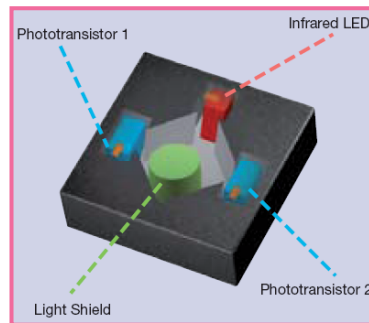
Family	Supply voltage (V)	Supply current (uA)	Power down current (uA)	Detect temperature accuracy (°C)	Package	Detect temperature (°C)
BDJxxxHFV	2.4to5.5	7.5	0.3	± 2.5	HVSOF5	55, .. , 90

7. Optical 4-Direction Detection Sensor

4-way Detection 0.8mm Thinnest* Package

4-way detection at 90° intervals is enabled utilizing an infrared diode, phototransistor and shield. Integration is easy and makes instantaneous detection possible. In addition, the simple design and optical method minimizes malfunctions and ensures a high degree of precision. Conventional products often exhibit noise during rotation, the RPI-1040, however, utilizes a novel light shield that results in **silent operation**.

* July 2009 survey



Broad compatibility

Optically detects the orientation of devices, making it ideal for a variety of consumer/industrial applications, including image orientation and fall detection.

Orientation Detection

Simplify preview for image correction (i.e. autofocus, white balance adjustment)

Video Devices
(Mobile Phones, Digital Cameras)

Image Rotation

Image Rotation Based On Device Position

Photo Display Devices
(Projectors, Photo Frames)

Rotates images based on orientation

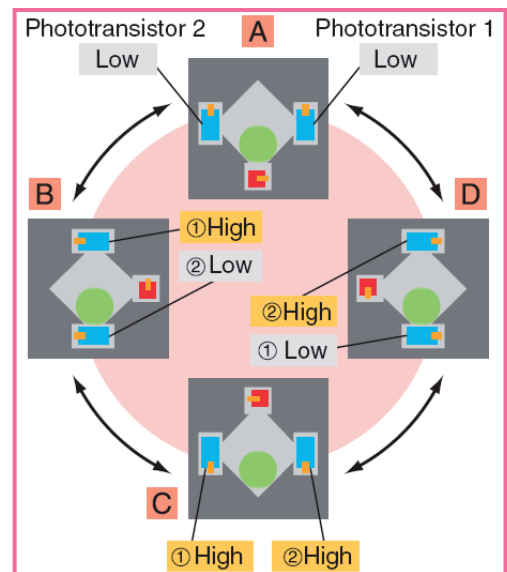
Fall Detection

Movement Sensing
(LCD TVs)

Detects falls and turns the power OFF

Operation Principle

An infrared LED and 2 phototransistors are utilized for 4 way direction detection. During the silent movement of the ball shield, output of phototransistor will change between High/Low state. The state of both phototransistors allows to detect 4 directions.



Line-up of 4-direction type Sensors

RPI-1031 package size is 3.9x3.9x2.4mm.

RPI-1041 package size is 3.1x3.1x0.8mm.

Part Number	Collector current I_C (Min.) (mA)			Response time tr-tf (Typ.) (μs)
	I_C (mA)	V_{CE} (V)	I_F (mA)	
RPI-1031	0.10	5.00	5.00	10
RPI-1040	0.05	5.00	5.00	10

Visit our website for additional examples

www.rohm.com/products/opto_device/sensor/4_direction/uses.html

ROHM Optical Sensors

Search

Actual Size

<Dimensions>

(Unit: mm)

Volume and area reduced 79% and 37%, respectively, compared to conventional products

Volume reduced 79%

RPI-1040

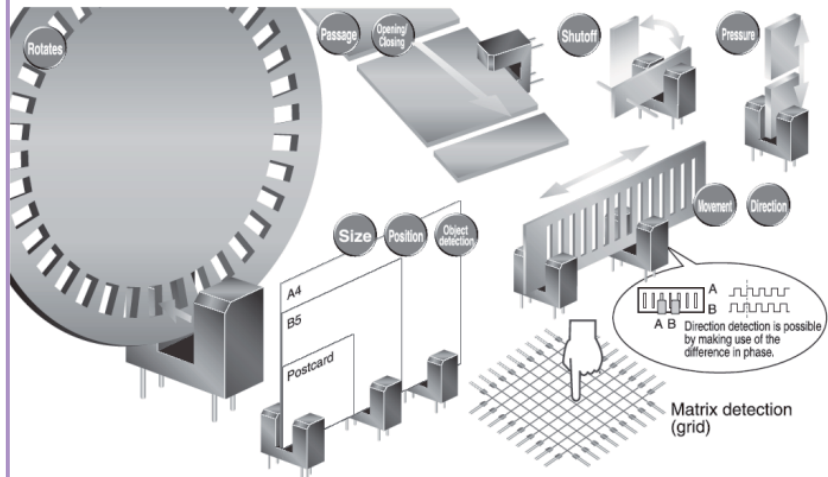
Area reduced 37%

RPI-1040

ROHM's optical sensors serve as eyes to monitor changes of any motions, and comply with customers' day-to-day diversifying requests. ROHM is in charge of integrated production from the die fabrication to the final assembly of all photo emitting/receiving devices with options of customization.



Detection of all movements



Transmission Type photointerrupters

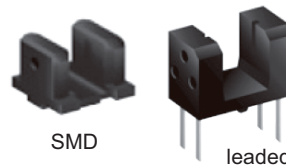
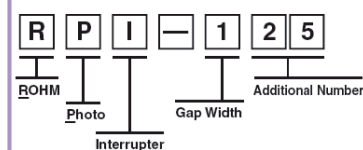
Optical switches which detect existence/absence of object(s) by intercepting of light, suitable for various applications like sensing of position or speed of rotation, etc

Reflective Type photosensors

This is the type for judging existence or absence of an object by detecting the reflection from such object with casted light.

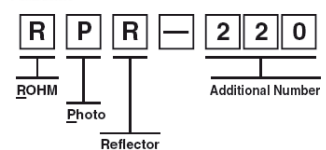
Transmission Type

7 characters :



Reflective Type

7 characters :



Infrared Lighting Emitting Diodes (LED)

Infrared LED suitable for the remote-controller & optical communication equipments.



S I R - 3 4 1 S T 3 F						
Series Name	Additional Number		Output Configuration	Package Color	Terminal Shape	
SIR	#3, #5 lamp infrared LED		S	B	3F	Straight
SIM	Side view infrared LED		R	T	T31	Taping
SML	Surface mount infrared LED				T32	Taping
SCM	Chip LED				A47	Taping
					T86	Embossed Taping
					T87	Embossed Taping
					T95	Embossed Taping
					T97	Embossed Taping

Phototransistors

High reliability/sensitivity photo-transistor to be used with infrared LED in pairs popularly used in compact instruments.



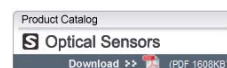
R P T - 3 4 P B 3 F						
Series Name	Additional Number		Output Configuration	Package Color	Terminal Shape	
RPT	#3 lamp device		P	B	3F	Straight
RPM	Side view infrared LED		R	T	T31	Taping
SML	Surface mount infrared LED				T32	Taping
SCM	Chip LED				T86	Embossed Taping
					T87	Embossed Taping
					T95	Embossed Taping
					T97	Embossed Taping

For more information, please visit our website

http://www.rohm.com/products/opto_device/sensor/

There, you can also download **Optical Sensors** catalog

http://www.rohm.com/products/databook/s/pdf/sensor_catalog.pdf



Application Examples for Optical Sensors

Optical sensors can be used in various types of applications in order to detect all movements. The 2 following pages show a few examples among many possible applications for consumer and industrial markets.



Video Camera / Digital Camera / Mobile Phone



Facsimile



DVD Player



Air Conditioner



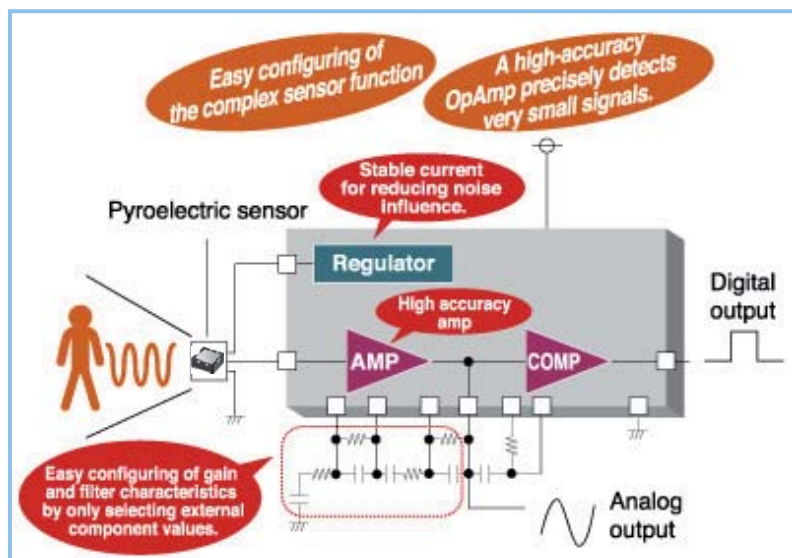
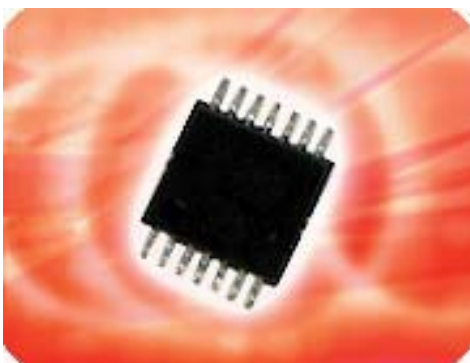
Others

Classification	Device	Applications
Home electronic appliances	Massage chairs	Internal structure position sensing
	Sewing machines	Motor rotation sensing Sensing of vertical motion of the needle and fabric feed timing
Industrial equipment	Automated production equipment	Internal structure position sensing
Others	Gaming devices (pinball machines, etc.)	Internal structure position sensing

9. Pyroelectric Infrared (PIR) Sensor

BD9251FV – Product Outline

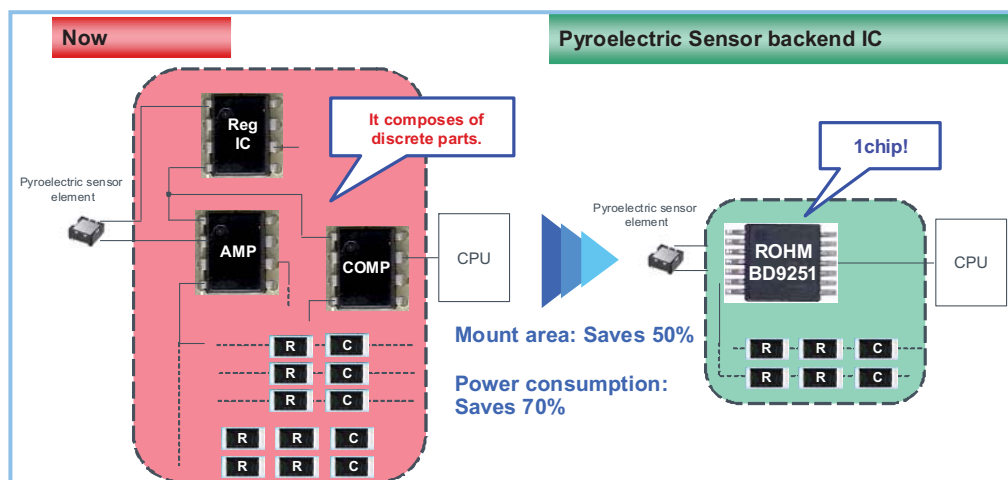
BD9251FV of ROHM is a preamplifier IC for pyroelectric infrared (PIR sensors). PIR Sensor is used for human body detection applications with high performance and low power consumption.



Main Features

BD9251FV IC features a high sensitivity amplifier combined with built-in detection comparator and sensor regulator into one single-chip. Single-chip concept of Rohm makes it easy to use and to reduce power consumption as well as space on the board.

SSOP-B14 package allows easy integration and soldering. Logic output works with CMOS level which can be connected directly to MCU. Operation voltage is 2.97~6.00V.

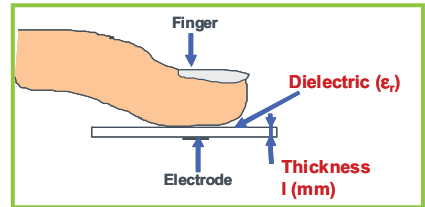


BD9251FV – Examples of Applications

Security systems					
Home automation					
Home Appliances					
					
Light switch	Air Conditioner	Notebook PC	TV		
					
Security camera	Security detector	ATM	PIR sensor		

Capacitive sensors convert the capacitance between an electrode and human finger to electric signals. They contribute to thinner, longer lifetime and more flexible designs compared with mechanical switches. A broad line-up is offered in variety of channels, interfaces, functions and voltages, facilitating development of capacitive switching modules.

Through Capacitive Touch Sensor (CTS) Controller IC family, ROHM helps the industry to adopt this cost efficient popular user interface to more applications. Besides traditional applications such as mobile phone, white goods, home appliances, portable media players, portable navigation devices, remote controls and many others, it can also be integrated for industrial application & control panels of machines.



Special Features

Proprietary CV (capacitance to voltage) conversion technology minimizes the effects of electrode resistance on the sensor circuit. The capacitance between electrode and the sensor is converted into a voltage via CV conversion built-in circuit, then output digitally via an internal 10-bit ADC.

ROHM's CTS controller ICs feature built-in chattering prevention, hysteresis & detection threshold setting and noise cancellation functions.

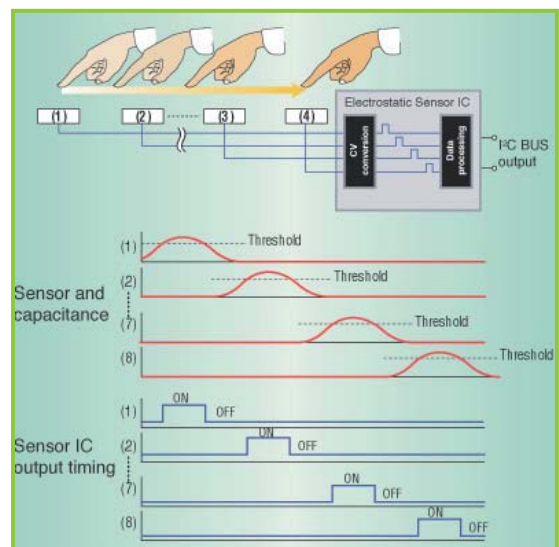
In order to provide a tactile feedback, up to half of channels of BU21008/10 can be configured as LED drivers!

A complete documentation package is provided for a simple development, such as PCB design guide, schematics and various application notes.

Rich Line-up

Gesture recognition information (for slider) as well as various settings and output registers values are communicated via I2C or SPI.

BU2105x series features PIO output interface standard SSOP package and 5V operation which can be connected directly MCU GPIO or key interface for easy replacement of mechanical switches without software development in industrial and white goods applications.



Part Number	Type	Nb of CH	Appli.	Output Type	Power Supply	Operating Temp.	Package	Status
BU21050FV*	Capacitive	8ch	Switches	8ch PIO output / 4bit Binary	4.5~5.5V	-40~+85°C	SSOP-A32 7.8x13.6x1.8mm, 0.8mm pitch	Available
BU21051FV*	Capacitive	2ch	Switches	2ch PIO output	4.5~5.5V	-40~+85°C	SSOP-A16 6.6x6.2x1.5mm, 0.8mm pitch	Available
BU21008MUV	Capacitive	16ch	Switches	I2C	AVDD=2.5~3.3V DVDD=1.7~3.3V	-40~+85°C	VQFN032V5050 5.0x5.0x1.0mm, 0.5mm pitch	Available
BU21010MUV	Capacitive	8ch	Switches	I2C	AVDD=2.5~3.3V DVDD=1.7~3.3V	-40~+85°C	VQFN016V5050 3.0x3.0x1.0mm, 0.5mm pitch	Available
BU21009MUV	Capacitive	16ch	Switches/Matrix	I2C	AVDD=2.5~3.3V DVDD=1.7~3.3V	-40~+85°C	VQFN032V5050 5.0x5.0x1.0mm, 0.5mm pitch	Available
BU21013MWV*	Capacitive	24ch	Matrix Touch Screen	I2C / SPI	AVDD=2.5~3.3V DVDD=1.7~3.3V	-40~+85°C	UQFN036V5050 5.0x5.0x1.0mm, 0.4mm pitch	Available
BU21018MWV*	Capacitive	36ch	Matrix Touch Screen	I2C / SPI	AVDD=2.5~3.3V DVDD=1.7~3.3V	-40~+85°C	UQFN056V7070 7.0x7.0x1.0mm, 0.4mm pitch	Under Development
BU21020MUV*	Resistive	8ch	Matrix Touch screen	I2C / SPI	AVDD=2.5~3.3V DVDD=1.7~3.3V	-40~+85°C	VQFN028V5050 5.0x5.0x1.0mm, 0.5mm pitch	Under Development

* Please, contact ROHM Sales for more information

11. Laser Diodes for Sensing

Production volume of laser diodes by ROHM ranks top-class in the industry. Stable production is achieved by effective use of common assembly lines due to higher design compatibility among the products. Wide range of product lineup is available ranging from low-power type to high-power type.

A laser diode, in contrast with LED, generates coherent or 'arrayed' light using a lens, which can be sent long distances or focused on an extremely small point. This principle makes it possible to be used for sensing such as distance measurement for example.

Function	Characteristics	Application Examples
① Reading	Enables high-speed reading of minute signals	Optical disk reading / writing (CDs, DVDs, Blu-ray)
② Recording	Image signals are written by changing the color of an organic membrane based on high output	Optical disk recording (CD-R, DVD-R, Blu-ray)
③ Photoexposure	Signals are drawn by irradiating a photosensitive drum	Laser printers
④ Communications	High-speed modulation is possible, making it possible to transmit large amounts of information	Optical communications in PCs, mobile phones, and other equipment.
⑤ Illumination	Allows accurate pointing via pin spot illumination	Laser microscopes, laser scalpels, pointing markers, and the like
⑥ Measurement	Attenuation over distance is low, making long-distance transmission possible	Road distance/building height measurements
⑦ Sensing	Interference fringes are easily created, enabling detection of minute changes	Sensing devices such as fire alarms, dust control, and laser mice.



Structure of a Laser Diode

In laser diode, amplitude of light is increased through induced emission.



Type	Part No.	Features	Optical Disc				Laser Printer			Other					
			BD-P	DVD-P /ROM	COMBO	DVD-R	CD-P /ROM	High Speed	Middle Speed	Low Speed	General Purpose	Bar Code Reader	Sensor		
660nm/780nm Dual Wavelength Laser															
Low/Low	RLD2WMUV2	Standard product / CAN	●	●											
	RLD2WMFV2	Standard product / Frame	●	●											
	New RLD2WMFL1	High ESD resistance / Frame	●	●											
	New RLD2WMNL2	Automotive-grade (85°C) / Glass-sealed CAN	●	●											
	★ RLD2WMFL3	80°C-class / Frame	●	●											
	★ RLD2WMUL3	80°C-class / CAN	●	●											
	New RLD2WMFR1	Self pulsation / Frame	●	●											
	★ RLD2WMDR1	Self pulsation / Covered frame	●	●											
Medium/Medium	★ RLD2WMFL4	10mW / Frame	●	●											
	New RLD2WMUS3	20mW / CAN	●	●											
Low/High	RLD2WMGZ4	DVD=10mW / CD=240mW			●										
High/Low	RLD2WMZS1	DVD=240mW / CD=20mW				●									
High/High	★ RLD2WMGU1	DVD=300mW / CD=350mW				●	●								
Multi-beam Laser															
High Speed	★ RLD2BPNK2	Twin Infrared / 90µm pitch							●	●					
	★ RLD2BPNK3	Twin Infrared / 28µm pitch							●	●					
660nm Laser															
Low Power	RLD65MPT7	DVD Single beam / CAN			●							●	●	●	
	RLD65MPT3-13A	DVD Single beam / Glass-sealed										●	●	●	
780nm Laser															
High Speed	RLD78NZH1	Infrared single / 5mW								●	●				
	RLD78NZM1	Infrared single / 10mW							●	●					
	New RLD78NZM2	Infrared single / 15mW							●	●					
	★ RLD78NZM3	Infrared single / 15mW							●	●					
Low Power	RLD78MPA1	CD / I CUT CAN Package						●				●	●	●	
	RLD78MRA1	CD / Resin package						●				●	●	●	
	RLD78MZGM	Infrared single / 5mW										●	●	●	
High Power	RLD78PPY5	CD=240mW			●										
★ : Under Development															

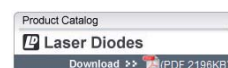
★ : Under Development

For more information, please visit our website

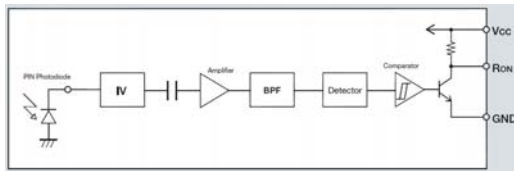
http://www.rohm.com/products/opto_device/laser_diode/

There, you can also download **Laser Diodes** catalog

<http://www.rohm.com/products/databook/ld/pdf/ld.pdf>



ROHM remote control receiver modules are comprised of a photodiode and signal processing IC die bonded to a metal lead frame. Gold wires are used to ensure high reliability. The components are then sealed with mold resin to eliminate visible optical noise and the entire structure except for the condenser lens which is covered in a metal shield casing.



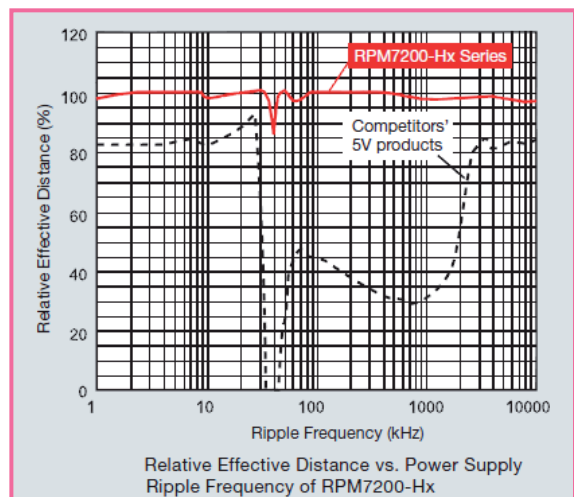
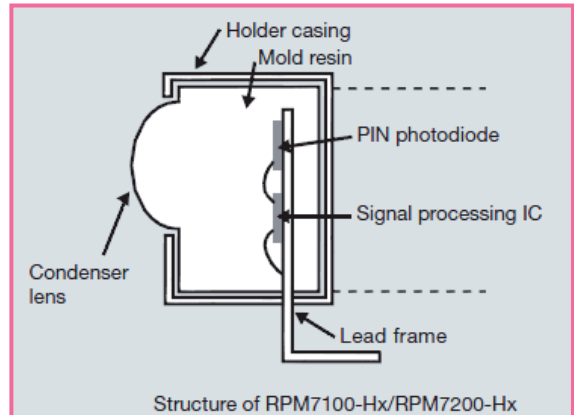
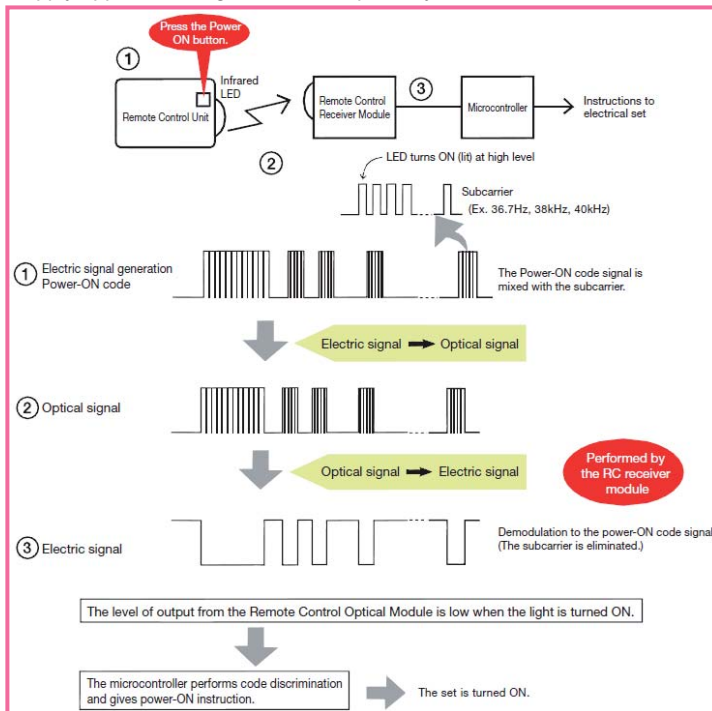
Wide line-up

ROHM offers 2 **leadless** (5.0V RPM7100-Hx, 3.0V RPM7200-Hx) and 4 **surface mount** (5.0V RPM5500, 5.0V RPMS2001, 3.0V RPM5300, 3.0V RPMS1001) series. Remote control receiver modules are available in both **top view** and **side view** configurations.



Broad Compatibility

Both types utilize a dual-chip structure incorporating a PIN photodiode and receiver IC. Malfunctions due to noise are prevented by reducing supply ripple, resulting in broad compatibility.

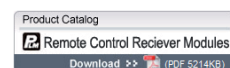


For more information, please visit our website

http://www.rohm.com/products/opto_device/reciever_module/

There, you can also download **Remote Control Receiver** catalog

http://www.rohm.com/products/databook/remote/pdf/remote_catalog.pdf

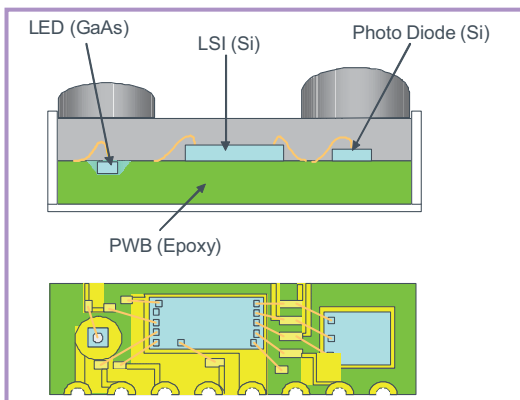
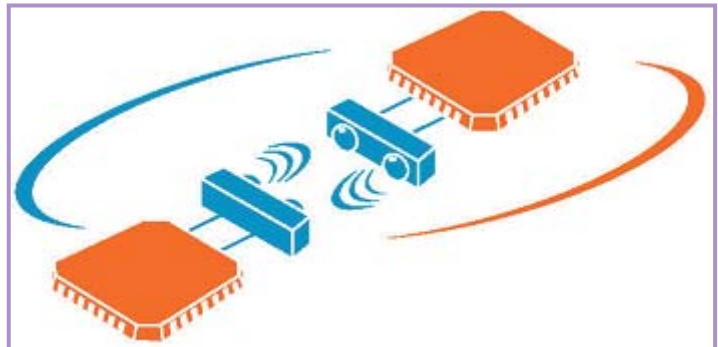


13. IrDA Module & Controller

Are you just satisfied with bluetooth? There are things only optical communication can do.

The IrDA infrared communication modules features such advantages like, high communication speed, high level of security, more design freedom (compatibility for future redesigning of set).

ROHM's IrDA communication modules are among the smallest in the industry and feature ultra-low power consumption, enabling ROHM to command a large market share. All products are fully supported and utilize the latest optical technology, providing the ideal solution to virtually any IrDA need.



Full solution: Controller + Module

ROHM can provide the full solution by offering IrDA controller IC (supporting SIR/MIR/FIR/IrSimple) and IrDA transceiver module for high reliability and optimum compatibility.

Without shield case



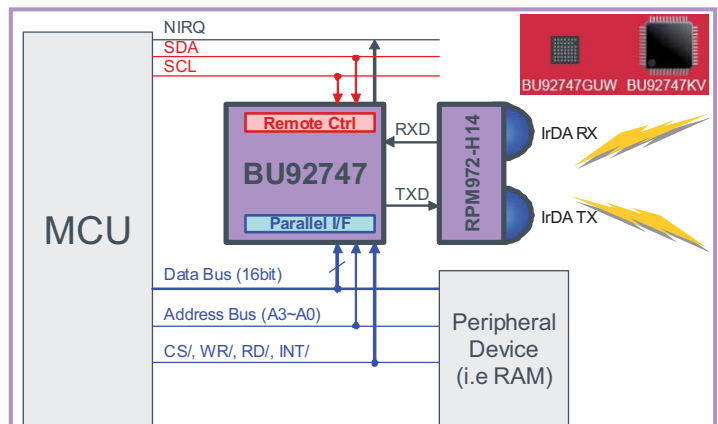
With shield case



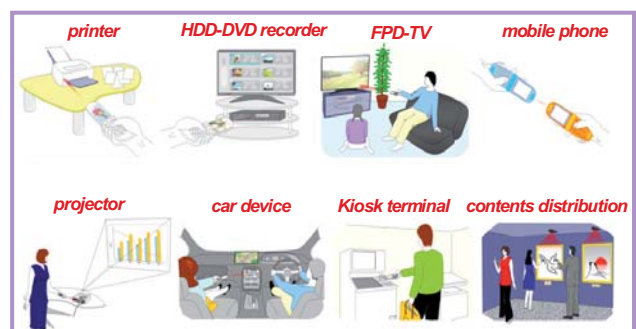
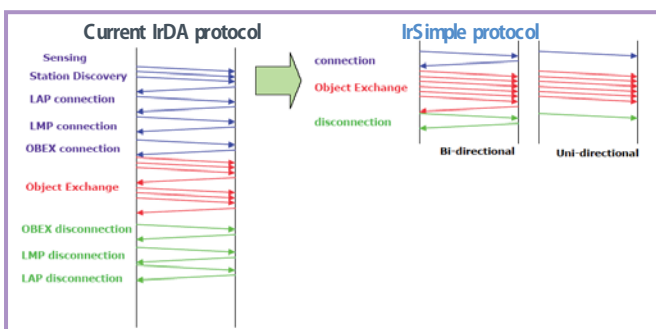
IrSimple for High Speed

IrSimple protocol allows to achieve high speed communication by simplified protocol review in the IrDA 4Mbps (FIR) without any change of AFE. This new protocol drastically reduces the data transfer time about 4~10 times compared to conventional IrDA protocol.

Data rate	File size		
	441Kbyte. (2Megapixel)	784Kbyte. (4Megapixel)	1,121Kbyte (6Megapixel)
4Mbps (IrSimple)	0.9 sec	1.7 sec	2.5 sec
4Mbps (FIR)	9.4 sec	17.9 sec	25.6 sec
115.2kbps (SIR)	46.9 sec	89.6 sec	128.1 sec



→ ROHM can provide full kit, e.g both IrDA Controller IC (**BU92747**) and IrDA Transceiver Module (**RPM972-H14**)



ROHM was the first company to start the mass production for thermal printheads – used in large volumes over the world. Contact Image Sensors (CIS), developed on this technology, are also widely used all over the world.

ROHM's image sensors heads are used in variety of fields, contributing to diversifying the nature of applications. Complying with innovative downsizing while maintaining the high functionality based on the three basic technologies such as optimized optical solution, ceramic substrate, LSI solution.

ROHM will continue to expand its line-up with products to fulfill your requirement.

	Competitor(CCD)	ROHM(CIS)	ROHM (CIS) Advantages
Drive Voltage	High voltage (9V)	Low voltage (3.3V)	Low power consumption
Size	Large (scaled down optical system)	Small (similar-sized optical system)	Compact size
Light Source	CCFL (unstable intensity)	LED (stable intensity)	No warm-up time Mercury-free



Depending on application, scanning parameters will change such as resolution, scanning speed, color/monochrome image capture, effective scanning width.

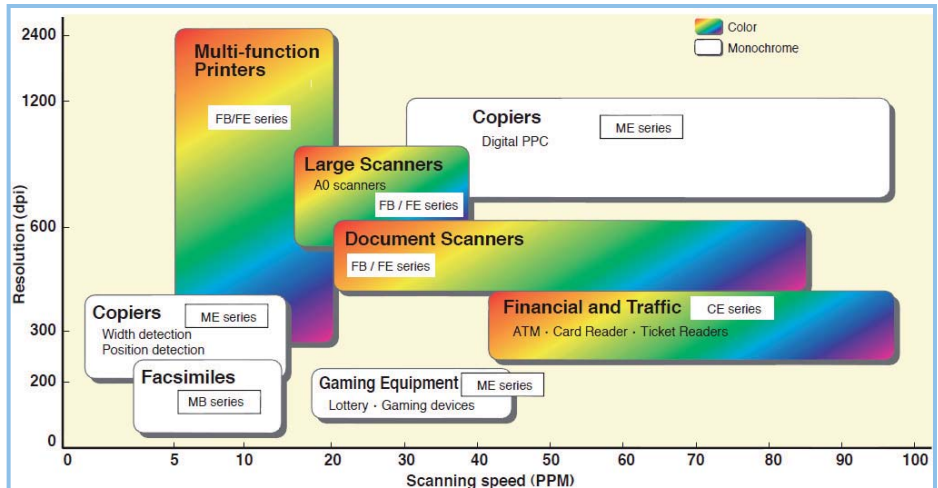
ROHM's wide line-up of CIS heads includes products for color/monochrome, up to 216 effective scanning width, up to 1200dpi, up 8MHz pixel clock frequency, down to 0.4ms/line scanning speed.

3.3V or 5.0V logic operation permits direct driving from microcontroller or ASIC, making it possible to have common power supply with the peripheral circuit.

A unique prism structure provides a uniform light output, making it possible to reduce size, weight and prevent noise. A ceramic substrate provides good heat dissipation and eliminates dust, improving scanning quality.

CE series enables bi-directional scanning.

MB, ME series are specialized for monochrome scanning. Ideal not only for scanning copies and faxes, but also for detecting the position or width of printed material or records as well.



Class	Applications	Individual Applications				Model series			
						Color CIS		Monochrome CIS	
						FB/FE series	CE series	MB series	ME series
Document Scanners	Document Scanner	Document Scanner				●		○	
	Multi-function Printers	Multi-function Printer				●		○	
	Large Scanner	A0 Scanner				●		○	
Financial and Traffic Terminals	Financial	ATM	Check Reader	Card Reader			●		○
	Traffic	ID Reader	Ticket Reader				●		○
	Gaming Equipment	Lottery	Gaming Machine				○		●
B/W Copiers Facsimiles	Copier	Copier	Width Detection	Digital PPC			○		●
	Facsimile	Facsimile	Mobile Fax			○		●	

○ : Good ● : Ideal

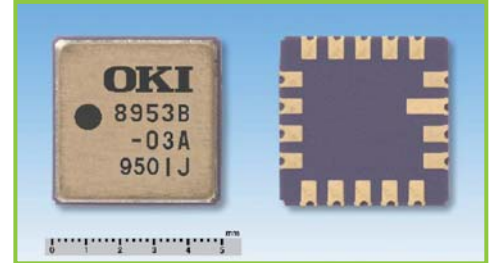


15. MEMS Acceleration Sensor



ROHM's portfolio also includes products from OKI Semiconductor, which complete the line-up for sensors with MEMS acceleration sensor.

ML8953B can detect the movement and position of every device and provides versatile functions by Micro-Electro-Mechanical-Systems (MEMS) with formation of 3 dimensional structure and smaller movable parts and LSI technologies. ML8953B features a built-in flash microcontroller, thus application programs can be installed.

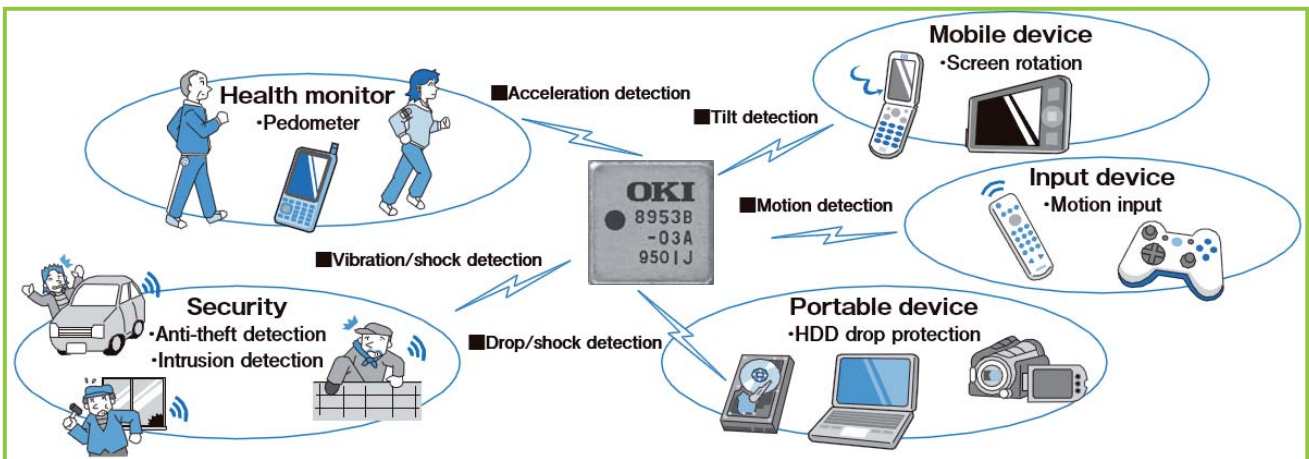


Installed software and functions runs autonomously. Main CPU starts/stops and read results after an interrupt.

Reduced power consumption of main CPU.

Applications

MEMS acceleration sensor's versatile functions bring you opportunities for introducing products in various markets. Acceleration sensor enables to detect acceleration, tilt, motion, vibration/shock, drop...



Features

ML8953B features 3-axis (i.e 6 directions) accelerometer (in MEMS technology) equipped with flash microcontroller and operates with low power consumption.

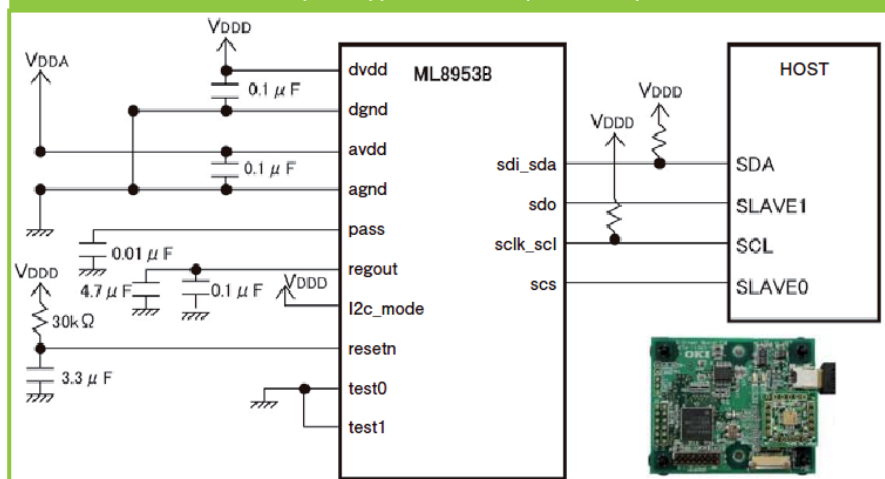
Digital interface with host CPU can be selected among SPI (3 or 4 wires mode supported) or I2C (2 wires).

It also features intelligent functions:

- A roll angle and pitch can be output.
- The preciseness is improved by average value output.
- In the auto measurement mode, a drop and shock can be automatically detected, and then notified to the host.

ML8953B features a small 18-pin QFN package in 5.0x5.0x1.15mm.

Example of application circuit (in I2C mode)



Part Number	Feature	Package	Rated Acceleration	Supply Voltage(V)	Output Type	Temperature Sensor	Impact Resistance	Operating Temperature(°C)
ML8953B	3-Axis Accelerometer Equipped with Flash Microcontroller	C-TQFN18	±3g	Analogue : 2.5~3.6 Digital : 1.74~3.6	SPI, I2C	Built-in	5000g	-20~+70

* Please, contact ROHM Sales for more information



ROHM's sales can also offer products from OKI Semiconductor, which complete the line-up for sensors with Fingerprint authentication MCU working with most of sensors suppliers such as AuthenTec.

ML67Q5250 and **new ML67Q5260** are specific LSI for the fingerprint authentication system equipped with the fingerprint authentication accelerator. An external memory is not needed, and the fingerprint authentication system that achieves high speed, high accuracy, and low power consumption can be achieved low-cost and easily. Moreover, it realizes the high security system in which the fingerprint data cannot be easily read.

ML67Q5250/60 developed a high quality & high accuracy fingerprint authentication accelerator using DFT (Discrete Fourier Transform) based algorithm licensed by Precise Biometrics Co. Moreover, the various peripherals make it applied not only as companion-chip but also as main MCU.



Mobile Authentication

USB Key, USB Token, mobile Password storage etc.

Mobile

Secure and personalize mobile equipment like cell phone, PDA etc.

Access Control

Manage access to small scale buildings or locations, Including also house automation and garage door opener.

Locks

Replacing locks at doors, lockers, cabinets, baggage with biometric

User Management

Managing access to items like medical and office equipment, tools, measurement equipment etc.

Secure Storage

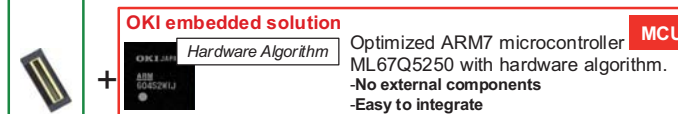
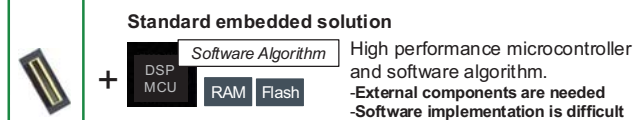
Storage like HDD can be secured with biometric functions.



PC/Server based applications



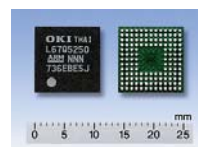
Embedded applications



Sensor-Suppliers: AuthenTec, UPEK, Atmel, Fujitsu, Atrua etc.
AuthenTec has approx. 40% market share for slide sensors (35 million sold sensors)

Sensor

ML67Q5250/60 allow fast authentication 0.8s max (1:1), 1.8s max (1:45). On top of hardware accelerator for DFT algorithm, a flexible embedded ARM7 MCU core is freely programmable for other tasks, and internal Flash ROM allows to store up to 45 finger templates. No external memory is required. ML67Q5260 features low power core 70mA operation / 30μA standby and hardware security to protect fingerprint data.



ML67Q5250



ML67Q5260

→ Small WCSP package

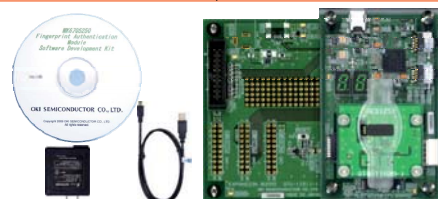
Evaluation kit	Software development environment	
	Code generator tool	Debug tool
ML67Q5250 SDK (*2)	RealView® Development Suite (RVDS) (*1) RealView® Microcontroller Development Kit (RVMDK) (*1) ARM® Developer Suite (ADS) (*1)	RealView® ICE (RVI) (*1) ULINK-ME® (*1)
MK67Q5250 SDK (*3)	RealView® Development Suite (RVDS) (*1) RealView® Microcontroller Development Kit (RVMDK) (*1) ARM® Developer Suite (ADS) (*1)	RealView® ICE (RVI) (*1) ULINK-ME® (*1)
ML67Q5260 SDK (*4) ^{new}	RealView® Microcontroller Development Kit (RVMDK) (*1) ARM® Developer Suite (ADS) (*1)	RealView® ICE (RVI) (*1) ULINK-ME® (*1)

*1: RVDS, ADS, RVMDK, RVI and ULINK-ME are proprietary products of ARM Ltd.

*2: ML67Q5250-SDK-2510 → Software Development Kit provided with AES2510 sensor.
ML67Q5250-SDK-1711 → Software Development Kit provided with AES1711 sensor.

*3: MK67Q5250 is fingerprint authentication module based on ML67Q5250.

*4: ML67Q5260-SDK-1751 → Software Development Kit provided with AES1751 sensor.
Actually, ML67Q5260 supports the new generation of Fingerprint Sensors like AES 1751.



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