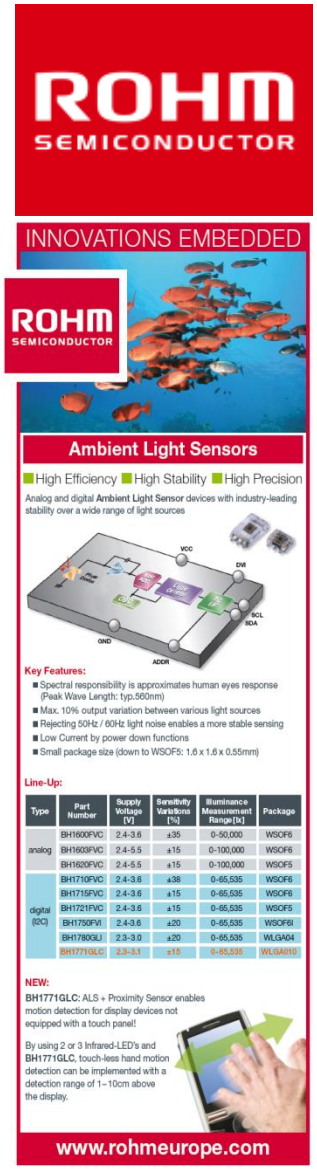
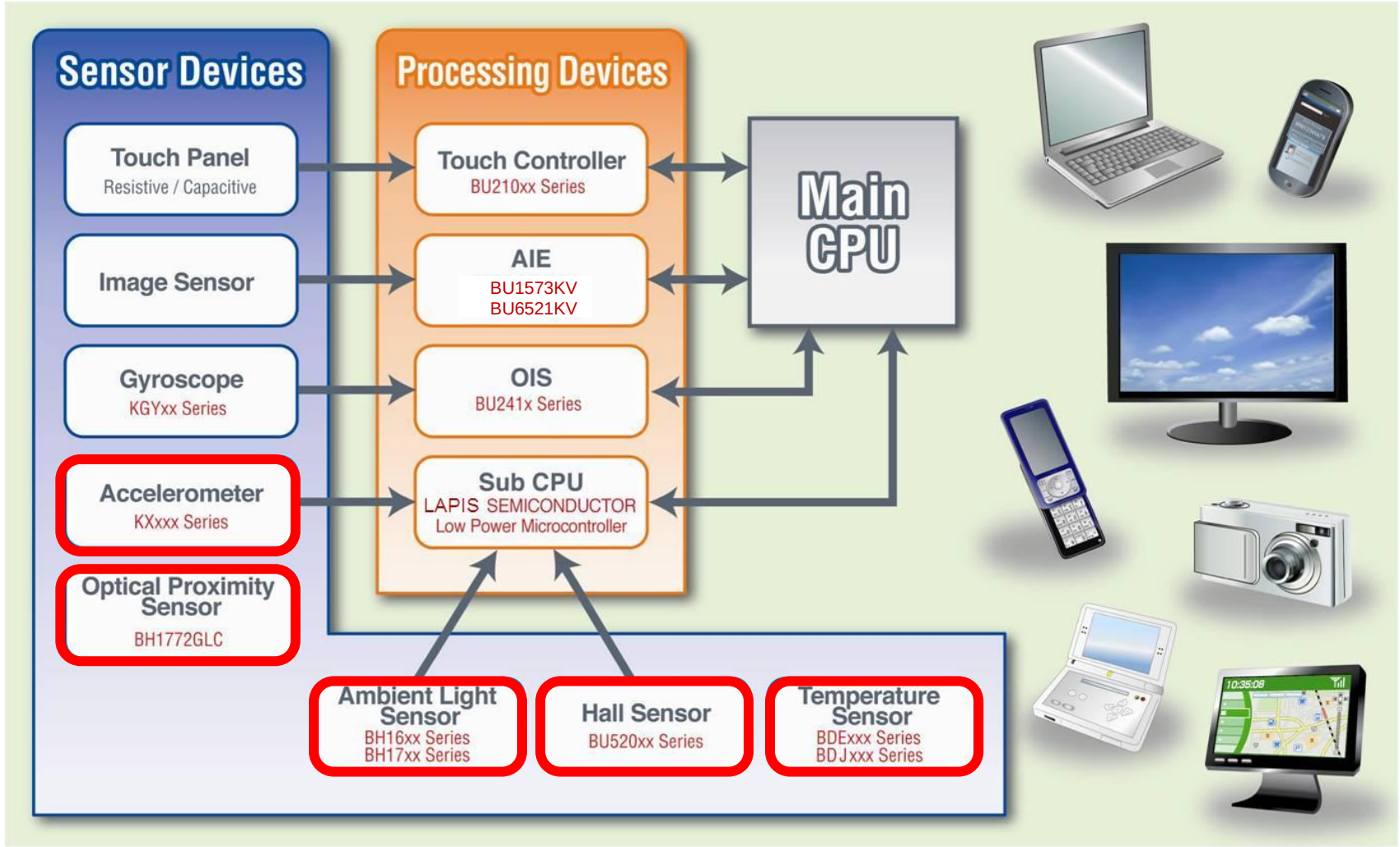


ROHM Sensor ICs

Product Presentation

Raimund Wagner - European Product Marketing

Sensor Devices and Processing Devices



Ambient Light & Proximity Sensors

Touch Interfaces

Capacitive

Resistive

Hall Sensors

Temperature Sensors

Kionix Accelerometers

Lapis UV Sensor

Ambient Light Sensors - Product / Application Map

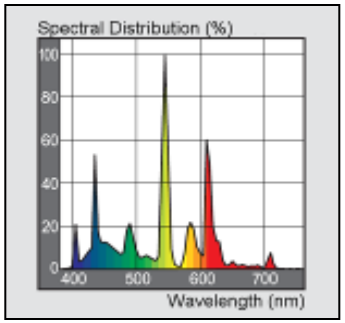
LCD Backlighting
Using ambient light sensors control the intensity of LCD backligthing for a wide range of applications

Public Lighting
Using ambient light sensors to turn on and off streetlights and other sources of exterior and interieur lumination.

Camera Lighting
Using ambient light sensors to control the intesity IR lighting of security or web Cameras.

Type	Part Number	Output Type	Supply Voltage [V]	Sensitivity Variations [%]	Output Sensitivity Gain Step	Illuminance Measurement Range[lx]	Temperature Operating Range [℃]	Package
analog type	BH1600FVC	current(source)	2.4-3.6	±35	2step	0-50,000	-30 to +85	WSOF6
	BH1603FVC	current(source)	2.4-5.5	±15	3step	0-100,000	-40 to +85	WSOF6
	BH1620FVC	current(source)	2.4-5.5	±15	3step	0-100,000	-40 to +85	WSOF5
	BH1621FVC	current(source)	2.4-5.5	±15	2step	0-100,000	-40 to +85	WSOF5
	BH1680FVC	current(source)	2.4-5.5	±15	3step	0-100,000	-40 to +85	WSOF5
digital type	BH1710FVC	I2C I/F	2.4-3.6	±38	-	0-65,000	-30 to +85	WSOF6
	BH1715FVC	I2C I/F	2.4-3.6	±15	-	0-65,000	-40 to +85	WSOF6
	BH1721FVC	I2C I/F	2.4-3.6	±15	-	0-65,000	-40 to +85	WSOF5
	BH1750FVI	I2C I/F	2.4-3.6	±20	-	0-65,000	-40 to +85	WSOF6I
	BH1751FVI	I2C I/F	2.4-3.6	±20	-	0-65,000	-40 to +85	WSOF6I
	BH1780GLI	I2C I/F	2.3-3.0	±20	-	0-65,000	-40 to +85	WLGA04
	BH1730FVC	I2C I/F	2.4-3.6	±15	-	0.008-65535	-40 to +85	WSOF6
	BH1772GLC	I2C I/F	2.3-3.6	±15	-	0-65,000	-40 to +85	WLGA010
	BH1785GLC	I2C I/F	2.3-3.6	±15	-	0.008-65535	-40 to +85	WLGA010

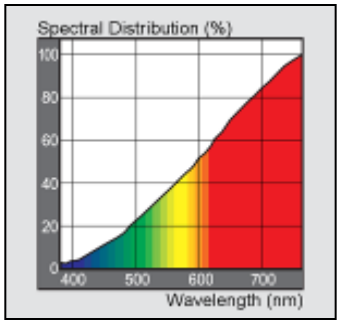
Key-Features: Stable output and ‚human eye' characteristic



Fluorescent light sources emit light mainly in the visible spectral range.

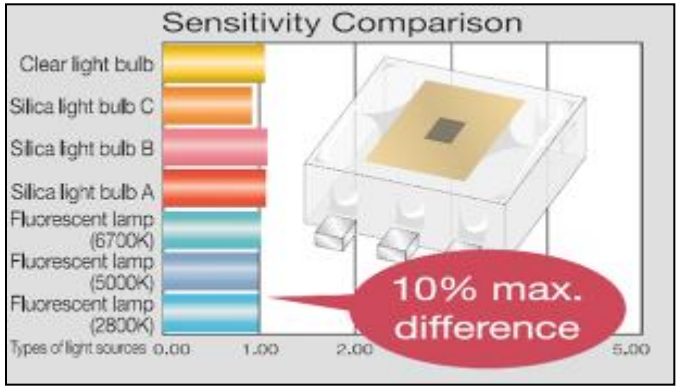
Each light source emits light in a different spectrum

Conventional sensors output different values even if the same brightness it is seen by human's eyes.

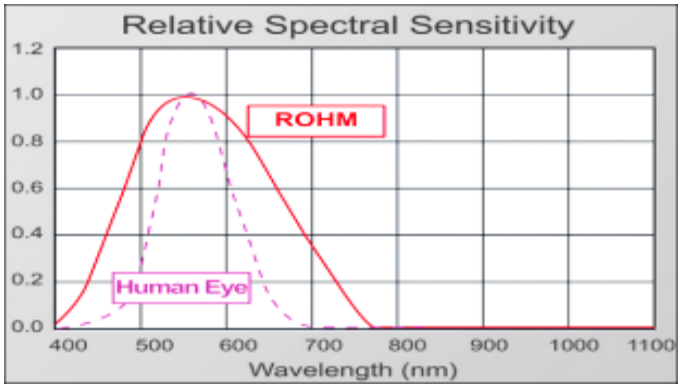


Incandescent light sources emit light in visible and infrared spectral range.

ROHM ambient light sensor ICs deliver **stable output with little variation between various light sources** (e.g. incandescent, fluorescent, sunlight), by using multiple photodiodes with different junction depths**.**



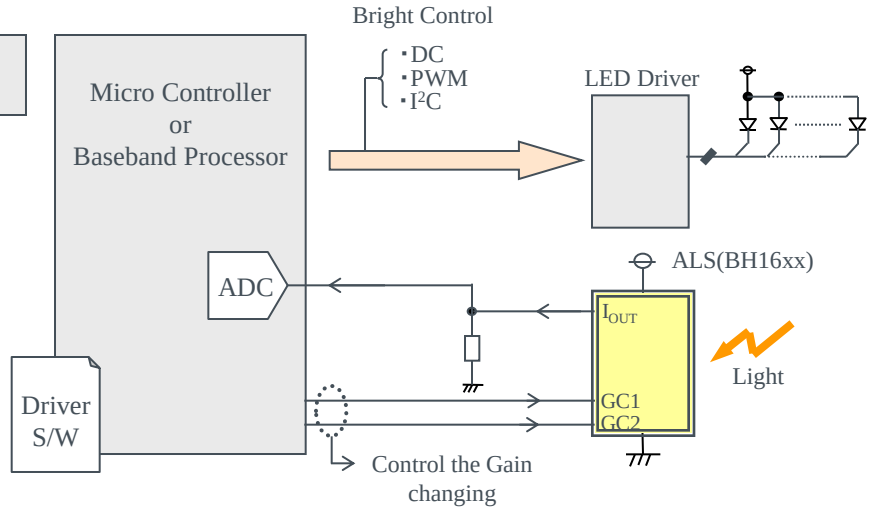
ROHM ambient light sensor ICs are optimized to achieve a **spectral sensitivity similar to the human eye,** which is necessary since otherwise wavelengths such as UV or IR, may cause inaccurate measurement.



Application Example: LED brightness control

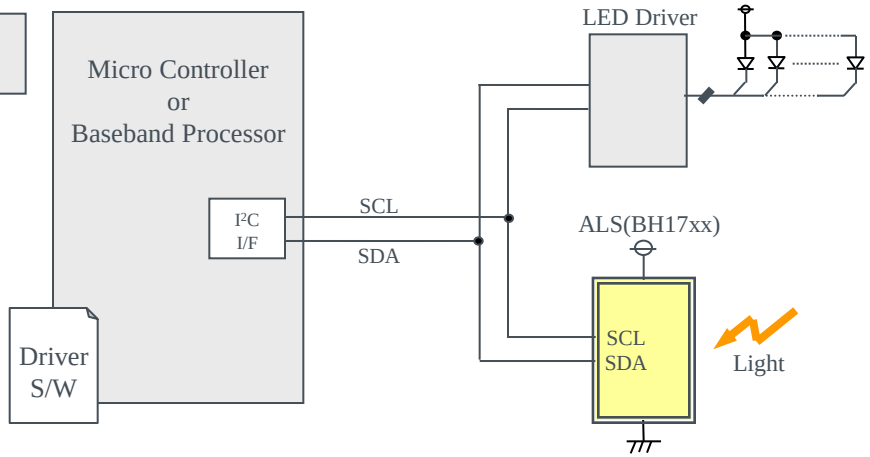
Analog Type (BH16xxFVC)

- Output current which is proportionate to the brightness.
- The output is converted into the voltage applying external resistance , and connected with ADC.



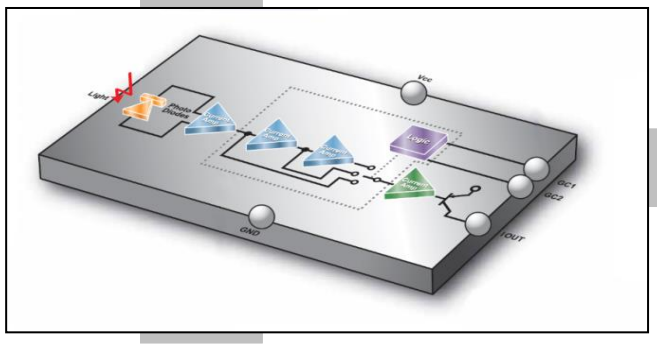
Digital Type (BH17xxFVC)

- Output digital value (16bit) which is proportionate to the brightness.
- The output is connected with the I2C bus line. Additional external Parts are unnecessary.



Analog Output Type Sensors

Output range	3(2) step gain settings of control output (possible to measure 0~above 100.000 lux)
Low Power	Internal shutdown function enables lower current consumption
Linearity	Output current is highly proportional to Intensity (60 µA (typ) @ 100 lx(H-Gain mode)
Sensitivity	Spectrum sensitivity similar to human eye
Voltage Range	Operating power supply voltage 2.4V ~ 5.5V(3.6V) Correspond to 1.8V logic input interface
Small size	Small package size (WSOF6,WSOF5) (3.0 x 1.6 x 0.7mm , 1.6 x 1.6 x 0.55mm)



WSOF6-Package
BH1603FVC
0-100000lux 3-step
2,4 – 5.5V

WSOF5-Package
BH1620FVC
0-100000lux 3-step
2,4 – 5,5V

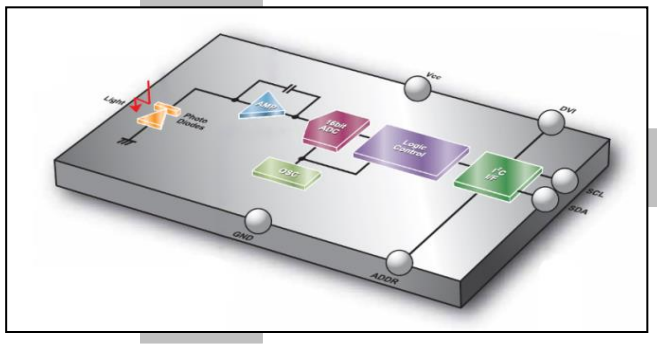
WSOF6-Package
BH1600FVC
0-50000lux 2-step
2,4 – 3.6V

WSOF5-Package
BH1621FVC
0-50000lux 2-step
2,4 – 5,5V

WSOF5-Package
BH1680FVC
0-50000lux (1/128lx)
2,4 – 5,5V

Digital Output Type Sensors

Output range	I2C BUS Interface corresponds to wide range of intensity (Fast Mode max. 400kHz; possible to measure 0~above 65.535 lux)
Low Power	Internal shutdown function enables lower current consumption
Linearity	Output value is highly proportional to Intensity (16 bit digital output)
Sensitivity	Spectrum sensitivity similar to human eye
Voltage Range	Operating power supply voltage 2.4V ~ 3.6V Correspond to 1.8V logic input interface
Noise filter	Rejecting 50Hz/60Hz noise allows a more stable sensing



WSOF6-Package
BH1710FVC
0-65000lux +/-35%

WSOF6I-Package
BH1750FVI
0-65000lux +/-20%

WSOF6I-Package
BH1751FVI
0-65000lux +/-20%

WSOF6-Package
BH1730FVC
0.008-65535lux
(Extended Range)

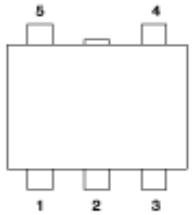
WSOF6-Package
BH1715FVC
0-65000lux +/-15%

WSOF5-Package
BH1721FVC
0-65000lux +/-15%

WLGA004-Package
BH1780GLI
0-65000lux
+ High Speed I2C

Highlight: BH1680FVC

ROHM's analog ambient light sensor BH1680FVC features a wide measurement range and an integrated infrared filter



PIN No.	Symbol
1	VCC
2	GND
3	GC1
4	GC2
5	IOUT

WSOF5

Key-Features

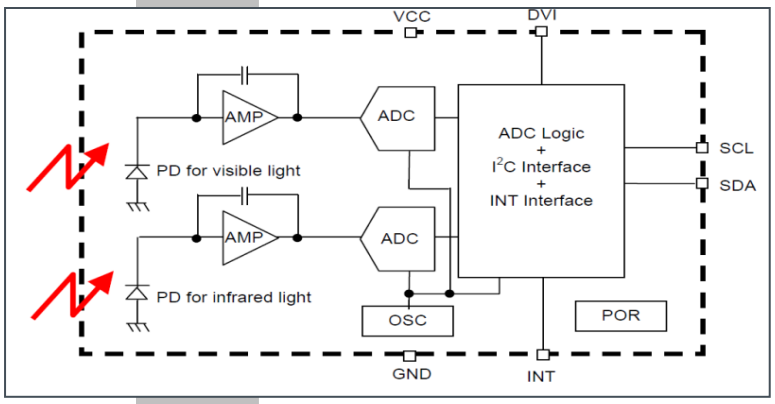
- Compact surface mount package 1.6 × 1.6 mm
- Spectral sensitivity close to human eyes sensitivity
- High sensitivity type
- Output current in proportion to brightness
- The influence of infrared is very small by an infrared cut filter
- Supply voltage operates from 2.4V to 5.5V
- Built-in shutdown function
- 3 steps controllable output current gain
- 1.8V logic input interface
- Low sensitivity variation (+/-15%)

Specifications	
Supply Voltage ()	2.4 ~ 5.5
Output Type	Current(Source)
Sensitivity Variations ()	±15
Illuminance Measurement Range ()	0-50000 (1/128lx steps)
Output Sensitivity Gain	3 step
Package size ()	1.6×1.6×0.55 WSOF5

Status:
Sample available

Highlight: BH1730FVC

ROHM's new digital ambient light sensor BH1730FVC features a very wide measurement range down-to 0.008lx and supports IR measurement for advanced filtering



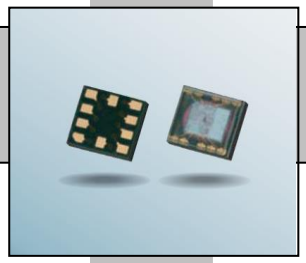
Specifications	
Supply Voltage ()	2.4 ~ 3,6V
Output Type	I2C
Sensitivity Variations ()	±15
Illuminance Measurement Range ()	0.008-65535 lux
Output Sensitivity Gain	3 step
Package size ()	2.6×1.6×0.75 WSOF6

Key-Features

- I2C bus Interface
- Two outputs (visible light & infrared light)
- Very Wide range and High resolution. (0.008-65535lx)
- Low Current by power down function
- 50Hz / 60Hz Light noise reject-function
- 1.8V Logic input interface
- Interrupt function
- Adjustable measurement window (0.001lx to 100.00lx)
- Small Light source dependency.
  (ex. Incandescent, Fluorescent, Halogen. LED. Sun Light)
- Small measurement variation (±20%)

Status:
Mass production

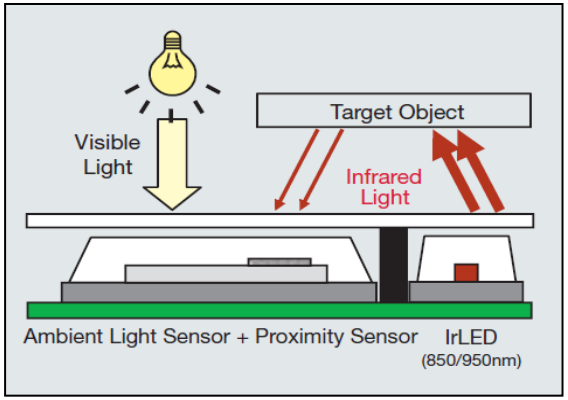
Highlight: BH1772GLC



The BH177xGLC integrates an optical proximity sensor and digital ambient light sensor (ALS) on a single chip. The proximity sensor can detect objects in a distances of 1cm to 10cm by detection of reflected IR light. ..

Key-Features

- Single-Chip Optical Proximity & Illumination Sensor IC
- Small sensitivity variation (less than +/- 15%)
- Internal shutdown, measurement duration
- sensitivity can be set by I2C
- Integrate Infrared LED current driver circuits (5 to 200mA)
- PS: High/Low comparator output (PS_OUT)
- PS: Integrate Sunlight canceling circuit
- ALS: Interrupt function (either ALS Interrupt or PS_OUT)

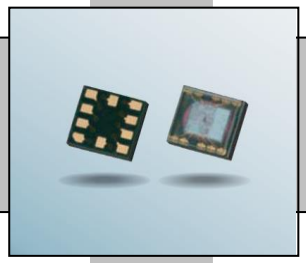


BH1772GLC

Supports simple proximity detection
(Possible to drive 1 IR-Diode)

Status:
Mass production

Highlight: BH1785GLC



BH1785GLC integrates optical proximity sensor and high sensitivity digital ambient light sensor in one package. The Proximity Sensor detects the approach of an human or object by reflection of IR LED light. The Ambient Light part can detects the wide range illumination from dark up to sunlight. ..

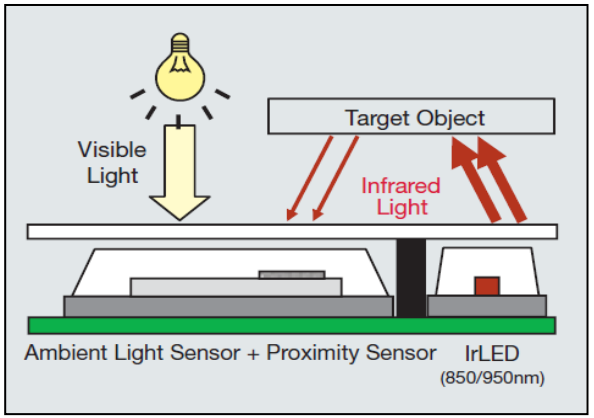
Key-Features

Proximity Sensor

- •Detection Distance = 10mm to 100mm
- •Detection distance with 10mA Ir LED current
- •Built in programmable IR LED driver
- •Integrated improved Sunlight canceling circuit
- •Low noise, below 40 counts !

Ambient Light Sensor

- •High resolution 0.008-65535 lx range
- •Correspond to I2C bus interface
- •Low current by power down function
- •Low light source dependency



BH1785GLC

High sensitive ALS with proximity sensor

Status:
Engineering samples available
Customer Samples samples for program builds June onward 2012
Mass production July onward 2012

Highlight: RPR-0400 Proximity Sensor Module

RPR-0400 integrates the proximity sensor BH1772 together with Rohm IR LED within one small package.

Key-Features

General

- No internal noise thanks to high airtight package by double molding process
- ALS and Proximity Sensor in one package. Reducing mounting space (as below)
- No care about mount position tolerance due to one package

Proximity Sensor

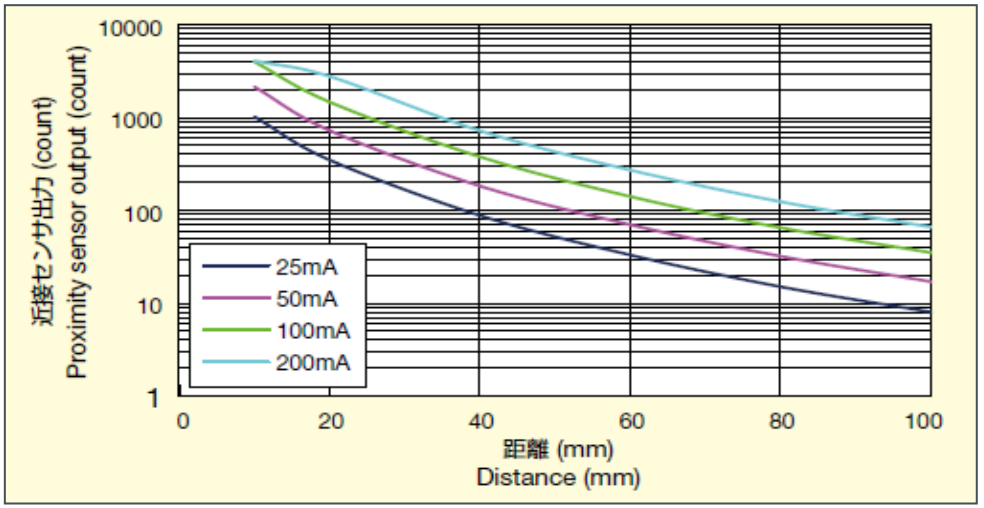
- Detection Distance = 10mm to 100mm
- Integrated improved Sunlight canceling circuit
- Low noise, detection with below 40 counts !

Ambient Light Sensor

- Resolution 1-65535 lx range
- Correspond to I2C bus interface
- Low current by power down function
- Low light source dependency

IR LED

- Integrated IR LED with variable power



Status:
Samples available
Mass production Q4/2012

Ambient Light & Proximity Sensors

Touch Interfaces

Capacitive

Resistive

Hall Sensors

Temperature Sensors

Kionix Accelerometers

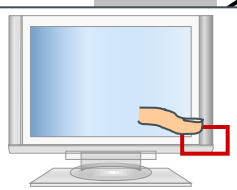
Lapis UV Sensor

Capacitive Touch Sensors - Products / Application Map

Air condition or Control Panel

White Goods

Lighting



Flat TV

And many others…

STB, DVD Player

Home Electric Appliances

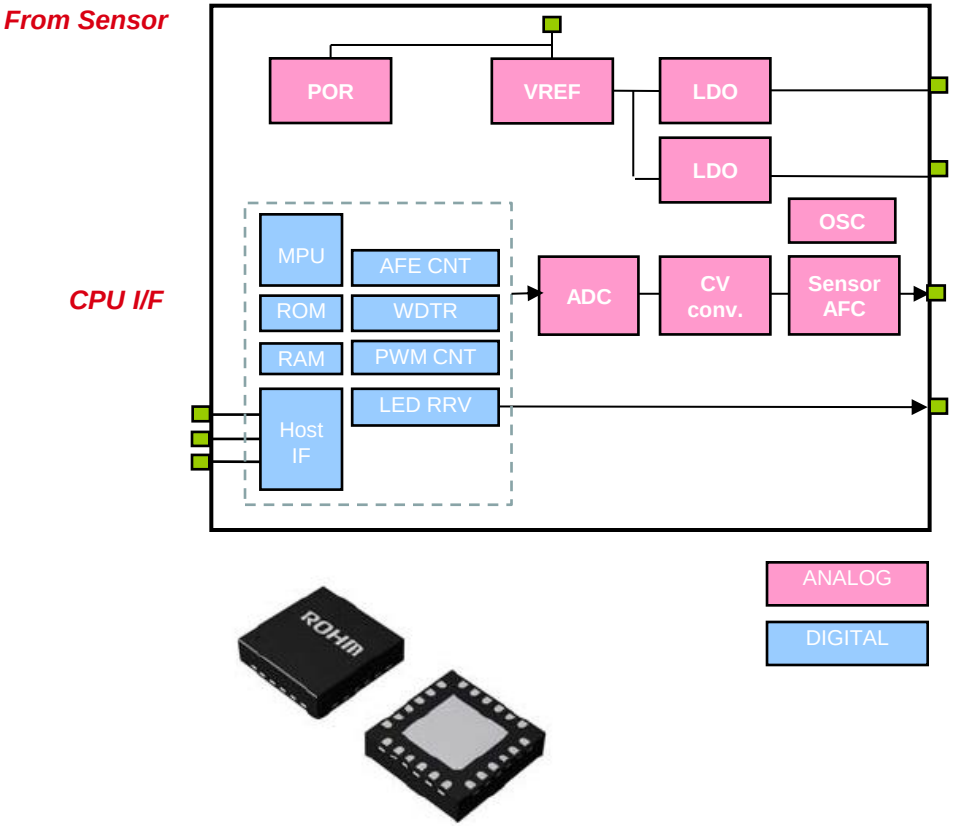
Part Number		Output	Power Supply	Package
BU21072MUV	10ch	2 wire serial	VDD: 3.0~3.6V	VQFN024 4.0x4.0x1.0mm
BU21078MUV	12ch	2 wire serial	VDD: 3.0~3.6V	VQFN028 5.0x5.0x1.0mm

NEW: BU21072/8MUV – 10/12CH type

Features

- 10ch CV-converter (BU21072)
  Supports up to 16 switches in matrix configuration
- 12ch CV-converter (BU21078)
  Supports up to 36 switches in matrix configuration
- 10bit ADC
- Host I/F:
  2 wire serial bus
- Single operation voltage:
  V_{DD}=3V ~ 3.6V
- Internal Clock (built-in CR oscillator)
- Power On Reset
- Package
  VQFN024V4040 or VQFN028V5050 or

Block Diagram



Ambient Light & Proximity Sensors

Touch Interfaces

Capacitive

Resistive

Hall Sensors

Temperature Sensors

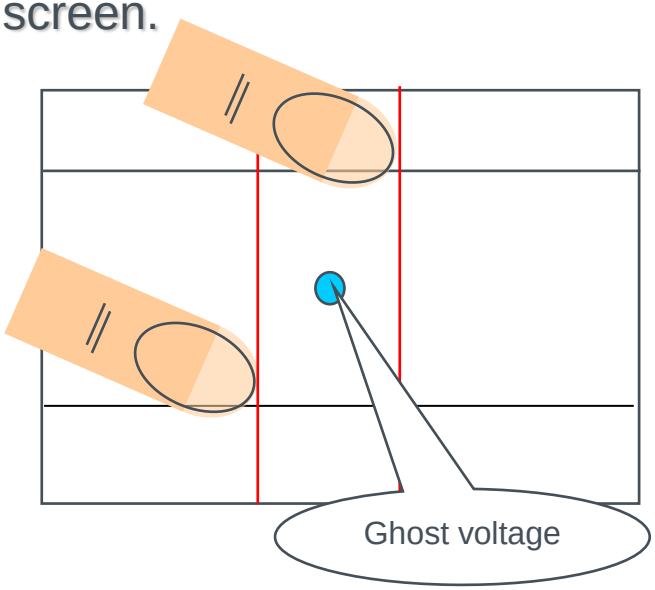
Kionix Accelerometers

Lapis UV Sensor

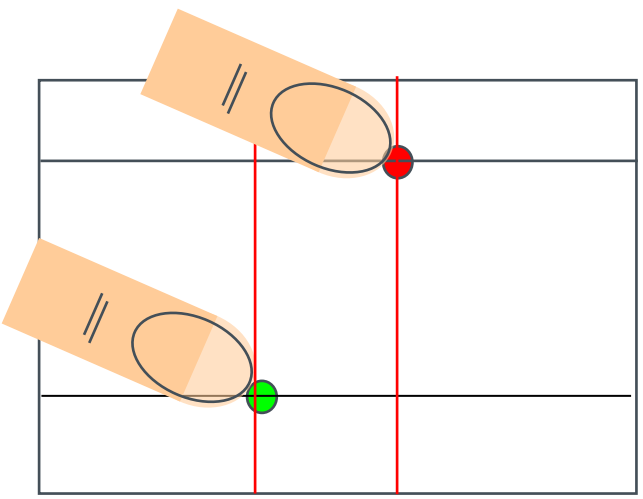
BU2102X

“controller of multi-touch with the conventional 4wire resistive touch panel “

It was difficult to detect 2point touching using conventional resistive touch screen.



Finally, ROHM have achieved to detect 2 point with standard 4 wire displays!

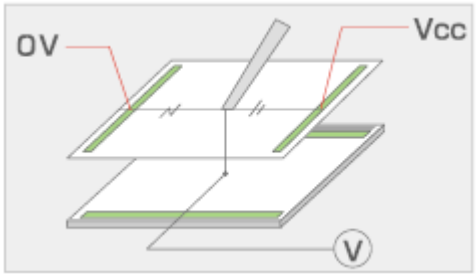


Advantage of ROHM Controller IC

4-wired resistive touch screen

Operation with 1 finger

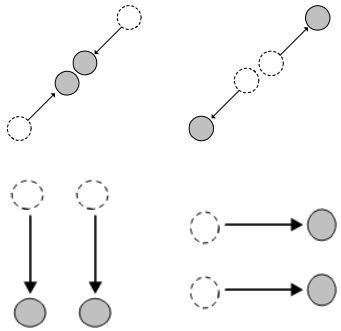
Conventional controller detect only 1 point.



BU21023 + 4 wired resistive touch screen

Good usability with 2 finger!

We can detect 2 point with Conventional Touch Screen.

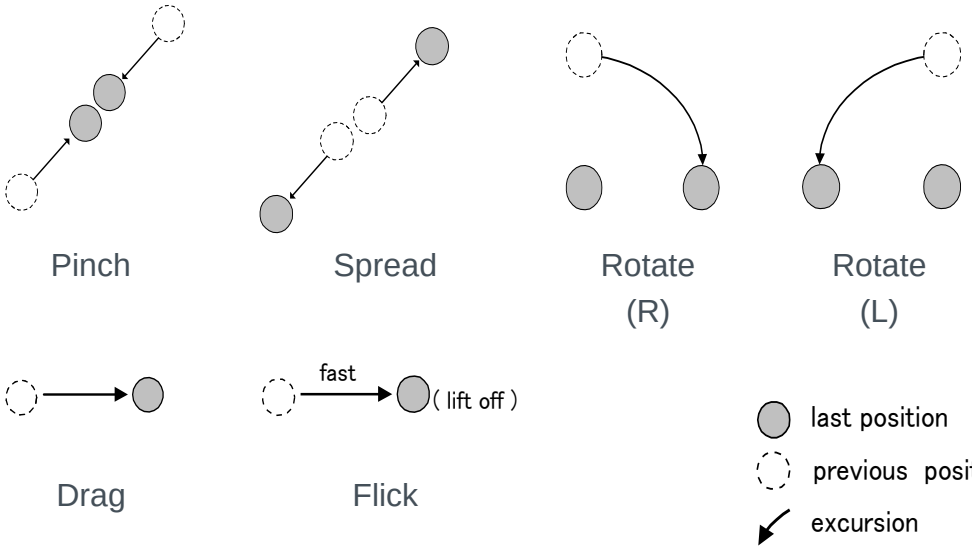


Pinch / Spread

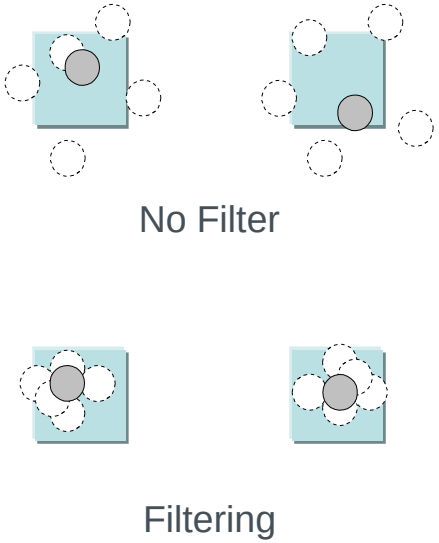
2 finger flick

BU21023 Features

Gesture Function



Filter Function



BU2102X detects two-finger gestures pinch, spread and rotate, plus single-finger gestures drag and flick and tap.

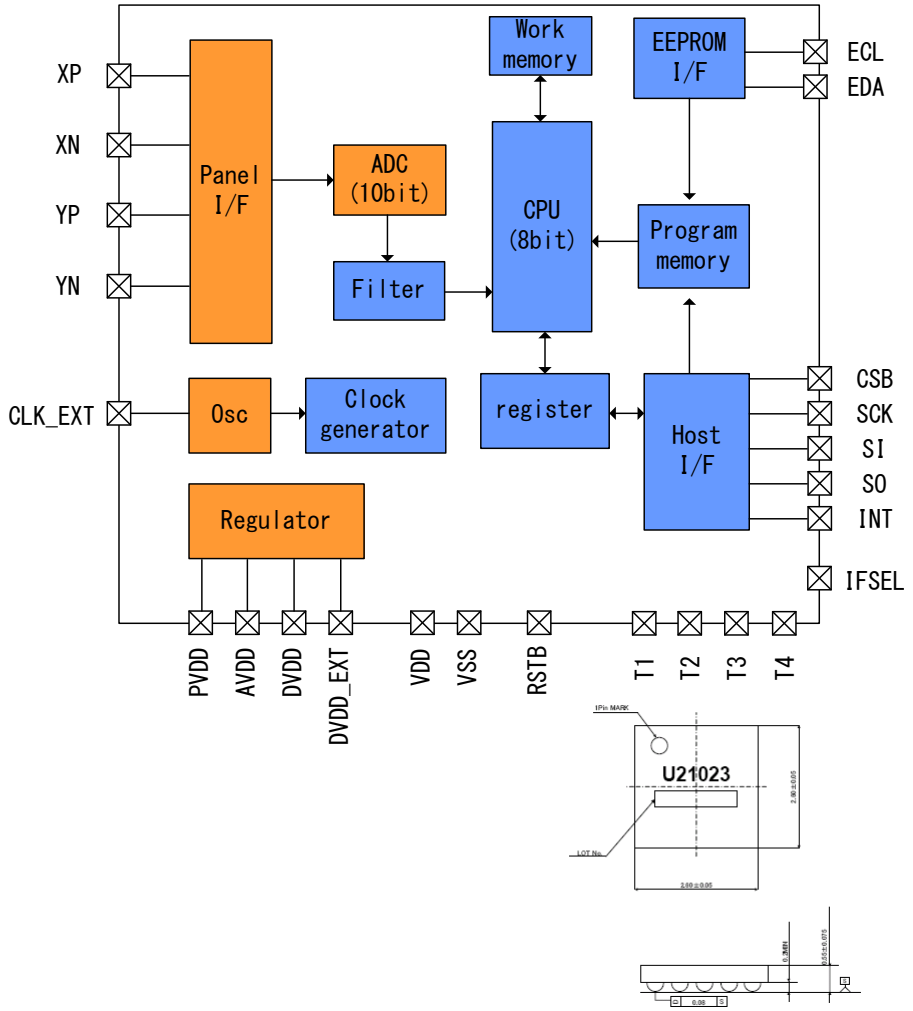
Coordinates could be automatically generated by embedded CPU, through some process like filtering.

- Median Average Filter
- Coordinated Average Filter

Product Overview of BU21023GUL

BU21023GUL

- Sensor ports
  support 4wire resistive touch panel
- A/D converter (10bit)
- Host interface SPI (4-wire)
  I2C (Selectable)
- Operation voltage VDD=2.7V~3.3V
- Automatic Touch position
  detection (2 point)
  10ms/1scan@10MHz
- Integrated clock oscillation
- Integrated power on reset
- Package
  WLCSP24 (2.6mmSQ, t=0.6mm)

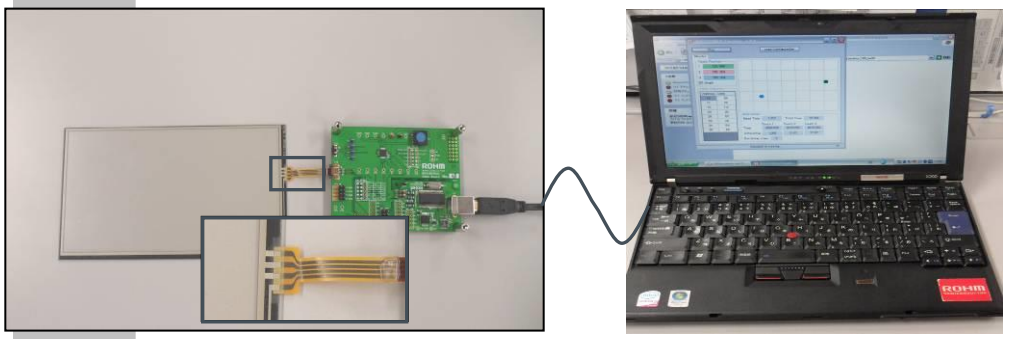


Resistive Touchscreen Controller IC Lineup

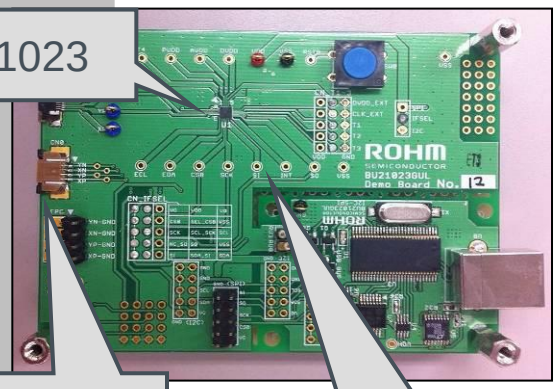
Resistive Touch Panel Controller Line-up

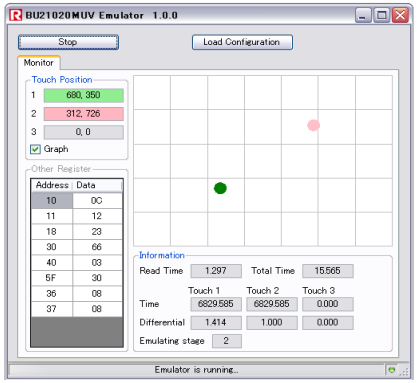
	BU21023MUV	BU21023GUL	BU21024FV-M	New BU21021GUL	New BU21049GUL	New BU21025GUL
Sample Status	MP		MP	MP	MP	MP
Panel Type	4-wire resistive touch screen					
Touch detection	Two point touch					One touch point
Resolution	1024 × 1024			4096 × 4096	4096 × 4096	4096 × 4096
Built-in CPU	8051 with 8kB RAM			Cortex-M0 with 16kB RAM	none	none
Feature	Up to 4 Gesture Flags Firmware gesture detection (Pinch, Spread, Flick, tap, double tap, rotate etc.)			More than 8 Gesture Flags Firmware gesture detection Flexible sensing procedure	AFE for dual touch detection	
Supply Voltage (V)	2.7 to 3.6			2.7 to 3.6	1.65 to 3.6	1.65 to 3.6
Opr. Temperature (°C)	-25 to 85		-40 to 85	-25 to 85	-25 to 85	-30 to 85
Package (mm)	VQFN028V5050 5.0×5.0×1.0	VCSP50L2 2.6×2.6×0.5	SSOP-B28 10.0×7.6×1.15	VCSP50L2 2.65×2.7×0.5	VCSP50L2 2.0×2.0×0.5	WL-CSP12 2.0×1.5×0.5
Application	Consumer		CAR AV	Consumer	Consumer	Consumer

Evaluation Kit



Evaluation board of BU21023





Evaluation Apps
- Detect 2points
- Resister Setting

Pinch Spread

Demo Apps
- **Photo Gallery（Pinch/Spread/Flick）**
- **Multi Touch（Detect 2points）**
- **Drawing（write in pen）**
- **QWERTY key input**

Ambient Light & Proximity Sensors

Touch Interfaces

Capacitive Resistive

Hall Sensors

Temperature Sensors

Kionix Accelerometers

Lapis UV Sensor

Rohm Hall Sensors - Products / Application Map

Consumer Applications

White Goods

Industrial Applications

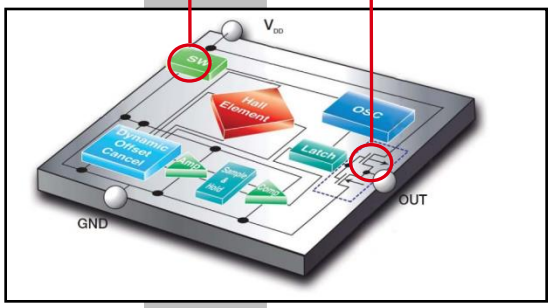
Measurement

Mobile Phone

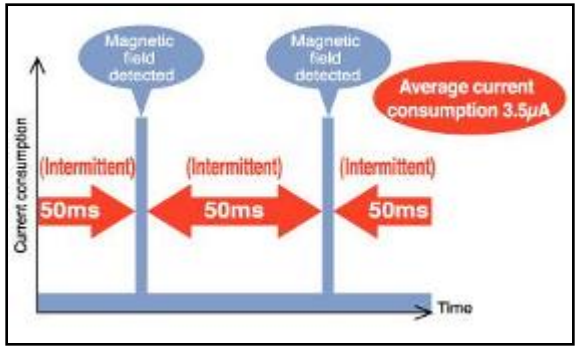
And many others…

		TYPE	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
		BU52051NVX	1.65～3.3V	+/-3.0mT	0.9mT	50ms	5μA	1	SSON004X1216
		BU52054GWZ	1.65～3.6V	+/-6.3mT	0.9mT	50ms	5μA	1	UCSP35L1
		BU52055GWZ	1.65～3.6V	+/-4.1mT	0.8mT	50ms	5μA	1	UCSP35L1
		BU52056NVX	1.65～3.6V	+/-4.6mT	0.8mT	50ms	5μA	1	SSON004X1216
		BU52061NVX	1.65～3.6V	+/-3.5mT	1.0mT	50ms	9μA	1	SSON004X1216
		BD7411G	4.5～5.5V	+/-3.4mT	0.8mT	-	3mA	1	SSOP5
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
		BU52742GUL	2.4～3.6V	+/-10.0mT	20.0mT	4μs	7.5mA	1	VCSP50L1

Rohm Hall Sensors: Key-Features Details I

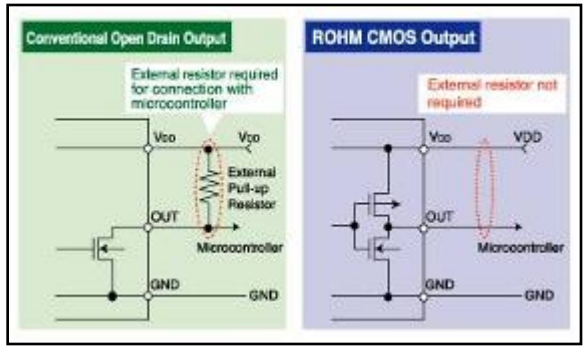


Intermittent operation for lower power consumption.



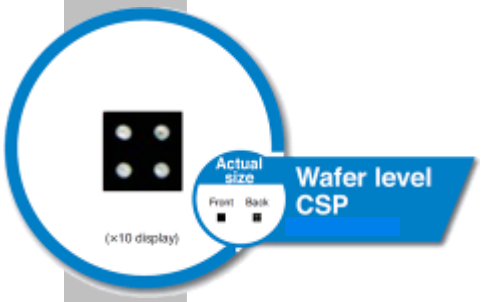
Maximizing the battery life of electronic devices is one of the most important considerations. In response to this, ROHM Hall ICs feature intermittent operation, resulting in lower power consumption and longer battery life.
Average Current Consumption:
(Intermittent Operation Cycle: 50ms typ.)
3.5μA typ. (BU52012HFV, BU52013HFV)
6.5μA typ. (BU52002GUL, BU52003GUL)

CMOS output eliminates the need for an external resistor.



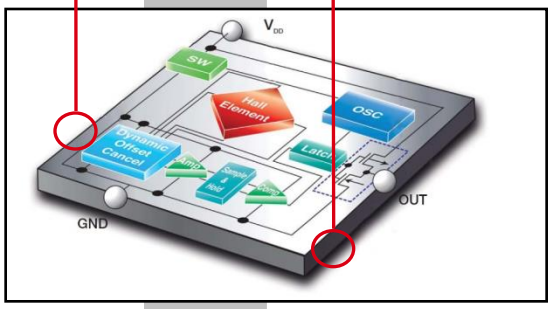
In conventional Hall Sensors open drain Hall ICs current flows through the external resistor during magnetic field detection, resulting in large overall current consumption. ROHM's Hall ICs feature CMOS output, eliminating the need for an external resistor, allowing direct connection to the microcontroller.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

Rohm Hall Sensors: Key-Features Details II

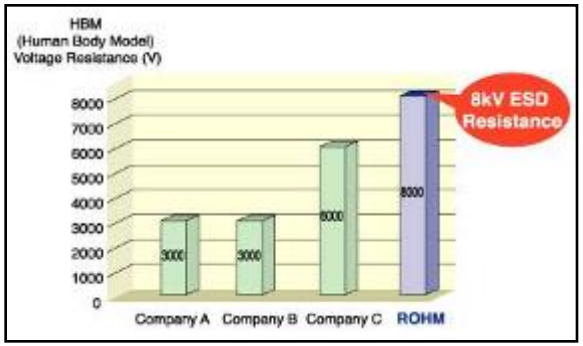


Ultra-small CSP saves space, making mounting easy.

Current and next-generation portable electronics are becoming increasingly small, 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.



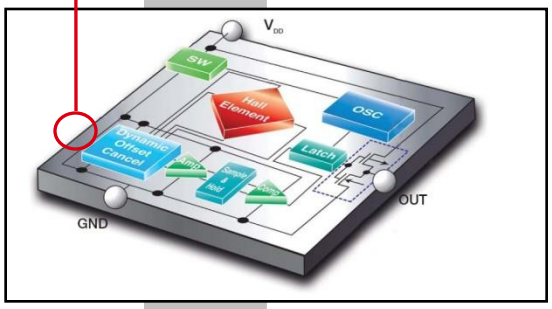
8kV ESD resistance ensures greater reliability.



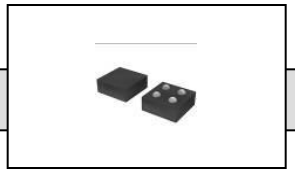
8kV (HBM) ESD resistance has been achieved through optimization of structure and circuitry, preventing damage due to ESD during assembly.

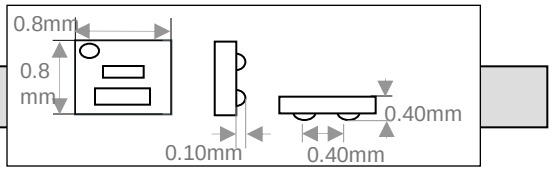
Rohm Hall Sensors: Package overview

Four package versions available

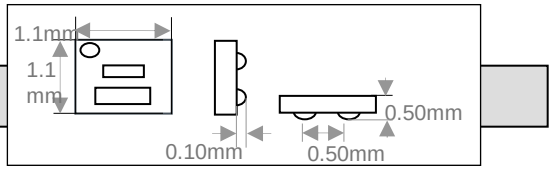


UCSP35L1 - WLCSP Package

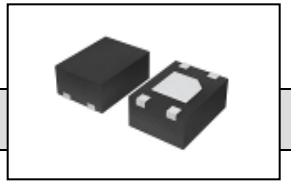


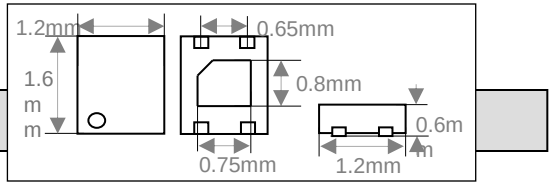


VCSP50L1 - WLCSP Package

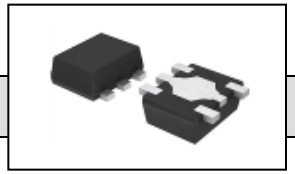


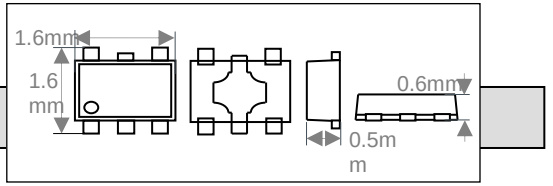
SSON004X1216 - Package



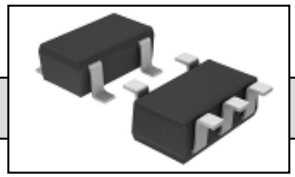


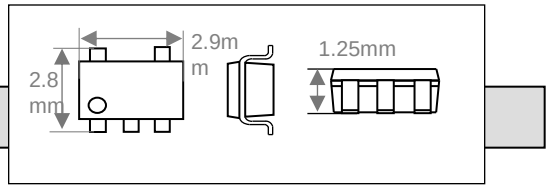
HSOF5 - Package





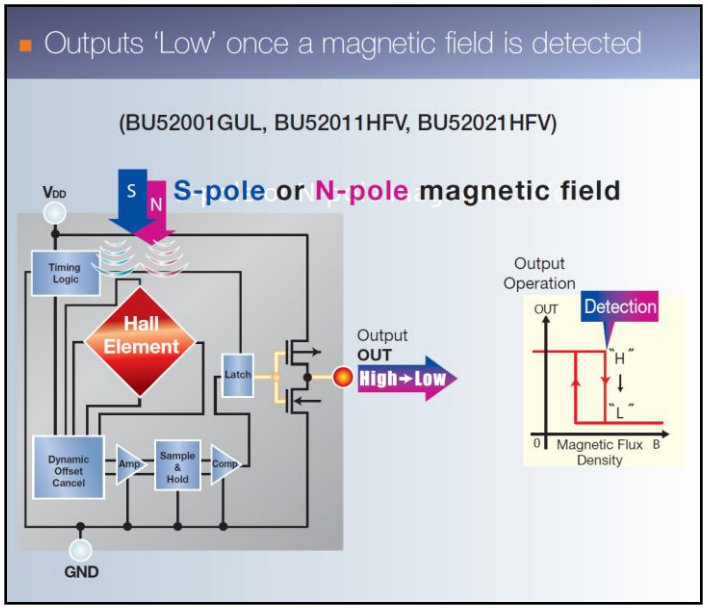
SSOP5 - Package

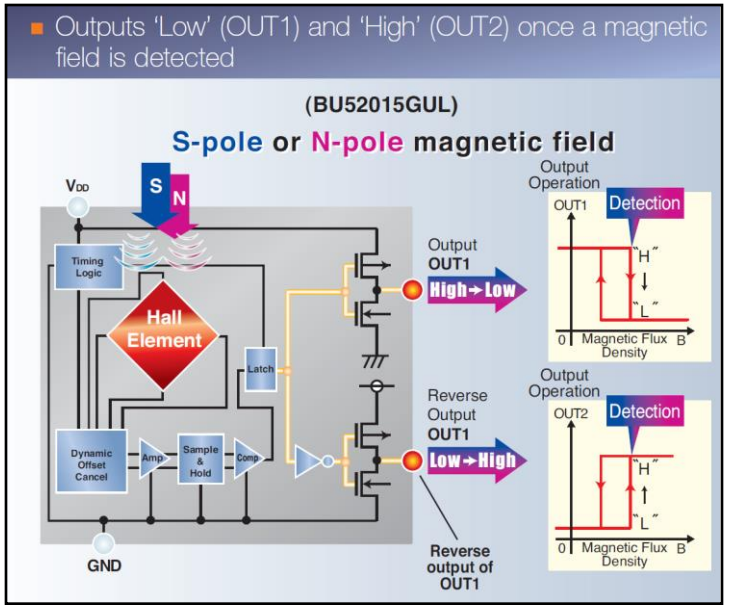




Omnipolar Detection

These devices can detect both S-pole and N-pole magnetic fields. Magnet management is simplified since the Hall IC will operate properly regardless of magnet orientation.





VCSP50L1
BU52001GUL
2.4V – 3.3V; 8µA

VCSP50L1
BU52015GUL
1.65V – 3.3V; 5µA

HVSOF5
BU52021HFV
2.4V – 3.6V; 8µA

HVSOF5
BU52011HFV
1.65V – 3.3V; 5µA

SSOP5
BU52025G
2.4V – 3.6V; 8µA

SSON004X1216
BU52051NVX
1.65V – 3.3V; 5µA

SSON004X1216
(higher accuracy)
BU52061NVX
1.65V – 3.6V; 9µA

NEW

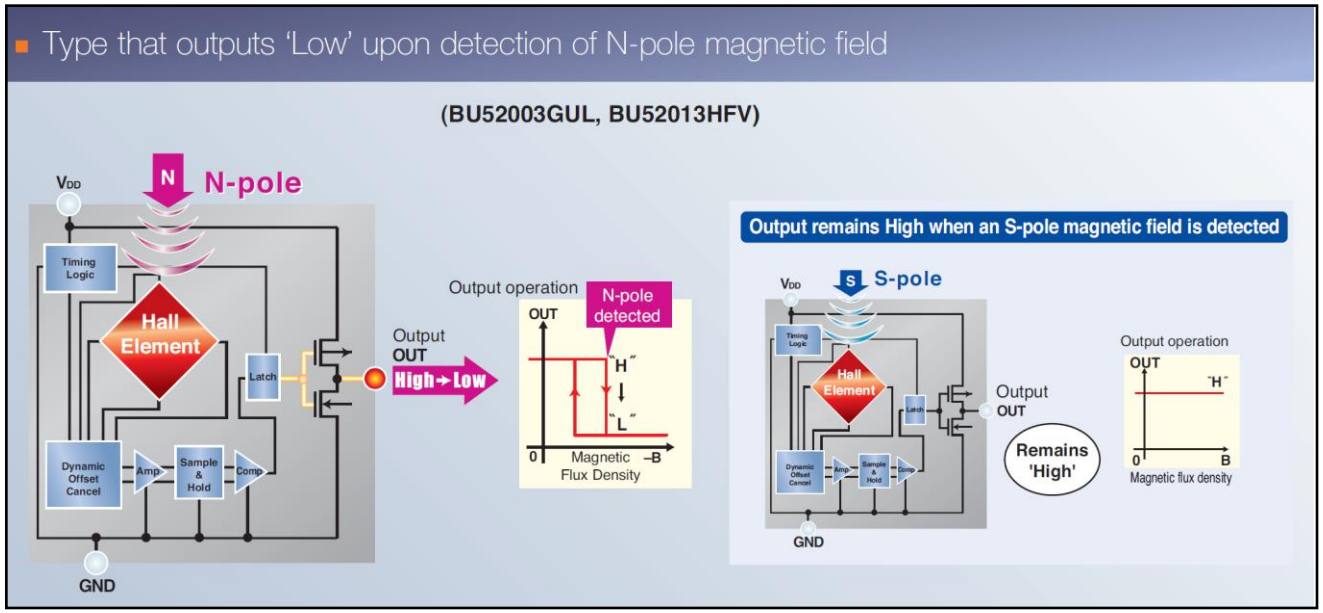
UCSP35L1(ultra small)
BU52054/5GWZ
1.65V – 3.6V; 5µA

NEW

SSOP5
BD7411G
4.5V – 5.5V; 3mA

Unipolar Detection

For the most cost-effective and lowest power implementation, unipolar detection Hall ICs provide the answer. The trade off comes from the need to assure proper magnet orientation in the production process.



HCSOF5(S-Pole)
BU52012HFV
1.65V – 3.3V; 3.5µA

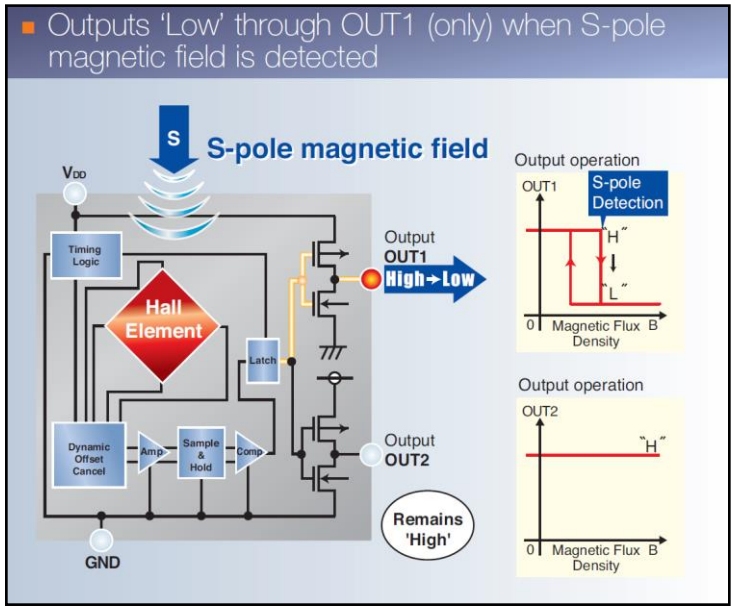
HVSOF5(N-Pole)
BU52013HFV
1.65V – 3.3V; 3.5µA

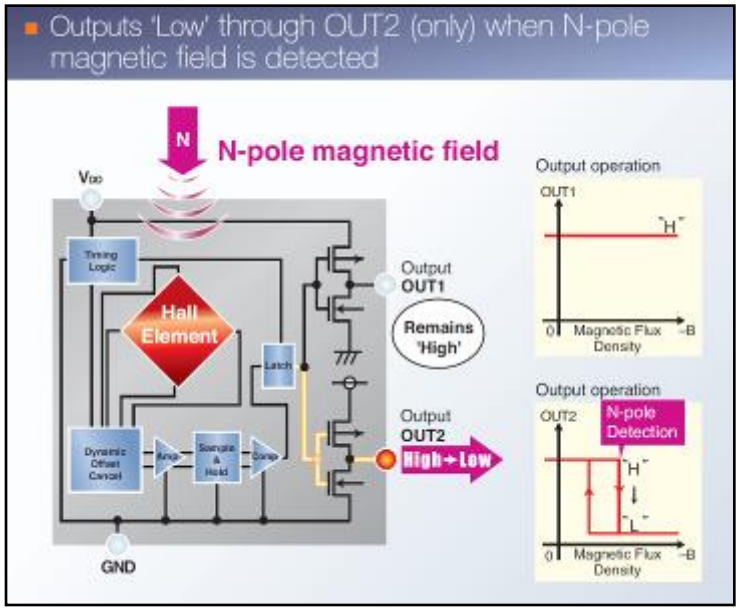
VCSP50L1(S-Pole)
BU52002GUL
2.4V – 3.3V; 6.5µA

VCSP50L1(N-Pole)
BU52003GUL
2.4V – 3.3V; 6.5µA

Omnipolar Detection with polarity discrimination

Omnipolar detection Hall ICs with built-in polarity discrimination add the capability of both detecting the position and the orientation of the magnet — important in applications where the device can be rotated.



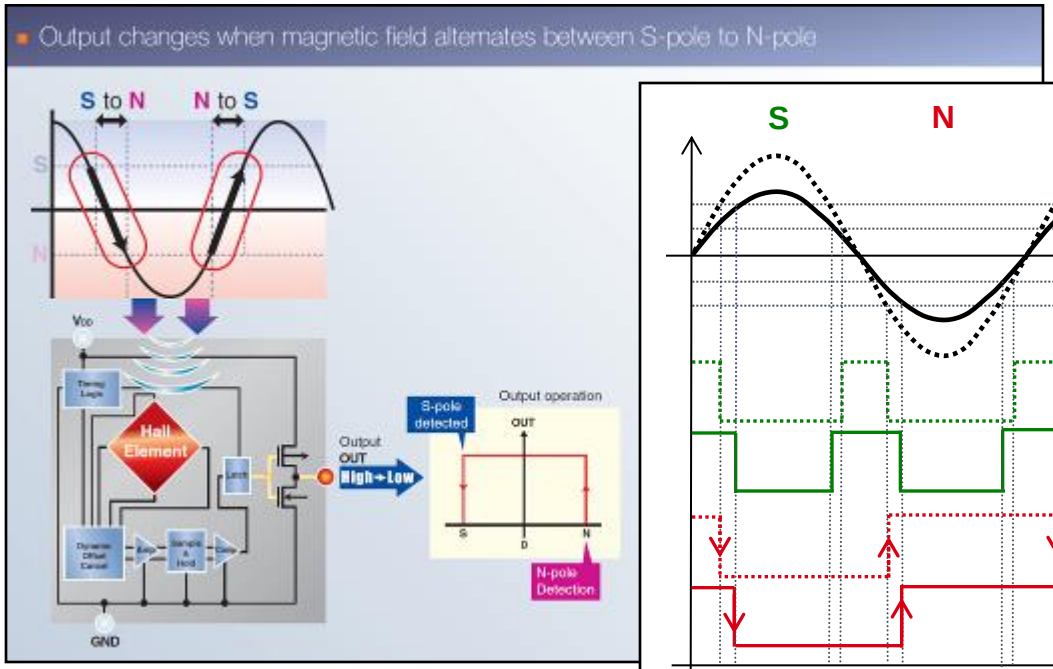


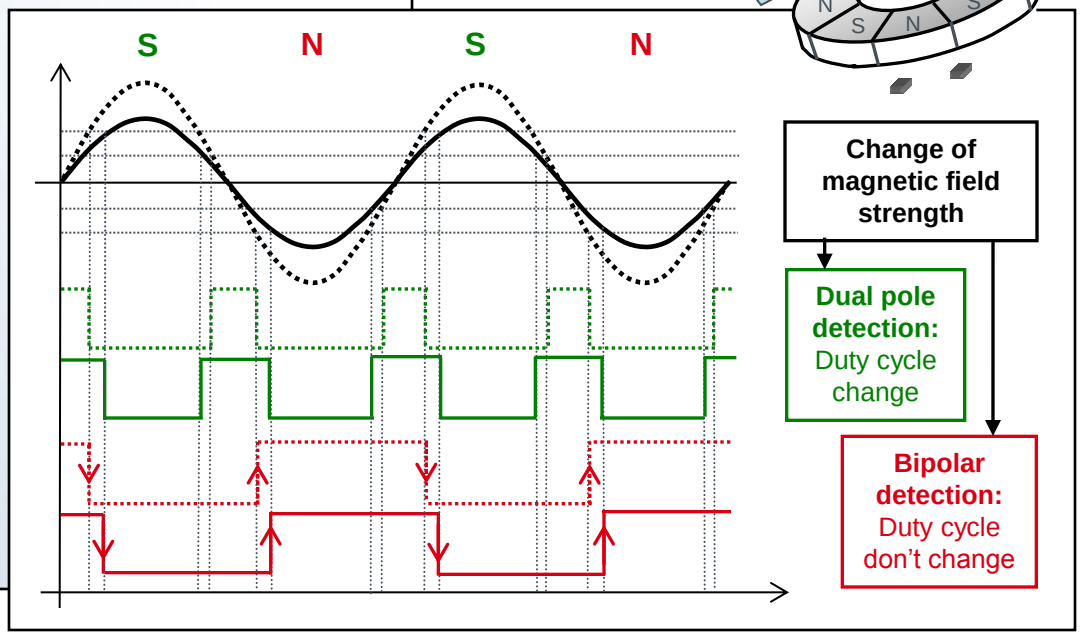
HVSOF5
BU52014HFV
1.65V – 3.3V; 5µA

VCSP50L1
BU52004GUL
2.4V – 3.3V; 8µA

Bipolar (Latching) Detection

Bipolar (latching) Hall ICs add the capability of detecting the dynamic movement of devices like jog wheels or track balls. Two of these devices are typically used to detect rotation.



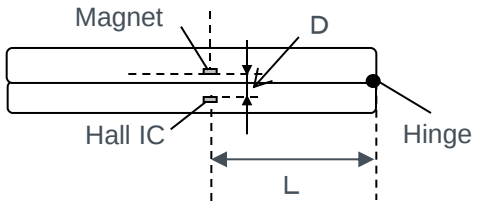


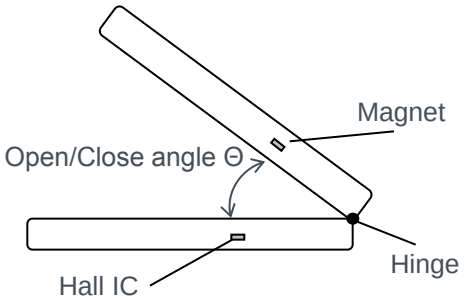
UNDER DEVELOPMENT

HVSOF5
BU52040HFV
1.65V – 3.3V; 200µA

Package TBC
(Double Hall elements with selectable hall distance)
BD742XG
4.2V – 24V

Application Example: (Open / Close Detection)



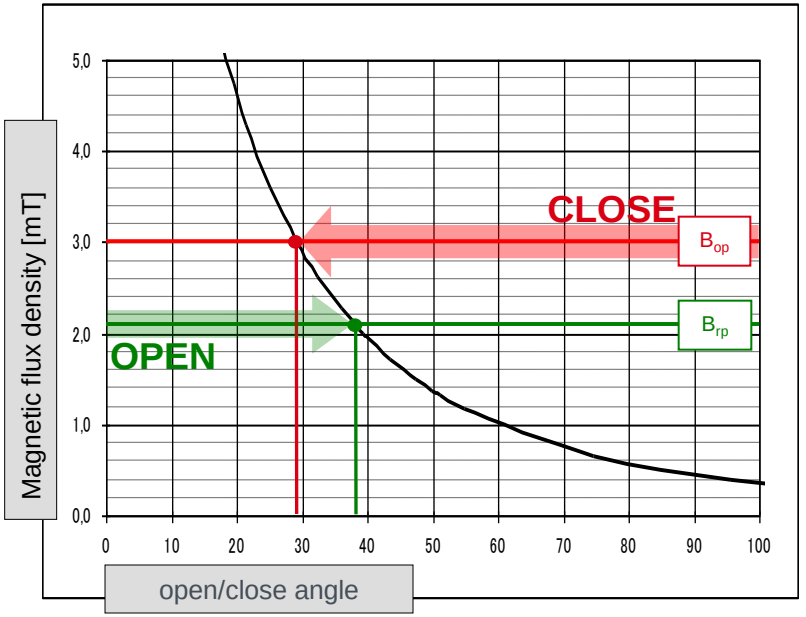


Suitable products:

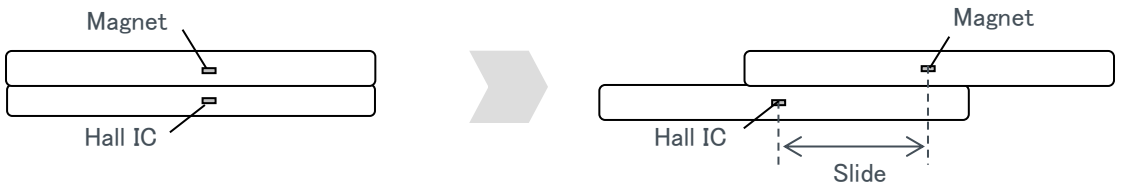
Omnipolar Detection with polarity discrimination type:
BU52004GUL; BU52014HFV

Omnipolar Detection type:
BU52015GUL; BU52021HFV and others

Applications:



Application Example: (Slide Detection)

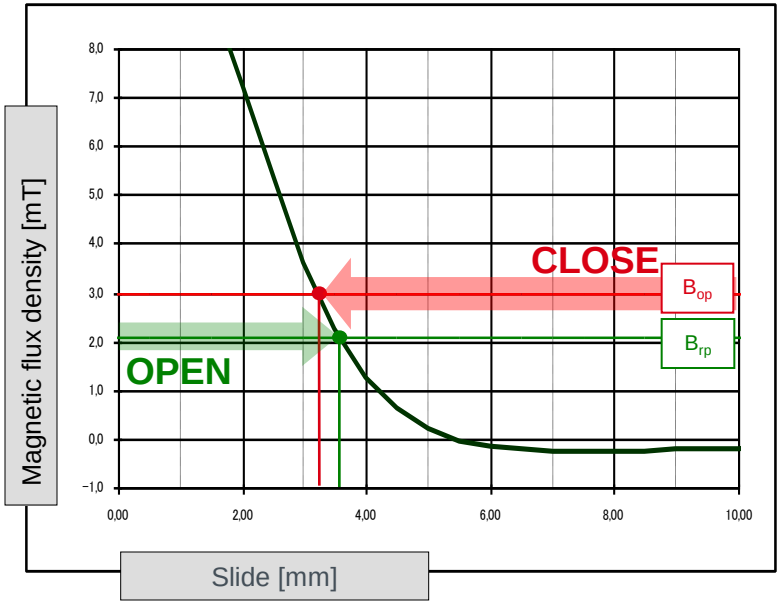


Suitable products:

Unipolar detection type:
BU52002GUL; BU52012HFV and others

Bipolar Latch type:
BU52040HFV

Possible applications:



Ambient Light & Proximity Sensors

Touch Interfaces

Capacitive Resistive

Hall Sensors

Temperature Sensors

Kionix Accelerometers

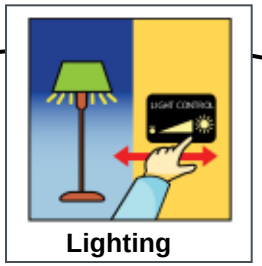
Lapis UV Sensor

Temperature Sensors - Products / Application Map


Mobile


Home Electronic


White Goods


Lighting


Power Supply


Computers

ROHM's temperature sensor ICs are suitable for all **Electrical equipment requiring temperature protection**, such as cell phones, PCs, LCD TVs, industrial devices, game machines, car navigation systems, and many more ….

Analog Output Temperature Sensor IC

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

Thermostat Temperature Sensor IC with changeable detect temperature

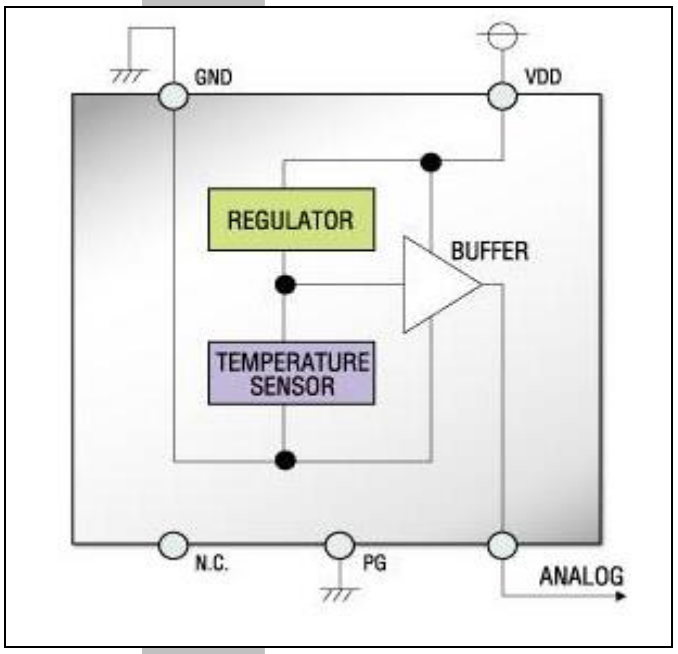
Family	Supply Voltage (V)	Supply current (uA)	Temp. Sensitivity (mV/℃)	Analog Output voltage (@30℃) (V)	Package	Detect temperature (℃)
BDExxxG	2.9 to 5.5	16	-10.68	1.753	SSOP5	-20, … , 120

Thermostat Temperature Sensor IC with low Current Consumption

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

Analog Output Temperature Sensor IC

High accuracy (±2° C) - guaranteed over a wide range of temperatures (-30° C to 100° C) - combined with stable sensitivity (-8.2mV/° C), make the **BD1020HFV** compatible with applications of all types.



Key Features

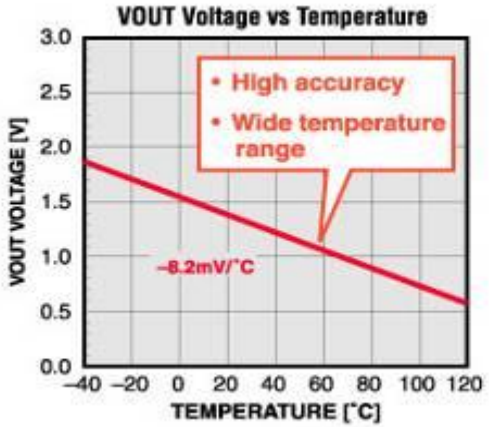
Stable sensitivity:
-8.2mV/° C

High accuracy:
±1.0° C typ. (Ta=30° C), ±2.0° C typ. (Ta=-30° C to 100° C)

Low supply current:
4.0µA typ.

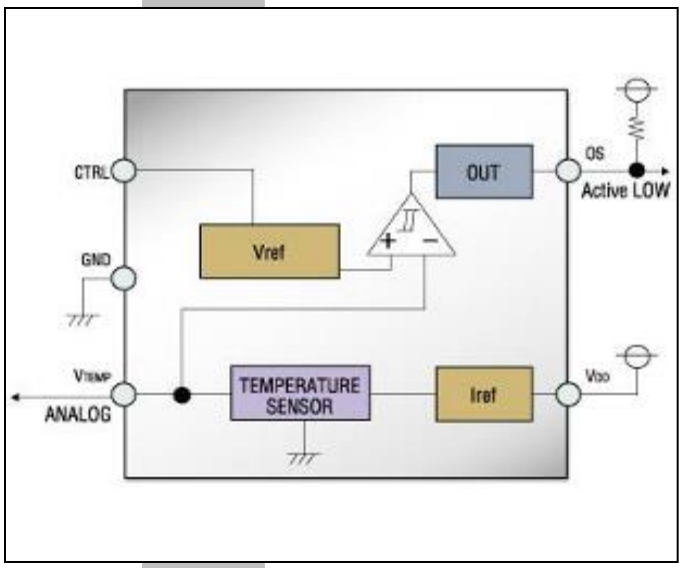
Ultra-compact package:
HSOF5 (1.60x1.60x0.60mm)

Package features excellent thermal resistance characteristics: 187° C/W typ.



Thermostat Temperature Sensor IC: Detect Temperature changeable

The **BDExxx0G series** is comprised of 15 models that detect temperatures from -20°C to 120° C, in 10°C increments.
In addition, the detection temperature can be set to 3 different levels (target, ±5°C) for greater compatibility.



Key Features

Wide detection range:
-20°C to 120°C (10°C increments: BDExxx0G series)

High accuracy temperature detection:
±4° C

3-stage detection temperature setting (via CTRL terminal):
±5° C(BDExxx0G series)

High accuracy analog output:
±3.5° C (Ta=30°C)

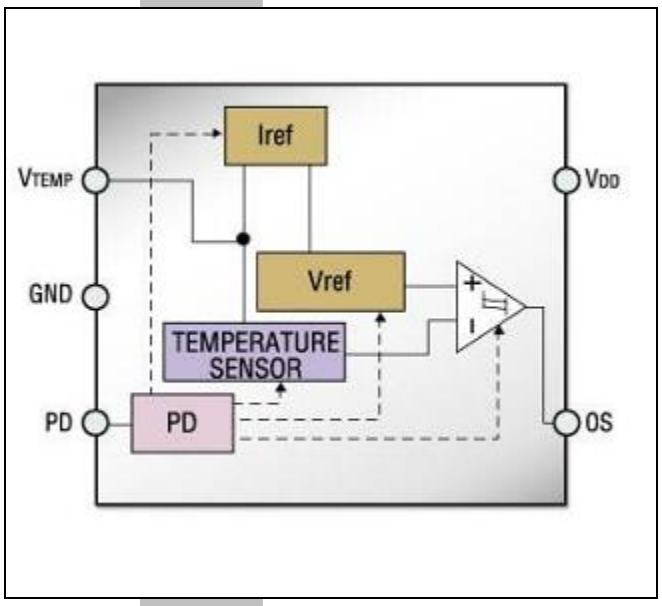
10°C hysteresis temperature

Part No.	Detection temperature(°C) CTRL control input			OS output type	
	L(Low)	H(High)	O(Open)	Circuit type	Output logic
BDE1200G	115.0	120.0	125.0	Open Drain	Active Low
BDE1100G	105.0	110.0	115.0		
BDE1000G	95.0	100.0	105.0		
BDE0900G	85.0	90.0	95.0		
BDE0800G	75.0	80.0	85.0		
BDE0700G	65.0	70.0	75.0		
BDE0600G	55.0	60.0	65.0		
BDE0500G	45.0	50.0	55.0		
BDE0400G	35.0	40.0	45.0		
BDE0300G	25.0	30.0	35.0		
BDE0200G	15.0	20.0	25.0		
BDE0100G	5.0	10.0	15.0		
BDE0000G	−5.0	0	5.0		
BDE9100G	−15.0	−10.0	−5.0		
BDE9200G	−25.0	−20.0	−15.0		

Detect temperature changeable (±5°C)

Thermostat Temperature Sensor IC: Low Current Consumption

With a low circuit current of 7.5uA (typ.), and a low standby current (1.0uA) during power down, the **BDJxxxHFV** series is a perfect solution for low power applications.



Key Features

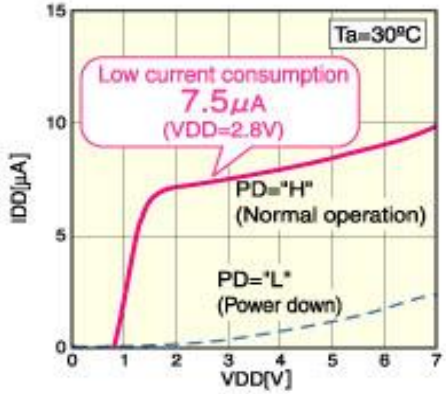
Low supply current:
7.5uA typ.

Ultra-compact package:
HSOF5 (1.6x1.6x0.6mm)

Active L Output

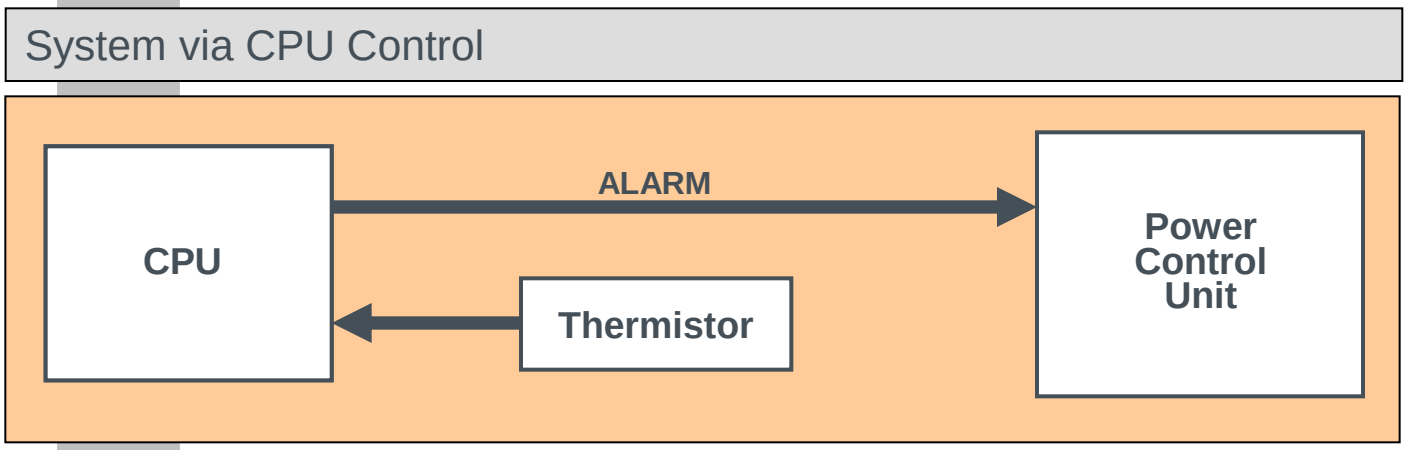
High thermostat output accuracy:
±1.0˚C

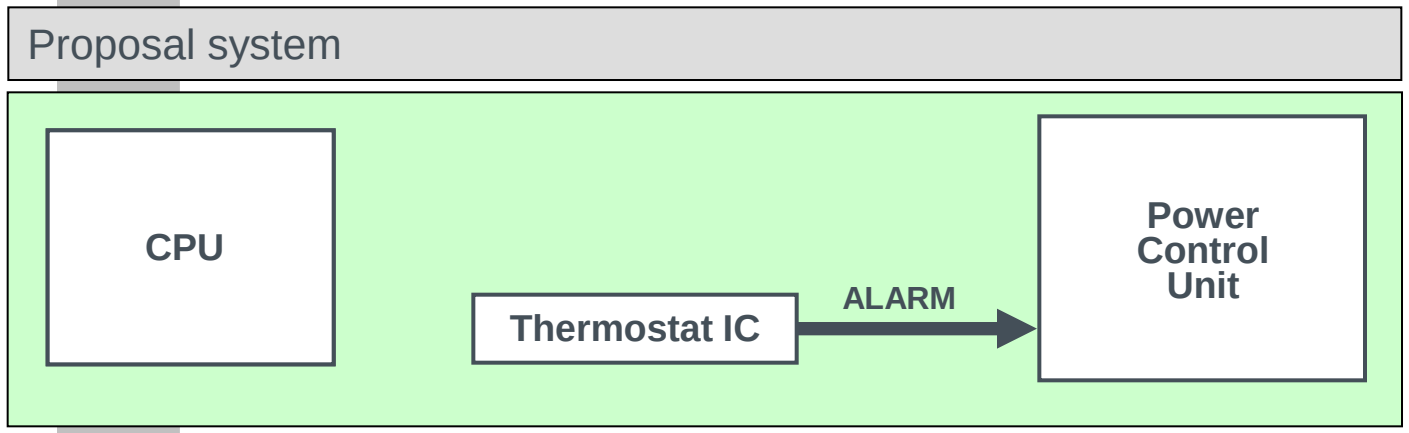
1.0uA standby current via power down function



Low current(IDD) vs. Power supply voltage characteristic

Application Example: Proposal more safety Thermal Protection





In case of thermal problem MCU has to act

More reliable protection by using Thermostat IC

Ambient Light & Proximity Sensors

Touch Interfaces

Capacitive Resistive

Hall Sensors

Temperature Sensors

Kionix Accelerometers

Lapis UV Sensor

Kionix – Company Overview

Location

Kionix Headquarters in Ithaca, NY

■ Major Markets of Kionix Acceleration Sensors

- Mobile terminals, Gaming controllers, HDD protection devices, PNDs (Personal Navigation Devices), and PC terminals with intuitive user interfaces
- Medical and healthcare products, Sports/fitness equipment
- Automotive applications

■ Company Overview

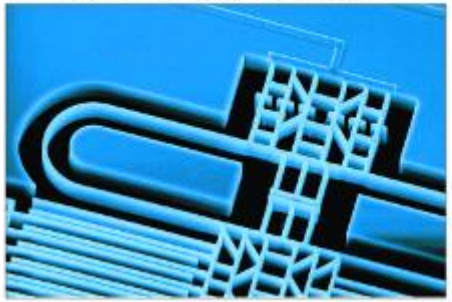
- Established: 1933
- Number of Employees: Approx. 170
- Main Products: Acceleration and Gyro sensors
- Headquarters: 36 Thornwood Drive, Ithaca, NY 14850, USA
- URL/http://www.kionix.com/

Kionix – Product Overview

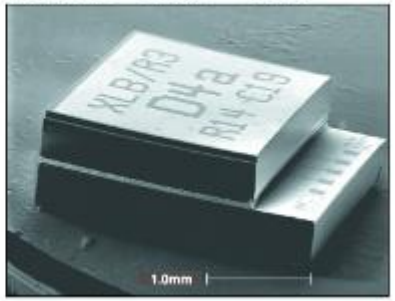
Kionix's Sensor Series is produced from monocrystalline silicon using a proprietary DRIE (Deep Reactive Ion Etching) process.

The sensors are composed of sensor elements enclosed at the wafer level that block out the effects of the external environment, along with two ASIC chips used for signal processing and other functions. These two blocks are integrated into a single package using conventional plastic packaging technology.

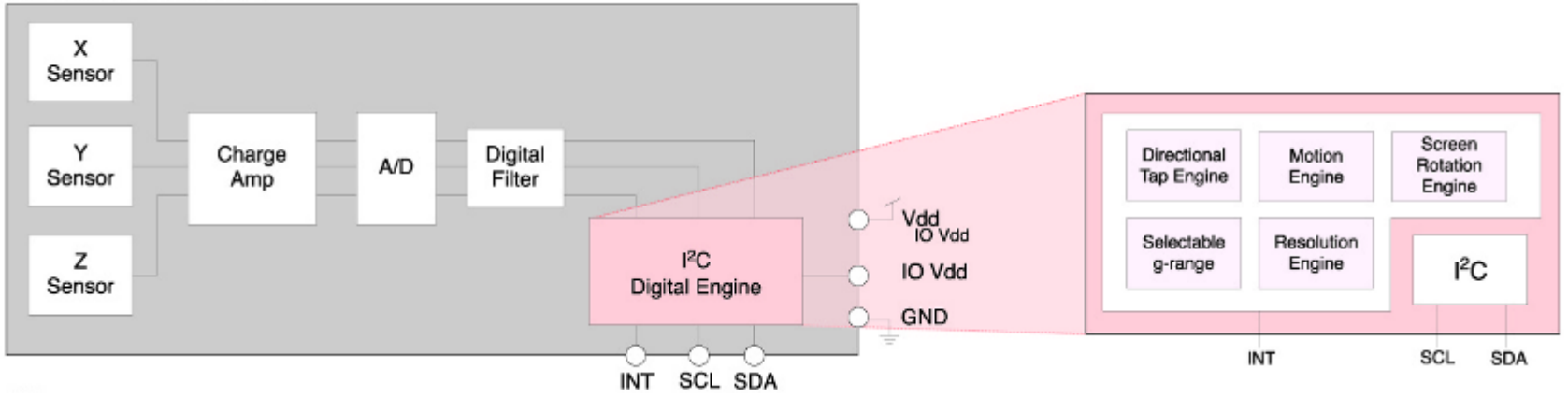
MEMS Sensor Block



MEMS Chip + Lid



Circuit Diagram



Kionix – Product Line-Up

Target Markets	Principal Applications	Product(s)	Principal Feature Highlights
Game Controllers	■ Motion tracking ■ Tilt sensing	■ KXSC4 ■ KXTC8 ■ KXTC9	■ 5x5x1.2mm, 4x4x1.3mm, and 3x3x0.9mm ■ High shock survivability ■ Low power consumption
Computer	■ HDD Drop detection ■ Motion detection	■ KXSS5 ■ KXSB5 ■ KXTH5 ■ KXTH9	■ 3x5x0.9mm and 3x3x0.9mm packages ■ Built-in algorithms specific to HDD protection ■ Standard high speed digital interface ■ Analog and MUX analog outputs
Mobile Handsets	■ Screen rotation ■ Tilt sensing ■ User Interface ■ Power management	■ KXUD9 ■ KXTE9 ■ KXTI9/KXTIK ■ KXTJ9/KXCJ9 ■ KXTJ2 ■ KX022/23	■ 3x3x0.9mm and 2x2x0.9mm ■ Low power consumption ■ Built-in screen orientation and power management algorithms (KXTE9 ,KXTF9,KXTI9) ■ Low current and low power wakeup (KXTJ9,KXTJ2,KX022/23)
Personal Navigation Devices	■ Inertial navigation (dead reckoning) ■ E-compass	■ KXR94 ■ KXRB5 ■ KXTI9/KXTIK	■ 5x5x1.2mm, 3x5x0.9mm and 3x3x0.9mm packages ■ High precision, Stable offset over temperature ■ Low noise density
Automotive	■ Stability control ■ Electronic suspension ■ Anti-theft	■ KXR94 ■ KXD94 ■ KX022/23	■ 5x5x1.2mm package ■ High precision, Stable offset over temperature ■ Low noise density

Ambient Light & Proximity Sensors

Touch Interfaces

Capacitive Resistive

Hall Sensors

Temperature Sensors

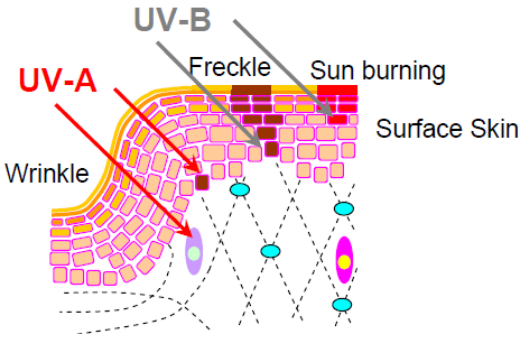
Kionix Accelerometers

Lapis UV Sensor

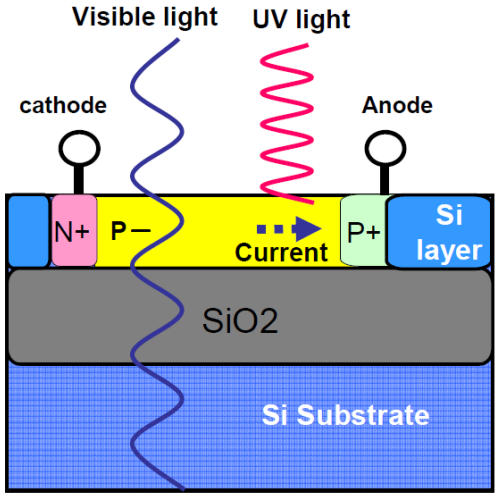
Lapis Semiconductor's UV Sensor : Technology

95%

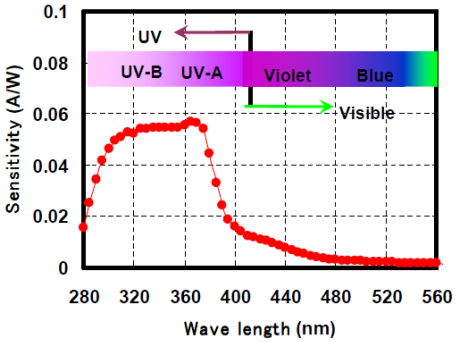
Category	Wave length	Characteristics
UV-A	400-315nm	-Skin aging (wrinkle, freckle) - Suntan
UV-B	315-280nm	- Sun burning - DNA damage
UV-C	280-200nm	- Cutting DNA chain - Skin cancers - Immunity damage



- Lapis Semiconductor UV sensor is using SOI technology
- UV energy is selectively detected by the depleted thin Si layer



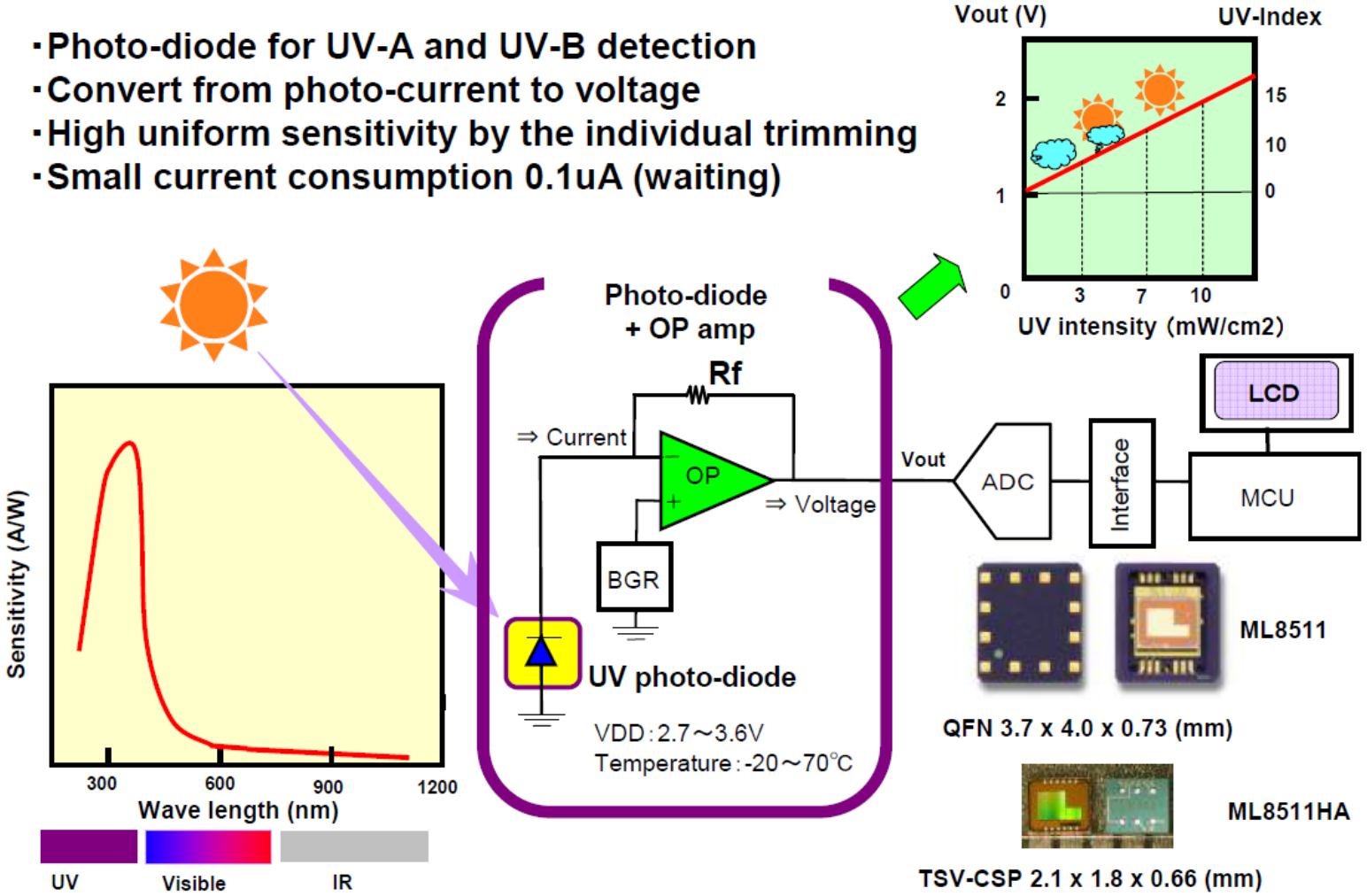
*SOI: Silicon on Insulator Substrate



UV Diode Sensitivity Characteristics

Lapis Semiconductor's UV Sensor : ML8511,ML8511HA

- Photo-diode for UV-A and UV-B detection
- Convert from photo-current to voltage
- High uniform sensitivity by the individual trimming
- Small current consumption 0.1uA (waiting)



Thank you!