



*Innovations Embedded*

**IC** Sensors

## Ambient Light Sensor ICs

*for automatic light control processing*

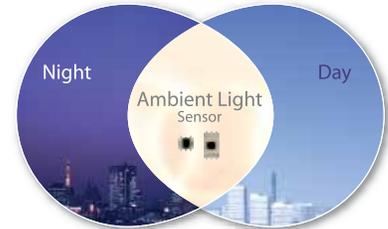


- LCD TV / Displays
- LCD-equipped Portable Devices

ROHM ambient light sensor (ALS) ICs are designed to control the brightness of LED-backlighted LCD displays based on ambient light availability and brightness for optimum display visibility and energy efficiency.

The compact ROHM ALS ICs are the ideal choice for LCD-equipped portable devices as well as LCD monitors and high-definition (HDTV) backlighting control.

- Mobile Phones
- Digital Cameras
- Video Players
- PDAs
- Notebook PCs
- Car Navigation systems
- LCD TVs
- LCD Monitors /Displays



ROHM's advanced ambient light sensor ICs are offered in ultra-small WSO5 and WSO6 packages

## Improved Visibility with Lower Power Consumption

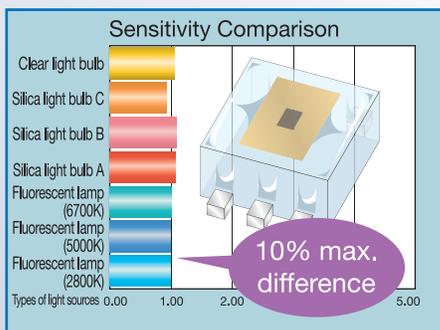
Adjusting the backlight intensity to compensate for variations in ambient light level can save 50% or more of the total power required to operate some portable electronic devices. This translates into dramatic improvement in operating time

between charges ("talk time") and/or the ability to extend the device's feature set.

To provide superior performance, backlight brightness control must be done in a uniform way over a wide range of ambient light conditions and

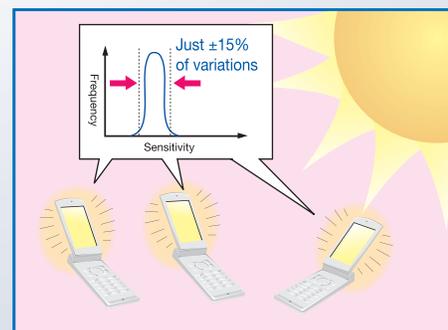
light sources. ROHM ALS ICs feature industry-leading performance that combines stable operation regardless of the light source (from incandescent to sunlight) with superior light sensing accuracy.

### ■ Stable operation regardless of light source



ROHM ambient light sensor ICs deliver stable output under a variety of light sources (e.g. incandescent, fluorescent, sunlight).

### ■ Superior light sensing accuracy



Unique laser trimming technology ensures high sensitivity accuracy — ±15% — more than twice as precise as conventional ICs, which can range from ±30% to ±55%.

ROHM ambient light sensor ICs are available in both analog and digital configurations. The key features of each type are highlighted in the next two pages of this selection guide.

ROHM analog ALS ICs have an output current proportional to light (current sourcing) with a measurement range of 0 to 100,000+ lux. As shown below,

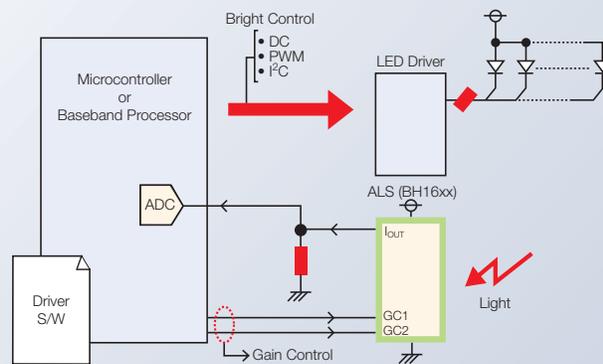
in a typical application, an external resistor converts the output current to a voltage for input to an MCU which in turn controls the LED driver. Direct connection to an LED driver is also possible (see page 6 for details).

ROHM Digital ALS ICs output a 16-bit digital signal over a direct I<sup>2</sup>C bus interface to the MCU.

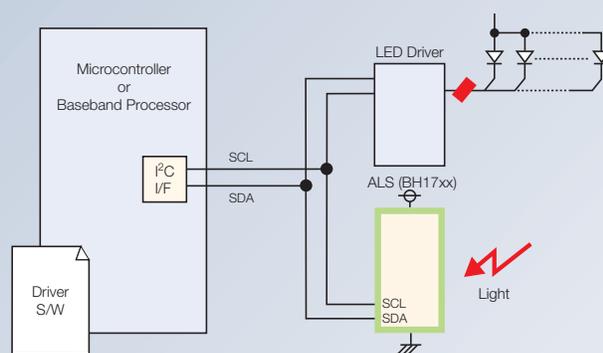
ROHM Semiconductor ambient light sensors all operate over a temperature range of -40 to 85°C to ensure stable operation under extreme conditions.

Analog and digital ALS ICs are each offered in compact, surface-mount packages. Package choices include the ultra-small WSOF5 (1.6x1.6x0.55 mm) or WSOF6 (3.0x1.6x0.7 mm).

## Analog Output Ambient Light Sensor ICs



## Digital Output Ambient Light Sensor ICs



## Analog Output Type

The BH16xx Series of analog ambient light sensors 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 depths 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.

### Uniform Sensitivity

**Sensitivity Comparison**

- Clear light bulb
- Silica light bulb C
- Silica light bulb B
- Silica light bulb A
- Fluorescent lamp (6700K)
- Fluorescent lamp (5200K)
- Fluorescent lamp (2800K)

Types of light sources: 0.00, 1.00, 2.00, 5.00

10% max. difference

### Built-in Shutdown Function

GC2	GC1	Mode	Function
0	0	Shutdown	IOUT OUTPUT Disabled
0	1	H-Gain Mode	60 $\mu$ A @ 100 lx
1	0	M-Gain Mode	10 $\mu$ A @ 100 lx
1	1	L-Gain Mode	1 $\mu$ A @ 100 lx

1: Connect to VCC 0: Connect to GND

### Three-Step Output Gain

IOUT ( $\mu$ A)

Illuminance (lx)

H-GAIN MODE  
M-GAIN MODE  
L-GAIN MODE

### Wide Output Range

Illuminance vs Output voltage ( $V_{CC}=3V, R_L=30k\Omega$ )

VOUT (V)

Illuminance (lx)

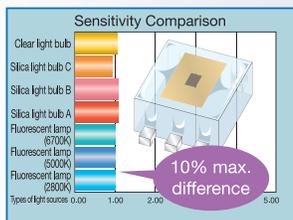
H-Gain mode  
M-Gain mode  
L-Gain mode

## Digital (16-bit Serial) Output Type

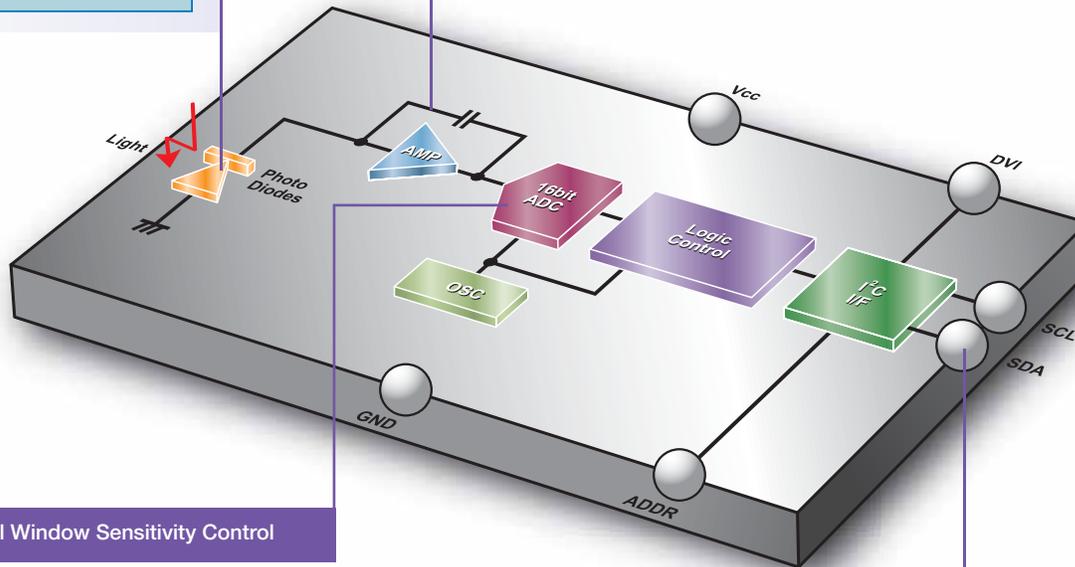
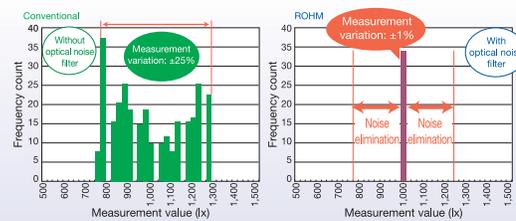
The BH17xx series of digital ambient light sensors ICs employ the same proprietary trimming and multiple photodiodes to assure uniform light sensitivity. The device's 16-bit analog-to-digital converter produces 1 lux resolution over a range of 0 to 65,000 lx. The I<sup>2</sup>C output is designed for direct connection to the system's microcontroller or baseband processor.

Two measurement resolution levels are provided, allowing design trade-offs 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 the light level changes are dynamic.

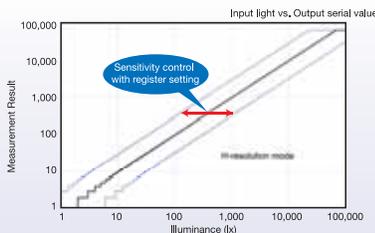
### Uniform Sensitivity



### 50Hz/60Hz Optical Noise Elimination



### Optical Window Sensitivity Control



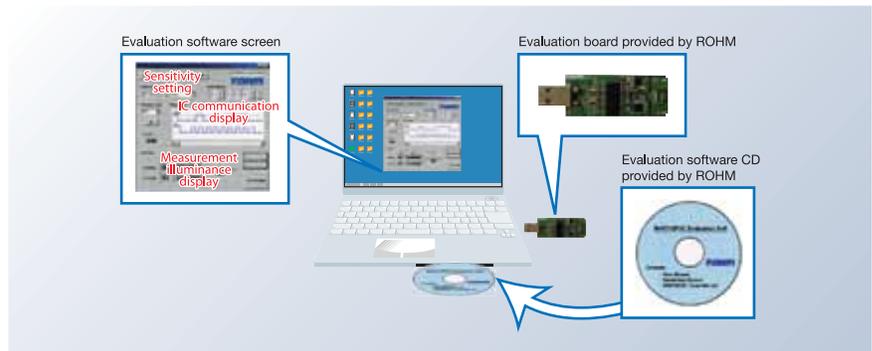
### Wide I<sup>2</sup>C Input Voltage

ROHM's I<sup>2</sup>C bus is compatible with operating voltages between 1.65V and V<sub>CC</sub> (3.6V, max) enabling operation in systems with multiple power supplies.

## Ambient Light Sensor Evaluation Kits

Evaluation kits for ROHM analog and digital ALS ICs are coming soon. Each kit consists of a USB-connected PC board and a CD-ROM with software provided to simulate and measure ambient light response.

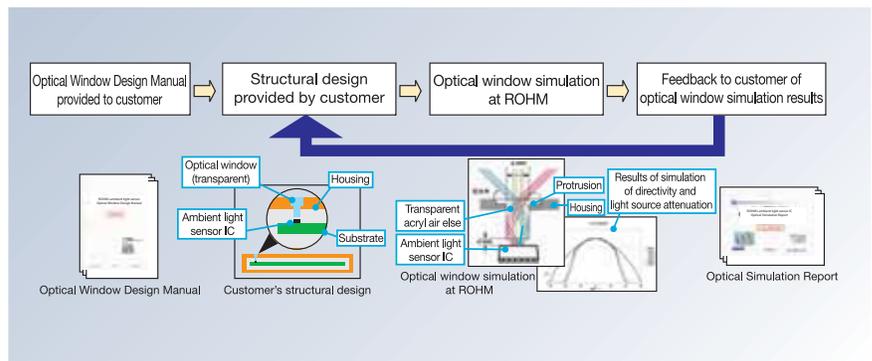
For more information, go to:  
[www.rohmsemiconductor.com/als.html](http://www.rohmsemiconductor.com/als.html)



## Optical Window Design Support

Applying an ALS requires both optical and semiconductor expertise to assure mounting of the IC with a suitable optical window for light reception. ROHM's "Optical Window Design Manual" provides design guidance to facilitate the design process.

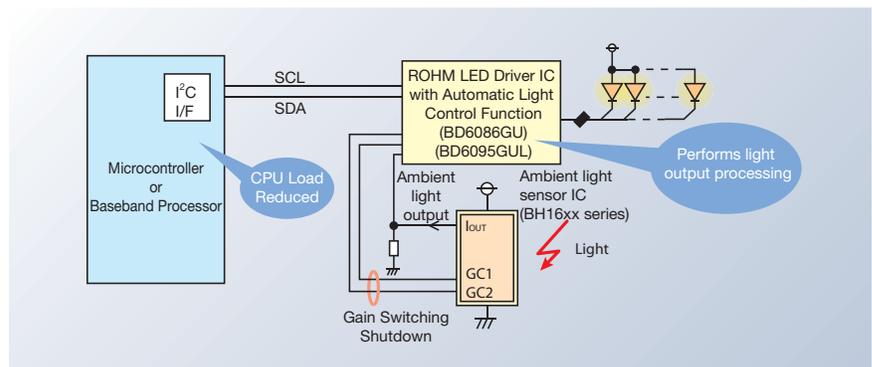
For more information, go to:  
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## Simplified Ambient light Control

The ROHM BD16xx Series ALS ICs are designed to interface directly to ROHM LED drivers (BD60xxGU) to automatically control white LED backlights in portable devices without any requirement for light control software. An MCU is not necessary but may still be used to provide control input to the ALS gain and shutdown functions, as shown.

For more information, go to:  
[www.rohmsemiconductor.com/als.html](http://www.rohmsemiconductor.com/als.html)



### Analog Current Output Type Ambient Light Sensor ICs

Part Number	Output Type	Power Supply Voltage (V)	Sensitivity Variation (%)	Number of Output Sensitivity Switching Levels	Illuminance Measurement Range (lx)	Operating Temperature Range (°C)	Package
BH1603FVC	Current (Source)	2.4 to 5.5	±15	3 steps	0 to 100,000	-40 to +85	WSOF6
BH1620FVC	Current (Source)	2.4 to 5.5	±15	3 steps	0 to 100,000	-40 to +85	WSOF5

BH1603FVC										
BH1620FVC										

### Digital 16-bit Serial Output Type Ambient Light Sensor ICs

Part Number	Output Type	Power Supply Voltage (V)	Sensitivity Variation (%)	I/O Voltage	Illuminance Measurement Range (lx)	Operating Temperature Range (°C)	Package
BH1715FVC	I <sup>2</sup> C I/F	2.6 to 3.6	±15	1.65 to Vcc	0 to 65,000	-40 to +85	WSOF6
BH1721FVC	I <sup>2</sup> C I/F	2.4 to 3.6	±15	1.65 to Vcc	0 to 65,000	-40 to +85	WSOF5
BH1750FVI	I <sup>2</sup> C I/F	2.4 to 3.6	±20	1.65 to Vcc	0 to 65,000	-40 to +85	WSOF6I

BH1715FVC											
BH1721FVC											
BH1750FVI											

## Key

	Analog output		High-accuracy detection		Built-in 16-bit AD converter	
	Serial output			Supply voltage 2.4V~3.6V/5.5V		Spectral sensitivity close to the human eye
	Output current source type		Compatible with 1.8V systems			Wide operating temperature range: -40C to +85C
	Transparent package type		Supports I <sup>2</sup> C bus I/F			
	Compact surface-mount package					
	Gain switching					



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