# Ambient Light Sensor for OLED

## Application Note AN013

### Introduction

This application note demonstrates the use of ambient light sensor with OLED under a wide range of illumination conditions from a dark environment to direct sunlight.

### Potential Benefits of using ambient light sensor for OLED

- Provide sunlight readability for some versions of OLED (e.g. Osram Spring Green)
- Dim to match lowlight ambient condition for comfortable viewing and longer display lifetime
- Extend battery life

The ambient light sensor detects the amount of light and sends a signal to adjust display brightness to match ambient conditions. When there is sufficient ambient light, the OLED display is at low or medium brightness. When it is brought outside and exposed to direct sunlight, the display is programmed to full brightness for sunlight readability.

In a dark room, the display can be dimmed significantly for comfortable viewing, with the additional benefit of longer display lifetime, at lower power consumption

### Ambient Light Sensor

SFH5711 is a new OSRAM Ambient Light Sensor product.

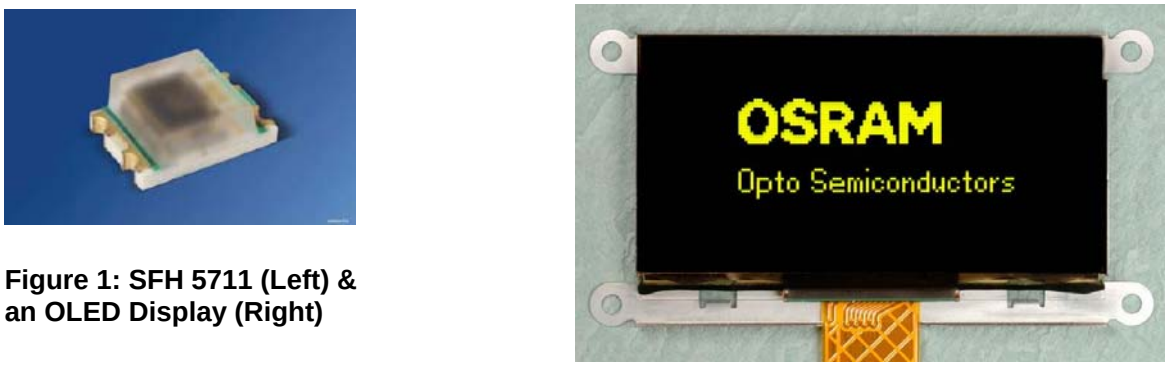



**Figure 1: SFH 5711 (Left) & an OLED Display (Right)**

The SFH5711 is a photodiode which is used for light detection and an IC with the following functions: amplification of the photodiode output signal, logarithmic converter and temperature correction. For more detailed information about ambient light sensor SFH 5711, please refer to the data sheet and application note for SFH 5711 located in
http://catalog.osram-os.com/catalogue/catalogue.do?act=showBookmark&favOid=000000020001bae400170023

## The ambient light sensor SFH 5711 has the following features:

- perfect V-λ characteristics
- opto-hybrid with logarithmic current output
- low temperature coefficient
- high accuracy over wide illumination range
- 2.8 x 2.2 x 1.1 mm SMT package

## SFH 5711 and OLED display interface

The SFH 5711 yields an analog current output $I_{out}$. This signal can either be directly transferred into a microcontroller or transformed into a voltage (see **Figure 2**). To capture two levels of illuminations requires a simple circuit. By adding a voltage comparator, we can simplify both software and hardware integration (see **Figure 3**).

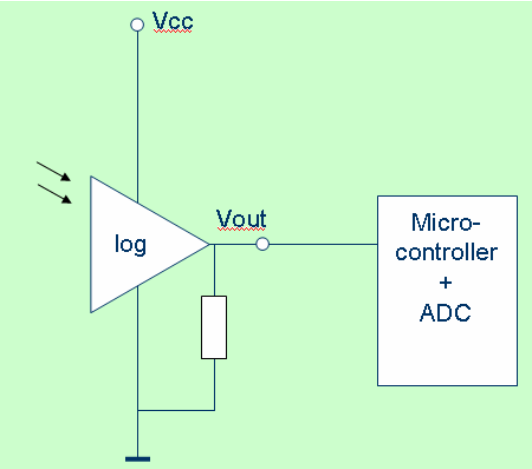



**Figure 2:**

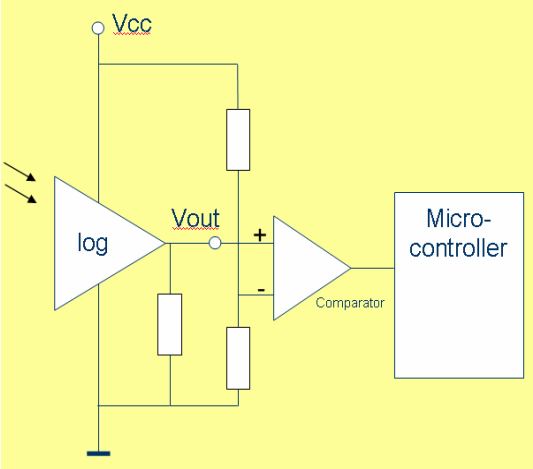
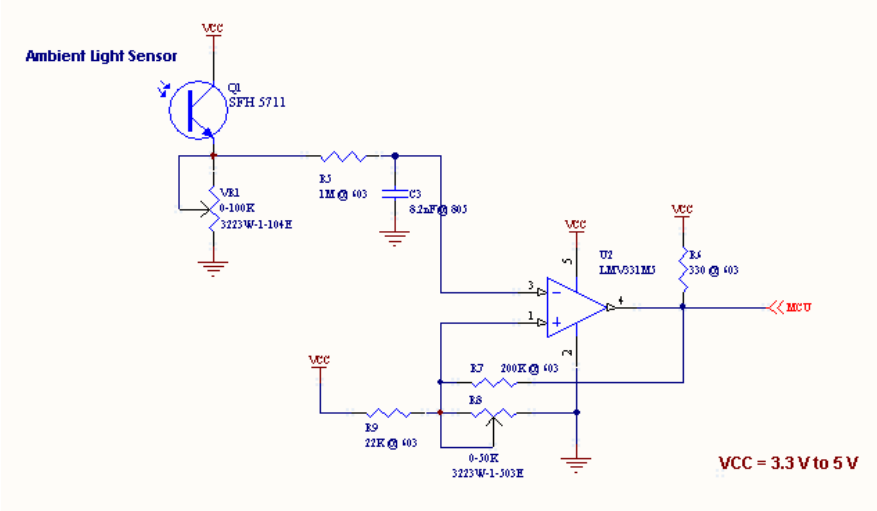



**Figure 3:**

## Schematic



The circuit demonstrates the use of ambient light sensor as a dimmer switch. The circuit sends a digital signal to a microcontroller depending on the amount of light the sensor detects (see **Table 4**).

| Illumination (lux) | Digital Output |
|---|---|
| < 300 (Normal to Dark) | 1 |
| 300–100,000 (Bright to Sunlight) | 0 |

**Table 4 Illumination Mapping Example**

**Note:** In order to trip at the above ambient light condition, adjustable resistor VR1 and R8 should be set to 39K and 18K ohm.

Operation of the circuit is simple. The voltage comparator (U1) compares voltages from the non-inverting and inverting inputs. If the comparator's inverting input voltage is equal or higher than the non-inverting input voltage, comparator trips and sends digital signal of 0 commanding the microcontroller to set the OLED to a higher luminance. On the other hand, the OLED is at low luminance if the comparator's inverting input voltage is less than non-inverting input voltage.

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