VISHAY INTERTECHNOLOGY, INC.



OPTOELECTRONICS Sensors

Ambient Light Sensors



Ambient light sensors are used to detect light or brightness in a manner similar to the human eye. They are most commonly found in industrial lighting, consumer electronics, and automotive systems, where they allow settings to be adjusted automatically in response to changing ambient light conditions. By turning on, turning off, or adjusting features, ambient light sensors can conserve battery power or provide extra safety while eliminating the need for manual adjustments.

RESOURCES

PRODUCT LITERATURE

- Complete listing of Ambient Light Sensors: http://www.vishay.com/photo-detectors/
 http://www.vishay.com/photo-detectors/
- Complete listing of photodiode products: <u>http://www.vishay.com/photo-detectors/</u> <u>photodie-out/</u>

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- Complete listing of phototransistor products: <u>http://www.vishay.com/photo-detectors/</u> phototrans-out/
- Optical Sensors portfolio: <u>http://www.vishay.com/optical-sensors/</u>
- Optoelectronics portfolio: <u>http://www.vishay.com/optoelectronics/</u>
- For technical questions, contact <u>detectortechsupport@vishay.com</u>
- Sales contacts: <u>http://www.vishay.com/doc?99914</u>





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Illuminance

Illuminance is the measure of the intensity of light incident on a surface and can be correlated to the brightness perceived by the human eye. In the visible range, it is measured in units called "lux". Light sources with the same lux measurement appear to be equally bright.

| Light Source | Illuminance (Lux) | | | |
|----------------|-------------------|--|--|--|
| Street Light | 20 | | | |
| Dusk | 1 to 100 | | | |
| Living Room | 50 to 200 | | | |
| Office | 200 to 600 | | | |
| Operating Room | 5 k to 10 k | | | |
| Cloudy | 2 k to 10 k | | | |
| Hazy | 25 k to 50 k | | | |
| Bright Sun | 50 k to 100 k | | | |

In the diagram below, the incandescent light and sunlight have been scaled to have the same lux measurement. In the infrared region, the intensity of the incandescent light is significantly higher. A standard silicon photodetector is much more sensitive to infrared light than visible light. Using it to measure ambient light will result in serious deviations between the lux measurements of different light sources and human-eye perception. Using Vishay's ambient light sensors will solve this problem because they are most sensitive to the visible part of the spectrum.

Spectral Sensitivity

The human eye can see light with wavelengths from 380 nm to 780 nm. Vishay's ambient light sensors closely match this range of sensitivity.

Linearity

The response of an ambient light sensor should be linear. Vishay's ambient light sensors are linear from 10 lux to 100 klx. Photodiode output typically requires amplification while phototransistor output may not.







Output Variability

Vishay offers phototransistor- and photodiode-based ambient light sensors. For a given irradiance, phototransistors may show lot-to-lot variability of the output current caused by variability of the photosensitivity and gain. In most applications, this is not a problem. The lot-to-lot variability of photodiodes is significantly lower because it is caused only by the variability of the photosensitivity. A digital photodiode-based ambient light sensor complements Vishys portfolio. It has an excellent V(λ) matched spectral responsitivity and provides a high-resolution 16-bit I²C output signal.

PRODUCT LITERATURE

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VMN-PL0366-1606



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| Part Number | Mounting | Size (mm) | Peak Wavelength (nm) | Bandwidth (nm) | Angle of Half Sensitivity (±*) | Light Current ¹ Standard A (µA) | Light Current ² Fluorescent (µA) | | | | | |
|------------------------|----------|------------------|----------------------------|-------------------|--------------------------------------|--|---|--|--|--|--|--|
| Photodiode Output | | | | | | | | | | | | |
| TEMD6010FX01 | SMD | 2.0 x 4.0 x 1.0 | 540 | 430 - 610 | 60 | 0.04 | 0.03 | | | | | |
| TEMD5510FX01 | SMD | 4.2 x 5.0 x 1.1 | 540 | 430 - 610 | 65 | 1.00 | 0.70 | | | | | |
| TEMD6200FX01 | SMD | 1.2 x 2.0 x 0.85 | 540 | 430 - 610 | 60 | 0.04 | 0.03 | | | | | |
| BPW21R | Leaded | TO5 - 8 mm | 565 | 420 - 675 | 50 | 0.9 | 0.75 | | | | | |
| Phototransistor Output | | | | | | | | | | | | |
| TEMT6200FX01 | SMD | 1.2 x 2.0 x 0.85 | 550 | 450 - 610 | 60 | 12 | 7 | | | | | |
| <u>TEMT6000X01</u> | SMD | 2.0 x 4.0 x 1.0 | 570 | 430 - 800 | 60 | 50 | 21 | | | | | |
| <u>TEPT5700</u> | Leaded | 5 mm, flat top | 570 | 430 - 800 | 50 | 75 | 31 | | | | | |
| <u>TEPT5600</u> | Leaded | 5 mm | 570 | 430 - 800 | 20 | 350 | 145 | | | | | |
| <u>TEPT4400</u> | Leaded | 3 mm | 570 | 430 - 800 | 30 | 200 | 83 | | | | | |

 $^{\rm 1}$ E_v = 100 lux, V_{CE} = 5 V, CIE Illuminant A, typical

 2 E_v = 100 lux, V_{CE} = 5 V, e.g., Sylvania color abbrev. D830, typical

| Part number | Mounting | Size (mm) | Ambient light range (lx) | Operating voltage range (V) | l²C bus voltage range (V) | Ambient light resolution (lx) | Output code |
|-------------------------|----------|------------------|-----------------------------|-----------------------------------|------------------------------|-------------------------------|--------------------------|
| I ² C Output | | | | | | | |
| <u>VEML6030</u> | SMD | 2.0 x 2.0 x 0.85 | 0 to 120000 | 2.5 to 3.6 | 1.7 to 3.6 | 0.0036 | 16-bit, I ² C |
| <u>VEML7700</u> | SMD | 6.8 x 2.35 x 3 | 0 to 120000 | 2.5 to 3.6 | 1.7 to 3.6 | 0.0036 | 16-bit, I ² C |

F

Part numbers with an F contain an infrared filtering epoxy to further improve the ambient light sensing performance

Part numbers with an X01 are gualified to the X01 AEC Q101 standard and support operating temperatures from - 40 °C to + 100 °C















VEML7700

VEML6030 TEMD5510FX01

TEMT6200FX01 TEMD6200FX01

TEMD6010FX01 TEMT6000X01

TEPT5600 TEPT4400 TEPT5700 BPW21R



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