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

- Complete listing of Ambient Light Sensors: http://www.vishay.com/photo-detectors/ambient-light-sensor/
- Complete listing of photodiode products: http://www.vishay.com/photo-detectors/photodie-out/
- Complete listing of phototransistor products: http://www.vishay.com/photo-detectors/phototrans-out/
- Optical Sensors portfolio: http://www.vishay.com/optical-sensors/
- Optoelectronics portfolio: http://www.vishay.com/optoelectronics/
- For technical questions, contact detectortechsupport@vishay.com
- Sales contacts: http://www.vishay.com/doc?99914

Illuminance

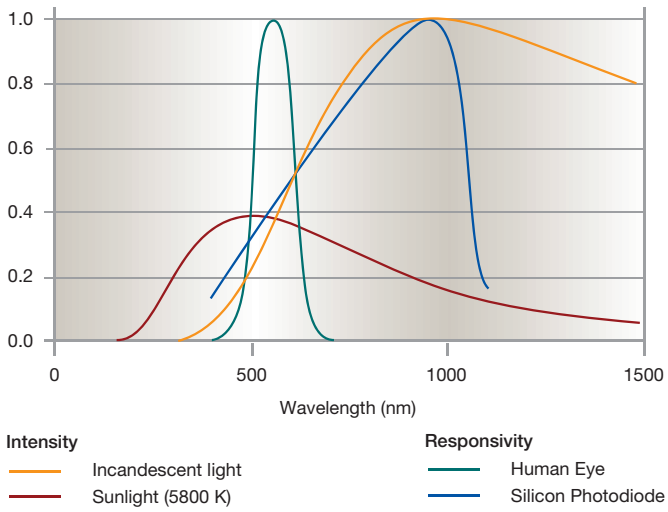
Illuminance is the measure of the intensity of light incident on a surface and can be correlated to the brightness perceived by the human eye. In the visible range, it is measured in units called “lux”. Light sources with the same lux measurement appear to be equally bright.

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.

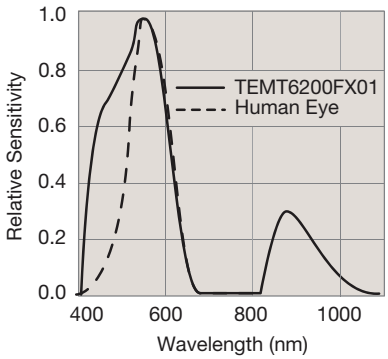
Spectral Sensitivity

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.



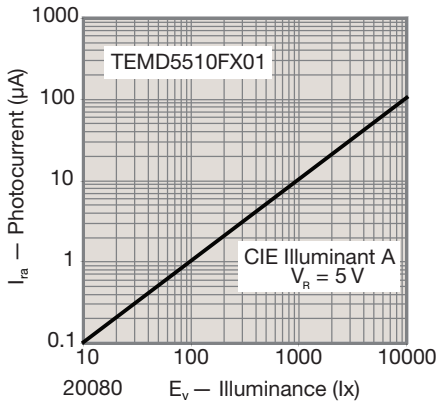
Linearity

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.



Reverse Light Current vs. Irradiance

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
TEMT6000X01	SMD	2.0 x 4.0 x 1.0	570	430 - 800	60	50	21
TEPT5700	Leaded	5 mm, flat top	570	430 - 800	50	75	31
TEPT5600	Leaded	5 mm	570	430 - 800	20	350	145
TEPT4400	Leaded	3 mm	570	430 - 800	30	200	83

[1] E_v = 100 lux, V_{CE} = 5 V, CIE Illuminant A, typical

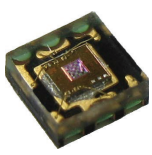
[2] E_v = 100 lux, V_{CE} = 5 V, e.g., Sylvania color abbrev. D830, typical

Part number	Mounting	Size (mm)	Ambient light range (lx)	Operating voltage range (V)	I²C bus voltage range (V)	Ambient light resolution (lx)	Output code
I²C Output							
VEML6030X01[3]	SMD	2.0 x 2.0 x 0.85	0 to 7200	2.3 to 3.6	1.7 to 5.0	0.002	16-bit, I²C

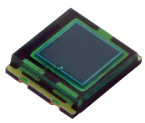
[3] Pending release

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

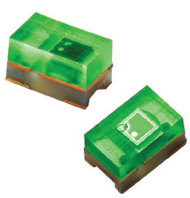
X01 Part numbers with an X01 are qualified to the AEC Q101 standard and support operating temperatures from - 40 °C to + 100 °C



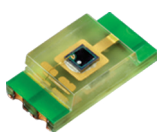
VEML6030X01



TEMD5510FX01



TEMT6200FX01
TEMD6200FX01

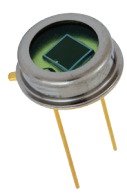


TEMD6010FX01
TEMT6000X01

TEPT5600

TEPT4400

TEPT5700



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