

Version:
December 1, 2022



Guide to Ambient Light Sensors

[Web: www.token.com.tw](http://www.token.com.tw)

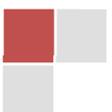
[Email: rfq@token.com.tw](mailto:rfq@token.com.tw)

Token Electronics Industry Co., Ltd.

Taiwan: No.137, Sec. 1, Zhongxing Rd., Wugu District,
New Taipei City, Taiwan. 248012

Tel: +886 2981 0109 **Fax:** +886 2988 7487

China: 17P, Nanyuan Maple Leaf Bldg., Nanshan Ave.,
Nanshan Dist., Shenzhen, Guangdong, China. 518054
Tel: +86 755 26055363



▶ Guide to Ambient Light Sensors

What is Phototransistors?

The environmentally friendly phototransistor is a combination of photodiode and amplifier integrated in a single chip. This integrated combination is used to overcome the main uniform gain limits of the photodiode. Many modern applications require the output signal from the photodetector to produce even larger than the single photodiode. Although the signal from the photodiode can always be amplified by using an external op amp or other circuit, this method is generally less practical or cost effective than using a phototransistor.

The phototransistor can be viewed as a photodiode whose output photocurrent signal is fed to the base of the transistor. When the device is not required to operate as a photodetector, the base is usually connected to allow the designer to use the base current to bias the transistor. The typical gain of the phototransistor can range from 100 to 1500. The current-voltage characteristics of the phototransistor are similar to those of the NPN signal transistor. The only difference is that the incident light provides the base drive current.

The structure of environmentally friendly phototransistor is very similar to the structure of photodiode. In fact, when optimized for this mode of operation, the collector-base junction phototransistor can be used as having a fairly good photodiode, with the main structural difference being that the phototransistor is two more junctions than the photodiode.

Phototransors are suitable for detecting light or brightness in a manner similar to that of the human eye. They are most commonly found in industrial lighting, consumer electronics and automotive systems, which can be automatically adjusted according to ambient light conditions. By turning on, off or adjusting the function, ambient light sensors can save battery power and provide additional security without the need for manual adjustment. Token Electronics offers a wide range of ambient light sensors, with pin-type and surface-mount patches, photodiode or phototransistor outputs.

Ambient Light Sensor Product Category

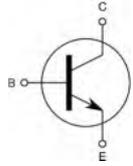
Ambient Light Sensors	Light Dependent Resistor (LDR) Photoresistor (CdS)		Advantages: similar to the human eye. Disadvantages: Cadmium, ROHS prohibited substances.
	Photodiode		Advantages: The uniformity of the photodiode between the units is relatively high. Disadvantages: low current output, the need for external amplification circuit.
	Phototransistor Photosensitive Sensor Photosensitive Triode		Advantages: with amplifier circuit, photoelectric transistor output current. Disadvantages: poor temperature characteristics.
	Photo IC		Advantages: amplification, logic control, switches and other integrated features Disadvantages: high dependence on professional products.

Why Use Environmentally Friendly Phototransistor?

Environmental protection phototransistor is known as phototransistor, photosensitive sensor, environmentally friendly photosensitive triode, ambient light sensor. The environmentally friendly phototransistor is a solid state photodetector with internal gain. This makes them more sensitive to photodiode on the same area basis and can be used to provide analog or digital output signals. Phototransistor series of detectors provide the following characteristics:

- Cost-effective photoelectric detector, detection range from visible to near infrared.
- 100 to 1500 gain.
- Moderate response time.
- Can be used for a variety of packaging, including epoxy coating, transfer molding, casting, sealed packaging and chip form.
- Replace the traditional CDS photoresistor, non-cadmium, lead and other harmful substances, in line with the EU ROHS standards.
- Can be used for almost any visible or near infrared light source, such as IRED, neon, fluorescent, incandescent bulbs, lasers, fire, sun and so on.

Source Lighting Guide

Light Source	Illumination (Lux)	ALS Circuit Symbol
Moonlight	0.1	
60W Light Bulb @1m	50	
1W MES Light Bulb @0.1m	100	
Fluorescent Light	500	
Bright Sunshine	30,000	

Filtering

Most photodiodes and phototransistors have an epoxy filter function that increases the relative spectral sensitivity and makes it closer to the human eye's sensitivity. This is sometimes called the $v(\lambda)$ curve. The part number contains the letter part of the FC with this epoxy resin. Figure 1 shows an ambient light sensor without epoxy filtering, and Figure 2 shows a sensor with epoxy filter. For this epoxy filter, the bandwidth ($\lambda_{0.5}$) is reduced from 430 nm to 800 nm to 430 nm to 600 nm.

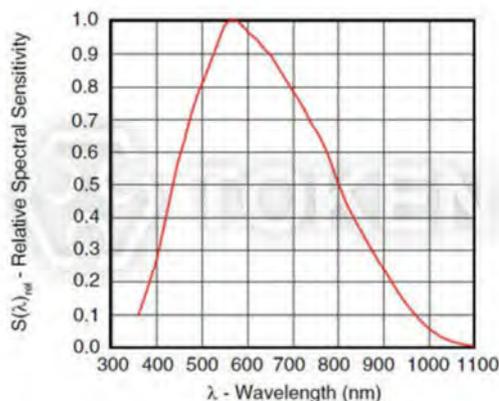


Figure 1 - No Epoxy Filter

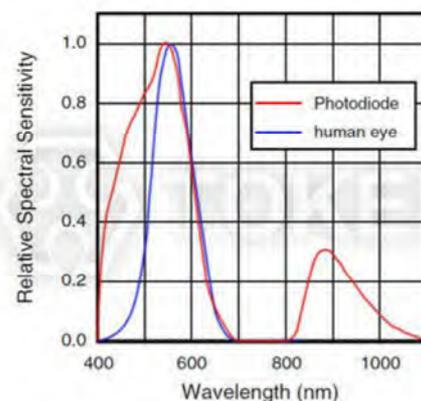


Figure 2 - Epoxy Filter