

ICS 31.260



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

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**Semiconductor devices - Part 5-7: Optoelectronic devices -
Photodiodes and phototransistors**

半导体器件 第 5-7 部分：光电子器件光电二极管和光电晶体管

(English Translation)

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1 Scope

This document specifies the terms, essential ratings and characteristics, and measuring methods for photodiodes (hereinafter referred to as the "PDs") and phototransistors (hereinafter referred to as the "PTs").

This document is applicable to photodiodes and phototransistors.

2 Normative References

This document has no normative references.

3 Terms and Definitions

The following terms and definitions are applicable to this document.

3.1.1 Electromagnetic radiation

Radiation a) Energy is emitted or transmitted in the form of electromagnetic waves associated with photons.

b) Electromagnetic waves or photons.

[Source: GB/T 2900.65-2004, 845-01-01, with modifications]

3.1.2 Optical radiation

Electromagnetic radiation of wavelengths between the transition region to X-rays ($\lambda \sim 1 \text{ nm}$) and the transition region to radio waves ($\lambda \sim 1 \text{ mm}$).

[Source: GB/T 2900.65-2004, 845-01-02]

3.1.3 Visible radiation

Any optical radiation capable of directly causing vision.

NOTE: The spectral range of visible radiation has no clear boundaries because it depends on the radiant power reaching the retina and the responsivity of the observer. The lower limit is generally between 360 nm and 400 nm, while the upper limit is between 760 nm and 830 nm.

[Source: GB/T 2900.65-2004, 845-01-03]

3.1.4 Infrared radiation

Optical radiation with a wavelength greater than that of visible radiation.

[Source: GB/T 2900.65-2004, 845-01-04, with modifications]

3.1.5 Ultraviolet radiation

Optical radiation with a wavelength smaller than that of visible radiation.

[Source: GB/T 2900.65-2004, 845-01-05, with modifications]

3.1.6 Light

- a) Perceived light;
- b) Visible radiation.

NOTE: The word "light" is sometimes used in the sense of 2) for optical radiation that extends beyond the visible region, but this usage is not recommended.

[Source: GB/T 2900.65-2004, 845-01-06, with modifications]

3.1.7 Photoelectric effect

Due to the correlation between light and matter, photons are absorbed and mobile charge carriers are subsequently generated. This produces changes in potential or current or resistance, but does not include certain electrical phenomena caused by changes in temperature.

3.2.1 Semiconductor photosensitive device

A semiconductor device that uses the photoelectric effect to detect optical radiation.

3.2.2 Semiconductor optoelectronic device

- a) A semiconductor device that emits, detects, or responds to coherent or incoherent optical radiation;
- b) A semiconductor device whose internal working mechanism is related to optical radiation.

3.2.3 Photodiode

The angle between the direction of maximum sensitivity (optical axis) and the mechanical axis z in the sensitivity diagram.

NOTE: See Figure 6 b).

3.4.2.13 Peak-sensitivity wavelength, <photosensitive devices>

λ_{bdap}

The wavelength corresponding to the maximum spectral sensitivity.

NOTE: See Figure 6.

4 Essential Ratings and Characteristics of Photodiodes

The following ratings and characteristics apply to photodiodes (including fibre optic systems and subsystems):

a) Type

Environmentally rated or package-rated diodes for small-signal or switching applications.

b) Semiconductor materials

Silicon, gallium arsenide, indium phosphide, etc.

5 Essential Ratings and Characteristics of Phototransistors

The following ratings and characteristics apply to phototransistors (including fibre optic systems and subsystems):

a) Type

Environmentally rated or package-rated diodes for small-signal or switching applications.

b) Semiconductor materials

Silicon, etc.

c) Polarity

NPN/PNP.

d) Outline and packaging details

- 1) Outline drawing number from the referenced IEC and/or national standards;
- 2) Package type: Glass/metal/plastic/others;
- 3) Terminal identification and markings for any connections between the terminal and the package.

d) Description and requirements for the test device

The device under test is fixed to a test socket mounted on a calibrated optical base (State 1, State 2, State 3, or State 4) or on a calibrated device (State 3).

The light source shall be any of the following:

- 1) A standard light source (non-monochromatic) consisting of calibrated standard lamps, along with a matching regulated power supply and ammeter;

OR

- 2) A monochromatic light source, including one of the following two:

--- To the device described in 1) above, add an interference filter or any other system (monochromator, etc.) with a specified or known peak transmission wavelength and spectral radiation bandwidth;

--- Any other calibrated device with a known peak emission wavelength and spectral radiation bandwidth (e.g., a light emitting diode or an infrared emitting diode).

Regarding optical fibre devices with pigtails: The light source described in 2) shall be used.

e) Precautions

--- Overheating of the device under test due to optical radiation shall be avoided; when the radiation exceeds 200 W/m

2, it is recommended to install a heat shield as a shutter to limit the exposure duration;

--- The cleanliness of the optical surfaces shall be ensured;

--- The light source shall be stabilized between measurements;

--- When a standard light source is used as a light source, the diaphragm to suppress parasitic radiation shall be placed in front of the device under test.

For devices with pigtails, the device's optical port shall be illuminated.

f) Test procedure

Under specified temperature conditions, place the tube socket at a certain distance from