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

GB/T 15651.4-2026

Replacing GB/T 15651.4-2017

**Semiconductor devices - Part 5-4: Optoelectronic devices -
Semiconductor lasers**

半导体器件 第5-4部分：光电子器件 半导体激光器

(English Translation)

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents".

Drafting.

This document is Part 5-4 of GB/T 15651. GB/T 15651 has already published the following parts.

---Semiconductor Devices. Discrete Devices and Integrated Circuits - Part 5: Optoelectronic Devices (GB/T 15651-1995);

---Semiconductor Discrete Devices and Integrated Circuits Part 5-2. Basic Ratings and Characteristics of Optoelectronic Devices (GB/T 15651.2-2003);

---Semiconductor discrete devices and integrated circuits Part 5-3. Test methods for optoelectronic devices (GB/T 15651.3-2003);

---Semiconductor Devices Part 5-5. Optoelectronic Devices - Optocouplers (GB/T 15651.5-2024);

---Semiconductor Devices Part 5-6. Optoelectronic Devices - Light Emitting Diodes (GB/T 15651.6-2023);

---Semiconductor Devices Part 5-7. Optoelectronic Devices - Photodiodes and Phototransistors (GB/T 15651.7-2024);

---Semiconductor Devices Part 5-13. Hydrogen sulfide corrosion test for LED packages used in optoelectronic devices (GB/T 15651.13-(2026).

This document replaces GB/T 15651.4-2017 "Semiconductor Devices - Discrete Devices - Part 5-4. Optoelectronic Devices - Semiconductor Lasers".

Compared with GB/T 15651.4-2017, the main technical changes in "Optical Devices" are as follows, except for structural adjustments and editorial modifications.

a) Added physical concept-related terms (see 3.1), "relative intensity noise" (see 3.4.3.1), and "small signal cutoff frequency" (see 3.4.3.1).

The specific definitions in 3.4.4) have been expanded to include the terms "beam axis" (see 3.3.1) and "spatial distribution and spectral characteristics" (see 3.5).

The definition section adds terms and definitions related to "output and current characteristics" (see 3.4.2);

b) The terminology and definitions in "Device Type" have been changed (see 3.2, 2017 version 3.2), and "Switching Time" and "Rise Time" have been changed.

The definition of "descent time" (see 3.4.1, 2017 edition);

c) The materials list includes "gallium nitride" and "indium gallium nitride" (see 4.2.1);

d) Additional information has been added to the limit values (see 4.4);

e) The supplementary information includes "temperature characteristics of the emission wavelength" (see 4.6);

f) The specified conditions for the carrier-to-noise ratio test method have been changed; "modulation depth" has been replaced with "modulation mode" (see 5.2.2, 2017 version 5.2.2);

g) The precautions for the test methods of turn-on delay time and turn-off delay time have been changed, adding "It should be at least the laser fall time t_f ".

Three times the reciprocal value (see 5.3.1.2, 2017 version 5.3.1.2);

h) The small-signal cutoff frequency test method has been modified (see 5.3.2, 2017 version 5.3.2);

i) A detailed description of the life test method has been added (see 5.4);

j) The precautions for the half-intensity width test method have been modified, adding that "the lens system L, device D, and scanning photodetector SD should..." "Located on the same horizontal axis" (see 5.5.3, 5.5.5 in the 2017 edition).

This document is equivalent to IEC 60747-5-4:2022 Semiconductor devices - Part 5-4. Optoelectronic devices - Semiconductor lasers.

The following minimal editorial changes have been made to this document.

---Incorporating the content of the amendments to IEC 60747-5-4:2022/AMD1:2024, in the margin of the relevant clauses.

It is marked with a vertical double line (||).

Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents.

This document was proposed by the Ministry of Industry and Information Technology of the People's Republic of China.

This document is under the jurisdiction of the National Semiconductor Device Standardization Technical Committee (SAC/TC78).

Introduction

GB/T 15651 is a series of standards for semiconductor optoelectronic devices, which mainly specifies the general requirements, basic ratings, and...

Characteristics, testing methods, and technical requirements for devices such as semiconductor lasers, optocouplers, light-emitting diodes, photodiodes, and phototransistors.

The quality assurance regulations and other related content are proposed to consist of the following 13 parts.

---Part 5: Optoelectronic Devices. The purpose is to present semiconductor photoelectron emitting devices, semiconductor photosensitive components, and their internal workings.

Standards for semiconductor devices and their classification based on their mechanisms and optical radiation.

---Part 5-2. Basic Ratings and Characteristics of Optoelectronic Devices. The purpose is to provide basic ratings and characteristics for semiconductor photoelectric emitting devices and semiconductors.

Photodetectors, semiconductor photosensitive devices, semiconductor devices that emit light internally, and base devices classified as optoelectronic devices these ratings and characteristics are applicable only to fiber optic systems or subsystems.

---Part 5-3. Test Methods for Optoelectronic Devices. The purpose is to provide test methods for optoelectronic devices used in fiber optic systems or...

Except for subsystems.

---Part 5-4. Optoelectronic Devices - Semiconductor Lasers. The purpose is to provide the basic ratings, characteristics, and...

Test method.

---Part 5-5. Optoelectronic Devices - Optocouplers. The purpose is to provide the terminology, basic ratings, and characteristics of optocouplers.

Safety testing and measurement methods.

---Part 5-6. Optoelectronic Devices - Light Emitting Diodes (LEDs). The purpose is to provide the terminology, ratings, characteristics, and measurement methods for light-emitting diodes.

Test methods and quality assessment methods.

---Parts 5-7. Optoelectronic Devices - Photodiodes and Phototransistors. The aim is to present photodiodes and phototransistors...

The terminology, basic ratings and characteristics of the device, as well as the measurement methods.

---Parts 5-8. Test Methods for the Photoelectric Efficiency of Light Emitting Diodes (LEDs). The purpose is to provide experimental methods for evaluating the photoelectric efficiency