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

GB/T 47089-2026

**Test method for determining the geometrical parameters of
patterns on patterned sapphire substrates**

蓝宝石图形化衬底表面图形几何参数的测定方法

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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. 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 prepared by the National Technical Committee on Standardization of Semiconductor Equipment and Materials (SAC/TC203) and the National Semiconductor Equipment and Materials Standards Committee. It was jointly proposed and is under the jurisdiction of the Materials Subcommittee of the Chemical Technology Committee (SAC/TC203/SC2). This document was drafted by: Guangdong Zhongtu Semiconductor Technology Co., Ltd., Xuzhou Meixing Optoelectronics Technology Co., Ltd., and BOE Huacan Optoelectronics. Electric Power Co., Ltd., Tiantong Yinxia New Materials Co., Ltd., Songshan Lake Materials Laboratory, and Nanjing Tongli Crystal Materials Research Institute Co., Ltd. The main drafters of this document are: Zhang Neng, Mi Bo, Xiao Guiming, Zhu Jing, Wang Zirong, Zhu Guangmin, Kang Kai, Lu Yarong, Wang Xinqiang, Xu Jun, and Yuan Ye. Geometric parameters of sapphire patterned substrate surface Determination methods

1 Scope

GB/T 47089-2026 is the Chinese national standard covering the cone or dome pattern etched into a sapphire wafer before LED epitaxy - its height, pitch, base diameter and sidewall angle, which decide both how well the gallium nitride grows and how much light escapes the finished LED. First edition. It was issued on 28 January 2026 and has been in force since 1 August 2026, as a first edition. The document is under the responsibility of the Standardization Administration of China. This page is published from the official record of the 2026 edition; the clause text of a standard this recent is not yet in circulation, and the figures, limits and tables it contains are those of the document itself, delivered in full with the English translation.

This document describes a method for determining the geometric parameters of the surface

pattern on a patterned sapphire substrate. This document applies to the determination of geometric parameters of individual patterns and pattern arrays on the surface of sapphire patterned substrates.

2 Normative references

The contents of the following documents, through normative references within the text, constitute essential provisions of this document. Dated citations are not included. For references to documents, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies. This document.

GB/T 14264 Semiconductor Materials Terminology

GB/T 25915.1-2021 Cleanrooms and related controlled environments - Part

3 Terms and Definitions

The terms and definitions defined in GB/T 14264 and GB/T 43662, as well as the following terms and definitions, apply to this document.

3.1 point position The test positions on the patterned sapphire substrate are defined by the origin coordinates of the geometric center, and the test points are located according to the coordinates of different positions.

4 Principles

4.1 Reflectance Measurement Method By utilizing the differences in reflectance values corresponding to different pattern sizes on the surface of a patterned sapphire substrate, the average reflectance and the maximum reflectance were obtained. Characteristic values such as reflectance value, minimum reflectance, coefficient of variation of reflectance, and reflectance range are used to measure an array of multiple graphics in the overall region. A comprehensive assessment.

4.2 Atomic Force Microscopy Measurement The sample surface is studied by collecting the extremely weak interatomic interaction forces between the sample surface and a micro force-sensitive element. The structure and properties of the pattern can be used to directly determine the pattern height and bottom width at a specific position in the geometric parameters of the pattern on the surface of a patterned sapphire substrate.

4.3 Scanning Electron Microscopy Measurement Method A narrowly focused high-energy electron beam scans the sample, and through the interaction between the beam and the matter, various physical information is excited. Information collection, magnification, and re-imaging are used to characterize the microscopic morphology of materials, thereby determining the geometric pattern on the surface of patterned sapphire substrates. The

parameters include the period, height, bottom width, spacing, bottom angle of the graphic, and arc spacing of the graphic.

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