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

GB/T 1553-2023

Replacing GB/T 1553-2009

**Test methods for minority carrier lifetime in bulk silicon and
germanium - Photoconductivity decay method**

硅和锗体内少数载流子寿命的测定 光电导衰减法

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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. This document replaces GB/T 1553-2009 "Photoconductivity Attenuation Method for Determination of Minority Carrier Lifetime in Silicon and Germanium Body" and is consistent with GB/T 1553- Compared with.2009, in addition to structural adjustments and editorial changes, the main technical changes are as follows:

- a) Changed the scope (see Chapter 1, Chapter 1 of the.2009 edition);
- b) Added the definitions of intuitive lifetime, minority carrier lifetime, carrier recombination lifetime, and injection level in terms and definitions (see Section

1 Scope

GB/T 1553-2023 is the Chinese national standard on test methods for minority carrier lifetime in bulk silicon and germanium - photoconductivity decay method, in the field of metallurgy. The /T suffix marks it as a recommended standard: it is not compulsory by itself, but it becomes binding as soon as a contract, a tender or a customer specification calls it up - which in practice is how most foreign buyers meet it. It was issued on 6 August 2023 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 March 2024. Classification: ICS 77.040, CCS H21. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This document specifies the photoconductance decay of non-equilibrium minority carrier lifetime during carrier recombination in extrinsic silicon single crystals and germanium single crystals. Test Methods. This document is applicable to the testing of non-equilibrium minority carrier lifetime in extrinsic silicon single crystals and germanium single crystals. DC photoconductivity attenuation-pulsed light The method can test cuboid or cylindrical

samples with special dimensions. The shortest life of silicon single crystal is 50 μ s, and the shortest life of germanium single crystal is tested. The life value is 10 μ s. The high-frequency photoconductivity attenuation method can test rod-shaped or block-shaped samples, and the minimum lifetime value for testing silicon single crystal and germanium single crystal is 10 μ s.

Note. There are two methods of DC photoconductivity attenuation. DC photoconductivity attenuation-pulse light method and DC photoconductivity attenuation-chopper light method (see Appendix A).

2 Normative reference documents

The contents of the following documents constitute essential provisions of this document through normative references in the text. Among them, the dated quotations For undated referenced documents, only the version corresponding to that date applies to this document; for undated referenced documents, the latest version (including all amendments) applies to this document.

GB/T 1550 Test method for conductivity type of extrinsic semiconductor materials

GB/T 1551 Determination of resistivity of silicon single crystal. direct current four-probe method and direct current two-probe method

GB/T 14264 Semiconductor material terminology

GB/T 26074 DC four-probe measurement method for resistivity of germanium single crystal

3 Chapter), deleted the definition of apparent life (see

3.1 of the.2009 edition), changed the definition of body life (see 3.2,.2009 edition of 3.2);

c) Among the interference factors, the trap effect, photovoltaic effect, temperature, conductivity amplitude modulation effect, sweep-out effect, wavelength of the light source and Turn-off characteristics, influence of optical filter (see 4.1, 4.4, 4.5, 4.10~4.13,.2009 version of 5.1, 5.4, 5.7, 5.3, 5.6, 5.5, 5.9), adding injection ratio, resistivity, sample surface, sample size, carrier concentration changes, the effect of adding water, and different life measurements The relationship between test methods (see 4.2, 4.3, 4.7, 4.8, 4.14~4.16);

d) The method principle has been changed (see 5.1, Chapter 4 of the.2009 edition);

e) The grinding materials have been changed (see 5.2.2,

7.1.2 of the.2009 edition);

f) Changed the placement of the light source, power supply, and filter (see 5.3.2.1~5.3.2.4, 6.2, 6.3, and

6.5 of the.2009 version), and deleted the constant thermostats, grinding equipment,

- cleaning and drying equipment (see 6.4, 7.6, and 7.7 of the.2009 edition), and added computers and software systems (see 5.3.2.6);
- g) Added test conditions (see 5.3.4);
- h) Changed the temperature requirements in the test steps (see 5.3.5.1, 8.1 of the.2009 edition);
- i) Changed the precision of the DC photoconductivity attenuation-pulse light method (see 5.3.7, Chapter 11 of the.2009 edition);
- j) Changed the schematic diagram of the high-frequency photoconductivity test system (see 6.2.1, A.3.1 of the.2009 version);
- k) Changed the requirements for optical pulse generating devices, optical systems, high-frequency power supplies, and detectors (see 6.2.2.1~6.2.2.4,.2009 edition A.3.2~A.3.5), adding a wide-band amplifier, sampler, oscilloscope or computer and software system test device (see 6.2.2.5~ 6.2.2.7);