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

GB/T 43967-2024

**Space environment - Test method of single event effects
induced by pulsed laser of semiconductor devices for space
application**

空间环境 宇航用半导体器件单粒子效应脉冲激光试验方法

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Foreword

This document is in accordance with the provisions of GB/T 1:1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting: Please note that some of the contents of this document may involve patents: The issuing organization of this document does not assume the responsibility for identifying patents: This document was proposed by the Chinese Academy of Sciences: This document is under the jurisdiction of the National Technical Committee on Aerospace Technology and Its Applications Standardization (SAC/TC425): This document was drafted by: National Space Science Center of the Chinese Academy of Sciences, 804th Academy of the Eighth Research Institute of China Aerospace Science and Technology Corporation graduate School: The main drafters of this document are: Han Jianwei, Ma Yingqi, Shangguan Shipeng, Zhu Xiang, Chen Rui, Li Changhong, You Hongjun, Liu Kui, Zhao Xu, Liang Yanan: Single particle semiconductor devices for aerospace in space environment Effect pulse laser test method

1 Scope

GB/T 43967-2024 gives the pulsed laser test method for single event effects in semiconductor devices intended for spaceflight. A single heavy ion passing through a die deposits enough charge to flip a bit, latch up a rail or destroy a power transistor, and the conventional way to test for it is an accelerator beam - expensive, heavily oversubscribed and blind to where on the die the event occurred. A focused picosecond laser pulse deposits charge in a similar way, can be aimed at a specific structure, and sits on a bench, which makes it the practical tool for screening and for locating the sensitive volume, provided the equivalence to ion testing is handled carefully. The standard sets the purpose

and principle of the test, the general requirements covering the test environment, samples, condition parameters, laser energy analysis, personnel, the simulation test equipment and the laser radiation safety, then the test design in hardware and software, the test procedure, the data processing and the report. It took effect on 25 April 2024.

This document specifies the use of pulsed laser radiation sources to carry out single event effect simulation tests on aerospace semiconductor devices (hereinafter referred to as "devices") Experimental design and procedures: This document is applicable to pulsed laser simulation tests of single-photon or two-photon absorption mechanisms of single-particle effects, etc: of semiconductor devices for aerospace applications: Experimental design and process control:

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document: For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document: GB/T 7247:

3 Terms and definitions

The following terms and definitions apply to this document: 3:1 single event effect single event effect; SEE A single high-energy particle acting on a device can cause flipping, locking, burning, and other phenomena: 3:

2 Single event upset; SEU An effect in which a single high-energy particle acts on a device, causing a change in the device's logical state: 3:

3 Single event latching single event latchup; SEL A single high-energy particle acts on the silicon substrate circuit, causing the parasitic thyristor structure to turn on, resulting in a low resistance, high current state of the device: Radiation effect: 3:4 single event burnout; SEB A single high-energy particle acts on a semiconductor power device, causing the parasitic transistor to turn on, causing the device to break down in a high-current, high-voltage state: or an effect of thermal damage:

5 Safety of laser products Part 5: Producer's checklist for GB 7247:1

GB/T 19022 Measurement management system - Requirements for measurement processes and measurement equipment

GB/T 27418 Evaluation and expression of measurement uncertainty

GB/T 32304 Requirements for electrostatic protection of aerospace electronic products

GB/T 39343-2020 Design and procedures for single event tests on aerospace processor

devices

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