ICS 31.080.99
CCS L 40

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 46567.1-2025

Intelligent computing - Test method for memristors - Part 1: Basic characteristics

智能计算 忆阻器测试方法 第1部分：基础特性

Issued on: October 31, 2025 **Implemented on: October 31, 2025**

Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC

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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 1 of GB/T 46567 "Test Methods for Intelligent Computing Memristors". GB/T 46567 has published the following... part.

1.Basic Features. 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 and is under the jurisdiction of the National Intelligent Computing Standardization Working Group (SAC/SWG32). This document was drafted by: Zhejiang Lab, Zhejiang University, Shanghai Fudan Microelectronics Group Co., Ltd., and China Mobile (Hangzhou) Information Technology Co., Ltd. Limited Liability Company, China Jiliang University, Fudan University, the 13th Research Institute of China Electronics Technology Group Corporation, Institute of Microelectronics of Chinese Academy of Sciences Hebei University, Northeast Normal University, National University of Defense Technology, China Academy of Information and Communications Technology, Inspur Electronic Information Industry Co., Ltd., Huazhong University of Science and Technology University of Science and Technology of China, Taiyuan University of Technology, Ningbo Shishi Technology Co., Ltd., Institute of Semiconductors, Chinese Academy of Sciences, Hangzhou Guolei Semiconductor Equipment Co., Ltd. The company, Shanxi Taihang

Laboratory Co., Ltd., China Telecom Cloud Technology Co., Ltd., Zhejiang Dahua Technology Co., Ltd., and Beijing Jinghanyu Electronics Co., Ltd. Cheng Technology Co., Ltd., Beijing Wanjie Data Technology Co., Ltd., Super Fusion Digital Technology Co., Ltd., Beijing Yunzhiyin Technology Co., Ltd. The company, Zhejiang Provincial Internet of Things Industry Association, and China Communications Industry Association. The main drafters of this document are. Shi Tuo, Wang Zhongxin, Liu Jinchang, He Shuibing, Li Lei, Liu Shanjia, Wang Ming, Zhong Xin, Shi Ge, Wu Xun, and Xu Xiaoxin. Yan Xiaobing, Wang Zhongqiang, Li Ying, Huang Wei, Wang Yinan, Zhang Lijing, Wang Bingiang, Li Yi, Liu Qi, Sun Wenxuan, Xu Haiyang, Yang Biao, Zhang Qian, Li Qingjiang Zhang Jiuliu, Zhang Hongwei, Yang Ming, Huang Xuhui, Wu Chenxi, Yu Shuangming, Kong Weisheng, Li Pengfei, Huang Weijing, Wang Xiaopeng, Huang Tao, Liu Hailian, Luo Lianshang Chen Yongxiang.

The resistance state of a memristor is determined by the external excitation history, possessing non-volatile memory functionality, making it ideal for achieving high-density, low-power, and fast data transfer. Memristors are ideal storage devices, providing a practical solution for developing high-efficiency in-memory computing systems. Simultaneously, memristors can simulate biological mutations. The synaptic behavior is applicable to the realization of synaptic functions in deep neural networks (DNNs) and spiking neural networks (SNNs), providing a basis for neuromorphic computing. This laid the foundation for the development of the domain. In cutting-edge applications such as neuromorphic computing, the performance of memristors directly impacts the overall system efficiency. Their key performance components... This includes fundamental characteristics (such as readout, electrical preprocessing, enhancement and suppression, etc.) and linearity, impulse-dependent plasticity, asymmetry, etc. However, the current industry... The lack of unified testing method standards has led to a lack of comparability in performance evaluation results among different units, which has hindered the standardized development of the technology. To address this issue, it is urgent to establish scientific and systematic testing standards to ensure the objectivity and consistency of memristor performance evaluation. To respond to industry needs and promote technological standardization, GB/T 46567 "Test Methods for Intelligent Computing Memristors" is proposed to consist of four parts. constitute.

1.Fundamental Characteristics. This section describes the testing of fundamental characteristics of memristors, including read, electrical preprocessing, enhancement, and suppression. method.

2.Linearity. This section describes the testing methods for the linearity of memristors.

3.Pulse-dependent plasticity. The purpose is to describe the test method for the pulse-dependent plasticity of memristors.

4.Asymmetry. This section describes the test methods for memristor asymmetry. Intelligent computing memristor test method Part

1 Scope

GB/T 46567.1-2025 is the Chinese national standard covering measuring a memristor - the current-voltage loop and the switching between resistance states, the set and reset voltages, the retention and the endurance in cycles, and the variability between devices that is the real obstacle to using them. Memristors are the device class in-memory computing is being built on. Part 1 of the series, first edition. Issued on 31 October 2025, it has been in force since 31 October 2025.

This document specifies the requirements for memristor testing equipment and environmental conditions, and describes the basic characteristics of memristor reading, electrical preprocessing, enhancement, and suppression. The test methods for sexuality were defined, and the requirements for test reports were specified. This document applies to the testing of fundamental characteristics of two-terminal bipolar memristors, including read, electrical preprocessing, enhancement, and suppression.

2 Normative references

This document does not contain any normative references.

3 Terms and Definitions

The following terms and definitions apply to this document.

3.1 memristor A nonlinear electronic component that can remember the amount of charge or magnetic flux flowing through it by changes in resistance.

3.2 pre-synaptic voltage Vpre The voltage applied to the presynaptic neuron of the memristor.

3.3 post-synaptic voltage Vpost The voltage applied to the postsynaptic neuron of the memristor.

3.4 Rread The resistance value of the memristor measured during the reading process (3.6) is the ratio of the reading voltage (3.7) to the reading current (3.8).

3.5 Gread The conductance of the memristor measured during the reading process (3.6) is the ratio of the reading current (3.8) to the reading voltage (3.7).

3.6 Read Operations to obtain the memristor resistance (3.4) or memristor conductance (3.5).