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GB/T 4937.38-2025

Semiconductor devices - Mechanical and climatic test methods - Part 38: Soft error test method for semiconductor devices with memory

半导体器件 机械和气候试验方法 第38部分：带存储的半导体器件的软错误试验方法

(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 38 of GB/T 4937, "Mechanical and Climatic Test Methods for Semiconductor Devices". GB/T 4937 has been published.

The following section.

---Part 1: General Provisions;

---Part 2: Low Pressure;

---Part 3: External Visual Inspection;

---Part 4: Highly Accelerated Steady-State Damp Heat Test (HAST);

---Part 8: Sealing;

---Part 10: Mechanical Impact Devices and Components;

---Part 11: Rapid Temperature Change in Two-Liquid Tank Method;

---Part 12: Sweep Frequency Vibration;

---Part 13: Salt Spray;

---Part 14: Lead Strength (Lead Wire Secureness);

---Part 15: Solder Heat Resistance of Through-Hole Mounting Devices;

---Part 16: Particle Collision Noise Detection (PIND);

---Part 17: Neutron Irradiation;

---Part 18: Ionizing Radiation (Total Dose);

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---Part 19: Chip Shear Strength;

---Part 20: Combined effects of moisture and soldering heat on molded surface mount devices;

---Part 20-1.Handling, Packaging, Marking, and Shipping of Surface Mount Devices Sensitive to the Combined Effects of Moisture and Solder Heat;

---Part 21: Solderability;

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---Part 23: High-Temperature Operating Life;

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---Part 26: Electrostatic Discharge (ESD) Sensitivity Testing Human Model (HBM);

---Part 27: Electrostatic Discharge (ESD) Sensitivity Testing Machine Model (MM);

---Part 29: Latch Test;

---Part 30: Pretreatment of Unsealed Surface Mount Devices Prior to Reliability Testing;

---Part 31: Flammability of Molded Devices (Internal Causes);

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---Part 35: Acoustic Microscopy Inspection of Plastic-Encapsulated Electronic Components;

---Part 36: Steady-state acceleration;

---Part 37: Plate Drop Test Method Using Accelerometers;

---Part 38: Soft Fault Testing Methods for Semiconductor Devices with Storage;

---Part 39: Measurement of moisture diffusivity and water solubility of organic materials for semiconductor devices;

---Part 40: Plate Drop Test Method Using Strain Gauges;

---Part 42: Temperature and Humidity Storage;

---Part 44: Test methods for single-event effects (SEE) by neutron irradiation on semiconductor devices.

This document is equivalent to IEC 60749-38:2008 "Semiconductor devices - Mechanical and climatic testing methods - Part 38: Semiconductor devices with memory" Soft error

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testing methods for conductor devices.

This document adds a chapter on "Normative References".

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

---Distinguish SER in formulas (1), (2) and (3) into SERalpha and SER_real_time.

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

Semiconductor devices are general-purpose basic products in the electronics industry chain and are the most basic units in electronic systems. GB/T 4937 "Semiconductor Devices" the "Mechanical and Climate Test Methods for Semiconductor Devices" is a fundamental and universal standard for testing semiconductor devices, used for evaluating and assessing semiconductors.

The quality and reliability of the device play an important role, and it is planned to consist of 44 parts.

---Part 1: General Principles. The purpose is to establish general guidelines for mechanical and climatic testing methods for semiconductor devices.

---Part 2: Low Pressure. The purpose is to test the ability of components and materials to avoid electrical breakdown failure.

---Part 3: External Visual Inspection. The purpose is to inspect whether the materials, design, structure, markings, and manufacturing processes of semiconductor devices meet the required standards.

Requirements for procurement documents.

---Part 4: Strong Accelerated Steady-State Damp Heat Test (HAST). The purpose is to specify the Strong Accelerated Steady-State Damp Heat Test (HAST) to detect...

To test the reliability of non-hermetically sealed semiconductor devices in humid environments.

---Part 5: Steady-State Temperature and Humidity Offset Lifetime Test. The purpose is to specify the steady-state temperature and humidity offset lifetime test to detect non-hermetic leaks.

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Reliability of packaged semiconductor devices in humid environments.

---Part 6: High-Temperature Storage. The purpose is to investigate the effects of high-temperature storage on semiconductor devices without applying electrical stress.

---Part 7: Internal Moisture Measurement and Other Residual Gas Analysis. The purpose is to assess the quality of the packaging process and provide information on the gas content.

Information on the long-term chemical stability of the substance within the shell.

---Part 8: Sealing. The purpose is to detect the leakage rate of semiconductor devices.

---Part 9: Marking Durability. The purpose is to test the durability of markings on semiconductor devices.

---Part 10: Mechanical Shock Devices and Components. The purpose is to test semiconductor devices and printed circuit board assemblies against moderate stress.

The ability to adapt to shocks.

---Part 11: Rapid Temperature Change Two-Batter Method. The purpose is to define the rapid temperature change (two-batter method) for semiconductor devices.

The test procedures, failure criteria, and other related content.

---Part 12: Sweep Frequency Vibration. The purpose is to detect the effect of vibration on semiconductor devices within a specified frequency range.

---Part 13: Salt Spray. The purpose is to test the corrosion resistance of semiconductor devices.

---Part 14: Lead Strength (Lead Bonding). The purpose is to test the bonding strength of semiconductor device lead/package interfaces and leads.

Solid.

---Part 15: Solder Heat Resistance of Through-Hole Mounted Devices. The purpose is to test the solder heat resistance of through-hole mounted solid-state packaged semiconductor devices.

The ability to withstand the thermal stress generated by peak soldering or soldering leads with a soldering iron.

---Part 16: Particle Collision Noise Detection (PIND). The purpose is to specify a method for detecting free particles within cavity devices.

---Part 17: Neutron Irradiation. The purpose is to detect the susceptibility of semiconductor devices to performance degradation in a neutron environment.

---Part 18: Ionizing Radiation (Total Dose). The purpose is to specify the methods for assessing the effects of low-dose-rate ionizing radiation on semiconductor devices.

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