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

GB/T 4937.27-2023

**Semiconductor devices - Mechanical and climatic test methods
- Part 27: Electrostatic discharge(ESD) sensitivity testing -
Machine model(MM)**

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Standardization Administration**

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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:

This document is part 27 of GB/T 4937 "Mechanical and Climate Test Methods for Semiconductor Devices": GB/T 4937 has been released

The following sections:

- Part 1: General;
- Part 2: Low pressure;
- Part 3: External visual inspection;
- Part 4: Highly Accelerated Steady State Damp Heat Test (HAST);
- Part 11: Rapid temperature change double tank method;
- Part 12: Frequency sweep vibration;
- Part 13: Salt spray;
- Part 14: Terminal strength (lead fastness);
- Part 15: Resistance to soldering heat of through-hole mounted devices;
- Part 17: Neutron irradiation;
- Part 18: Ionizing radiation (total dose);
- Part 19: Chip shear strength;
- Part 20: Plastic-encapsulated surface mount devices are resistant to the combined effects of moisture and soldering heat;

- Part 20-1: Handling, packaging, marking and transportation of surface mount devices sensitive to the combined effects of moisture and soldering heat;
- Part 21: Solderability;
- Part 22: Bonding strength;
- Part 23: High temperature working life;
- Part 26: Electrostatic discharge (ESD) susceptibility test Human body model (HBM);
- Part 27: Electrostatic discharge (ESD) susceptibility test machine model (MM);
- Part 30: Pretreatment of non-hermetic surface mount devices before reliability tests;
- Part 31: Flammability of plastic encapsulated devices (internal causes);
- Part 32: Flammability of plastic encapsulated devices (external causes);
- Part 42: Temperature and humidity storage:

This document is equivalent to IEC 60749-27:2012 "Mechanical and climatic test methods for semiconductor devices - Part 27: Electrostatic discharge

(ESD) Sensitivity Test Machine Model (MM):

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

- a) Change the electrical graphic symbols in Figure 1 in 4:2:4 to those specified in GB/T 4728 (all parts);
- b) The voltage symbol "U" is added after "level voltage" in Table 1 of Chapter 5:

Please note that some contents of this document may refer to patents: The issuing agency of this document assumes no responsibility for identifying patents:

Introduction

Semiconductor devices are common basic products in the electronics industry chain and are the most basic units in electronic systems: GB/T 4937 "Semiconductors

Mechanical and Climatic Test Methods for Bulk Devices" is the basic and universal standard for testing semiconductor devices:

The quality and reliability of the device play an important role, and it is proposed to be composed of 44 parts:

- Part 1: General: The purpose is to specify general guidelines for mechanical and climatic test methods for semiconductor devices:
- Part 2: Low air pressure: The purpose is to detect the ability of components and materials to avoid electrical breakdown failure:

--- Part 3: External visual inspection: The purpose is to detect whether the material, design, structure, marking and process quality of semiconductor devices meet the

Purchasing Documentation Requirements:

--- Part 4: Strongly Accelerated Steady State Damp Heat Test (HAST): The purpose is to specify the highly accelerated steady state damp heat test (HAST) to detect

Test the reliability of non-hermetic packaged semiconductor devices in humid environment:

--- Part 5: Steady-state temperature and humidity bias life test: The purpose is to specify the steady-state temperature and humidity bias life test to detect non-airtight

Reliability of packaged semiconductor devices in wet environments:

--- Part 6: High temperature storage: The purpose is to detect the influence of high temperature storage on semiconductor devices without applying electrical stress:

--- Part 7: Internal water vapor measurement and other residual gas analysis: The purpose is to detect the quality of the packaging process and provide relevant

information on the long-term chemical stability of the body in the shell:

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

--- Part 9: Sign durability: The purpose is to test the durability of marks on semiconductor devices:

--- Part 10: Mechanical shock: The purpose is to test the suitability of semiconductor devices and printed board assemblies to withstand moderately severe shocks

ability:

--- Part 11: Rapid temperature change double tank method: The purpose is to specify the rapid temperature change of semiconductor devices (double tank method)

Test procedures, failure criteria, etc:

--- Part 12: Frequency sweep vibration: The purpose is to detect the impact of vibration on semiconductor devices within the specified frequency range:

--- Part 13: Salt spray: The purpose is to detect the corrosion resistance of semiconductor devices:

--- Part 14: Terminal strength (lead fastness): The purpose is to detect the lead/package interface of semiconductor devices and the firmness of leads:

Solidity:

--- Part 15: Resistance to soldering heat of through-hole mounted devices: The purpose is to test the vibration of through-hole mounted solid-state packaged semiconductor devices

The ability of peak soldering or soldering iron soldering leads to generate thermal stress:

--- Part 16: Particle collision noise detection (PIND): The purpose is to specify the detection method for the presence of free particles in cavity devices:

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

--- Part 18: Ionizing radiation (total dose): The purpose is to provide for the assessment of the impact of low dose rate ionizing radiation on semiconductor devices:

Rapid annealing test method:

--- Part 19: Chip shear strength: The purpose is to detect the materials and processes used to mount semiconductor chips on sockets or substrates:

completeness of the process steps:

--- Part 20: Plastic surface mount devices resistance to combined effects of moisture and soldering heat: The purpose is to store in warehouse or dry by simulating

The moisture absorbed by plastic-encapsulated surface-mounted semiconductor devices in a dry packaging environment was evaluated to evaluate its resistance to soldering heat:

--- Part 20-1: Handling, packaging, marking and transportation of surface mount devices sensitive to the combined effects of moisture and soldering heat: Purpose

It is to regulate the operation, packaging, transportation and use of plastic-encapsulated surface-mounted semiconductor devices that are sensitive to the combined effects of moisture and soldering heat

method:

--- Part 21: Solderability: The purpose is to specify the lead-out terminals of component packages that are soldered with lead-tin solder or lead-free solder:

Solderability test procedure:

--- Part 22: Bonding strength: The purpose is to detect the bonding strength of semiconductor devices:

--- Part 23: High temperature working life: The purpose is to specify the effects of bias conditions and temperature on solid-state devices over time:

experiment method:

--- Part 24: Accelerated humidity unbiased strong accelerated stress test: The purpose is to test non-hermetic packaged solid-state devices in humid environment

environment reliability: