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

GB/T 4937.11-2018

**Semiconductor devices -- Mechanical and climatic test methods
-- Part 11: Rapid change of temperature -- Two-fluid-bath
method**

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Foreword

GB/T 4937 "Mechanical and Climatic Test Methods for Semiconductor Devices" consists of the following components.

- Part 1. General;
- Part 2. Low pressure;
- Part 3. External visual inspection;
- Part 4. Strongly accelerated steady-state damp heat test (HAST);
- Part 5. Steady-state temperature and humidity bias life test;
- Part 6. High temperature storage;
- Part 7. Internal water vapor content test and other residual gas analysis;
- Part 8. Sealing;
- Part 9. Logo durability;
- Part 10. Mechanical shock;
- Part 11. rapid temperature change double tank method;
- Part 12. Sweeping vibration;
- Part 13. Salt spray;
- Part 14. Terminal strength (lead robustness);
- Part 15. Resistance to soldering of through-hole mounting devices;
- Part 16. Particle collision noise detection (PIND);
- Part 17. Neutron irradiation;
- Part 18. Ionizing radiation (total dose);
- Part 19. Chip shear strength;

- Part 20. The combined effects of moisture-resistant and soldering heat on plastic surface mount devices;
- Part 20-1. Operation, packaging, marking and transport 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 24. Accelerated moisture-resistant and non-biased strong accelerated stress test (HSAT);
- Part 25. Temperature cycling;
- Part 26. Electrostatic discharge (ESD) sensitivity test human body model (HBM);
- Part 27. Electrostatic discharge (ESD) sensitivity test mechanical model (MM);
- Part 28. Electrostatic discharge (ESD) sensitivity test, charged device model (CDM), device level;
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- Part 31. Flammability of plastic encapsulated devices (internal);
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- Part 38. Soft error test methods for semiconductor memory devices;
- Part 39. Measurement of moisture diffusivity and water dissolution rate of raw materials for semiconductor components;
- Part 40. Plate-level drop test method using tension meter;
- Part 41. Reliability test methods for non-volatile memory devices;
- Part 42. Storage of temperature and humidity;
- Part 43. Guide to the reliability identification scheme for integrated circuits (ICs);

--- Part 44. Test method for neutron beam irradiation single particle effect of semiconductor devices.

This part is the 11th part of GB/T 4937.

This part is drafted in accordance with the rules given in GB/T 1.1-2009.

This section uses the translation method equivalent to IEC 60749-11.2002 "Semiconductor device mechanical and climatic test methods Part 11.

Rapid temperature change double liquid tank method.

The documents of our country that have a consistent correspondence with the international documents referenced in this part are as follows.

--- GB/T 4937.3-2012 Semiconductor devices - Mechanical and climatic test methods - Part 3. External visual inspection (IEC 60749-

3.2002, IDT).

This section has made the following editorial changes.

--- According to IEC 60749-11.2002 change order, the deviation of -40 °C in Table 1 -30 °C changed to -10 ° C;

--- The footnote number in the table is changed from "1, 2, 3" to "a, b, c".

1 Scope

This part of GB/T 4937 specifies the test method for rapid temperature change---two-tank method. When device identification can be used

The gas-air temperature cycle can also be measured by rapid temperature change---the two-tank method, the air-air temperature cycle test is preferred.

This test can also use a small number of cycles (5 times ~ 10 times) to simulate the effect of the heating liquid of the cleaning device on the device.

This test is applicable to all semiconductor devices. This test is considered to be destructive unless otherwise stated in the relevant specifications.

This test is basically the same as GB/T 2423.22-2002, but in view of the special requirements of semiconductor devices, the terms of this part are adopted.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only dated versions apply to this article.

Pieces. For undated references, the latest edition (including all amendments) applies to this

document.

GB/T 2423.22-2002 Environmental testing of electric and electronic products - Part 2. Test method Test N. Temperature change

(IEC 60068-2-14. 1984, IDT)

Methods of mechanical and climatic test methods for semiconductor devices - Part 3. External visual inspection (Semiconductor devices - Mechanical and climatic test methods - Part 3. External visual methods)

3 Terms and definitions

The following terms and definitions apply to this document.

3.1

Load load

The load consists of the test sample and the fixture used to fix the sample during the test.

Note. The maximum load is the maximum mass of the sample and fixture that can be placed in the tank's working area and that meets the specified temperature and time.

3.2

Monitoring sensor monitoring sensor

Calibrated and installed in a suitable position to indicate the same temperature as the worst-case location of the sample.

Note. The worst case sample position is determined by the period characteristic of the worst case load temperature.

3.3

Worst case load temperature worst-case load temperature

Insert the temperature of the sample indicated by the thermocouple at the center of the load.

3.4

Sample specimen

Test device or individual.

3.5

Transfer time transfer time

The time it takes for the load to be removed from one tank to the other.