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

GB/T 4937.22-2018

**Semiconductor devices -- Mechanical and climatic test methods
-- Part 22: Bond strength**

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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;
- Part 29. Latch test;
- Part 30. Pre-treatment of unsealed surface mount devices prior to reliability testing;
- Part 31. Flammability of plastic encapsulated devices (internal);
- Part 32. Flammability of plastic encapsulated devices (external);
- Part 33. Accelerated moisture resistance without bias high pressure cooking;
- Part 34. Power cycling;
- Part 35. Acoustic scanning microscopy of plastic electronic components;
- Part 36. Constant acceleration;
- Part 37. Plate-level drop test method using accelerometers;
- 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 22nd 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 60749-22.2002 "Semiconductor device mechanical and climatic test methods Part 22.

Bond strength.

1 Scope and purpose

This part of GB/T 4937 applies to semiconductor devices (discrete devices and integrated circuits).

The purpose of this section is to measure the bond strength or determine if the bond strength meets the specified requirements.

1.1 Test Description

Seven test methods are specified, each of which has different purposes, as follows.

- Method A and Method B. Test the bonding strength inside the device by directly applying a tensile force to the inner leads;
- Method C. for bonding outside the device, applying pull-off stress between the lead or the lead and the wiring board or substrate;
- Method D. for internal bonding, applying shear stress between the chip and the substrate or to a similar surface bonding structure;
- Method E and Method F. for external bonding, applying a push-on stress or a pull-up stress between the chip and the substrate;
- Method G. Used to test the strength of wire bond shear resistance.

1.2 Test device (applicable to all methods)

The test device shall include equipment that applies specified stresses at the bond points, leads or terminals as required by the specified test method. The device

Calibrated measurements and indications can be provided for stress applied in failure (in N). The device measures force within 100mN (package

Including 100mN) should have an accuracy of $\pm 2.5\text{mN}$, the force between 100mN and 500mN should have an accuracy of $\pm 5\text{mN}$, and the measurement is super

A force of over 500 mN should have an accuracy of $\pm 2.5\%$ of the indicated value.

2 Method A. Lead Tension (Single Bond Point) and Method B. Lead Tension (Double Bond Point) (see Appendix A)

2.1 Scope

The method is suitable for use in a semiconductor device package with internal leads bonded by soldering, thermocompression bonding, ultrasonic welding and other related technologies

Lead-to-die bonding, lead-to-substrate bonding, or inner lead-lead bonding.