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Test methods for lead-free solders— Part 7 : Methods for shear strength of solder joints on chip components

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal of establishing a Japanese Industrial Standard from The Japan Welding Engineering Society (JWES), with a draft of Industrial Standard based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

Soldering is called HANDAZUKE (Japanese), a technique to be used for mounting electronic and electrical machinery and apparatus, communication equipment and the like and its use field is wide and expectation for high reliability of the connection is large.

Though there are standards inside and outside Japan as well as International Standards like IEC or ISO, this Standard uses results of "standardization of test methods and the like necessary for solder connection corresponding to the reduction of an environmental load" based on the research and development by contract of New Energy and Industrial Technology Development Organization.

This Standard concerns the methods for shear strength of solder joints on chip components of lead-free solders which are environmentally friendly and is positioned as a standard for considering environment.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

JIS Z 3198 includes the following 7 parts with the general title *Test methods for lead-free solders*

Part 1 : Methods for measuring of melting temperature ranges

Part 2 : Methods for testing of mechanical characteristics—tensile test

Part 3 : Methods for spread test

Part 4 : Methods for solderability test by a wetting balance method and a contact angle method

Part 5 : Methods for tensile tests and shear tests on solder joints

Part 6 : Methods for 45° pull test of solder joints on QFP lead

Part 7 : Methods for shear strength of solder joints on chip components

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Test methods for lead-free solders— Part 7 : Methods for shear strength of solder joints on chip components

Introduction This Japanese Industrial Standard specifies the test methods for shear strength of solder joints on chip components by lead-free solder based on occupational results by contract of New Energy and Industrial Technology Development Organization concerning “The standardization of test method and the like necessary for solder connection corresponding to the reduction of an environmental load” carried out in 2000 and 2001.

1 Scope This Standard specifies test methods for shear strength of solder joints on chip components by using lead-free solder to be used principally for wiring connection of electrical machining and apparatus, electronic apparatus, communication equipment or the like, wiring connection of components and the like.

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS Z 3197 *Testing methods for soldering fluxes*

JIS Z 3283 *Resin flux cored solders*

JIS Z 3284 *Solder paste*

3 Definitions For the purposes of this Standard, the definitions given in **JIS Z 3197**, **JIS Z 3283**, **JIS Z 3284** and the following definitions apply:

- a) **lead-free solder** It is the generic term of “a tin based solder” not containing lead as an alloy component. It is a solder not containing lead for a use corresponding to that of “tin-lead based solder”, which is used for mounting an electrical, electronic, communication equipment and the like herein.
- b) **chip components** They are small pieces (chips) of an individual component simple substance, which are mounted by soldering.

4 Test piece A test piece shall be a chip components soldered joint substrate and each of the following items shall be as agreed upon between the manufacturer and the purchaser.

- a) Shape and dimensions of test material (substrate and chip components)
- b) Soldering method of test material
- c) Heat treatment of test material

5 Test method The test method shall be as follows:

- a) For a test, a pressure shear test (with a universal testing machine) is used and a shear jig having an indenter of 0.5 mm diameter is attached.

- b) A substrate with a shear jig mounted so as to be positioned vertically to and at the central part of the chip components is set to a tester.

When the shear jig is aligned with the components, the enlargement is carried out with a stereoscopic microscope.

Further, a gap between the shear jig and the substrate shall be $1/4$ or less of the thickness of the components. The shear jig shall not be brought in contact with the substrate (see Fig. 1).

- c) Bring the shear jig in contact with the chip components so as not to give a shock thereto (a force of 10 % or less of joint shear strength), add a load by moving the shear jig thereafter and start measurement.

Further, the transfer speed of the shear jig shall be 5 mm/min to 30 mm/min.

6 Method for obtaining measured value The method for obtaining a measured value shall be as follows:

- a) The maximum shear load is taken as a measured value.
b) In which position the fracture is; in soldering, on an interface or in a components is observed with a suitable observing device and recorded.

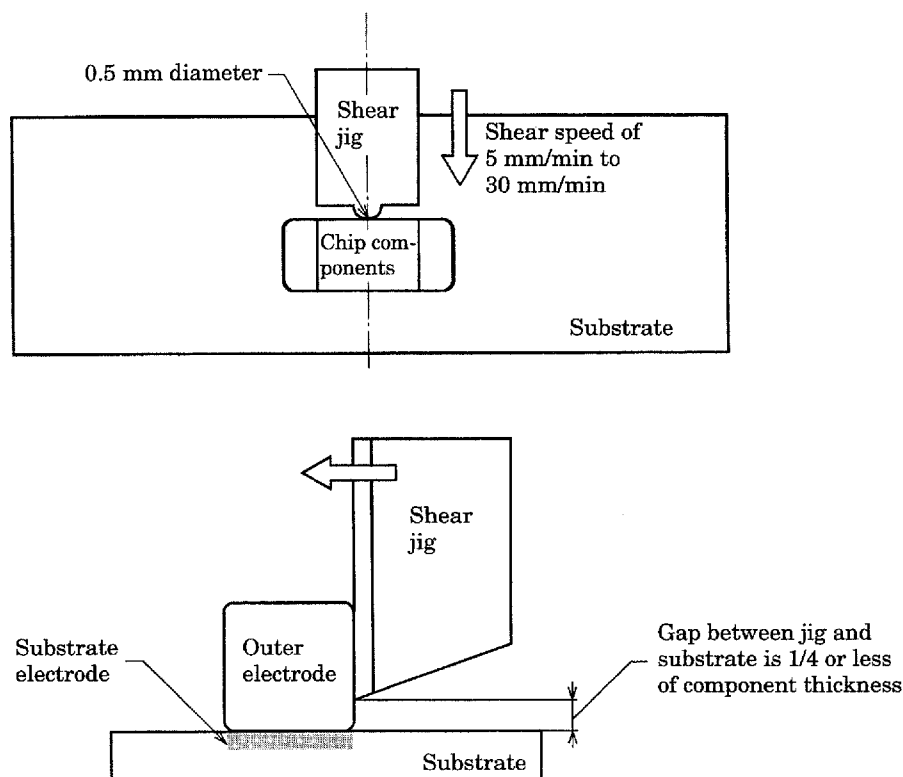


Fig. 1 General figure for measurement

7 Recording of test results Recording of test results shall be as follows:

- a) Date of test
b) Test place

- c) Name and classification of test material
- d) Presence of plating on a land on the substrate and a component electrode and classification of the plating
- e) Classification of test piece
- f) Type of solder
- g) Type of flux and conditions of soldering atmosphere
- h) Soldering method (heating method, preheating temperature, soldering temperature, retention time, heating speed and cooling speed and the like)
- i) Shear load of solder joint
- j) Rupture position

Errata for JIS (English edition) are printed in *Standardization Journal*, published monthly by the Japanese Standards Association, and also provided to subscribers of JIS (English edition) in *Monthly Information*.

Errata will be provided upon request, please contact:
Standardization Promotion Department, Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN
TEL. 03-3583-8002 FAX. 03-3583-0462

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