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(JWES)

**Test methods for lead-free solders—
Part 6 : Methods for 45° pull test of
solder joints on QFP lead**

ICS 25.160.50

Reference number : JIS Z 3198-6 : 2003 (E)

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 45° pull test of solder joints on QFP lead 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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Contents

	Page
Introduction	1
1 Scope	1
2 Normative references	1
3 Definitions	1
4 Outline of test	1
5 Test piece	1
6 Test method	2
7 Method for obtaining of measured value	2
8 Recording of test results	2

Test methods for lead-free solders— Part 6 : Methods for 45° pull test of solder joints on QFP lead

Introduction This Japanese Industrial Standard specifies the methods for 45° pull test of solder joints on QFP lead by lead-free solder based on occupational results by contact of New Energy and Industrial Technology Department Organization concerning “the standardization of test methods 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 methods for 45° pull test of solder joints on QFP lead to be used principally for wiring connection, components connection and the like of electrical machinery and apparatus, electronic apparatus, communication equipment and the like.

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions and 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 “tin-lead based solder”, which is used for mounting an electrical, electronic, communication equipment and the like.
- b) **QFP** (Quad Flat Package) It is a kind of the form of a surface mounting package wherein many lead pins jut out parallel to a horizontal direction from four sides of thin shaped square or rectangular main body and are soldered.

4 Outline of test In this test method, a QFP solder joint substrate by lead-free solder shall be attached to the jig given in Fig. 1 and pulled at 45° in angle to obtain a bonded joint strength.

5 Test piece The test piece shall be QFP solder joint substrate and the following respective items are subjected to the agreement between the purchaser and the supplier.

- a) Shape and dimensions of test piece (substrate and QFP)
- b) Classification of solder, flux and soldering atmosphere
- c) Soldering method

6 Test method The test method shall be as follows:

- a) A test piece is attached to the test jig given in Fig. 1.
- b) For fixing the substrate, the angle is provided at 45°.
- c) The test hook jig to be used shall have such a function when it is hooked on a lead, its position is not shifted, its tip is smaller than a space inside the lead and it is not deformed in testing. The recommendable hook jig shape is given in Fig. 2.
- d) The test hook jig given in Fig. 2 is attached to the shoulder part of a soldered QFP lead, and the hook jig is pulled vertically and upward to obtain the maximum load.
- e) The test speed shall be 10 mm/min or under.

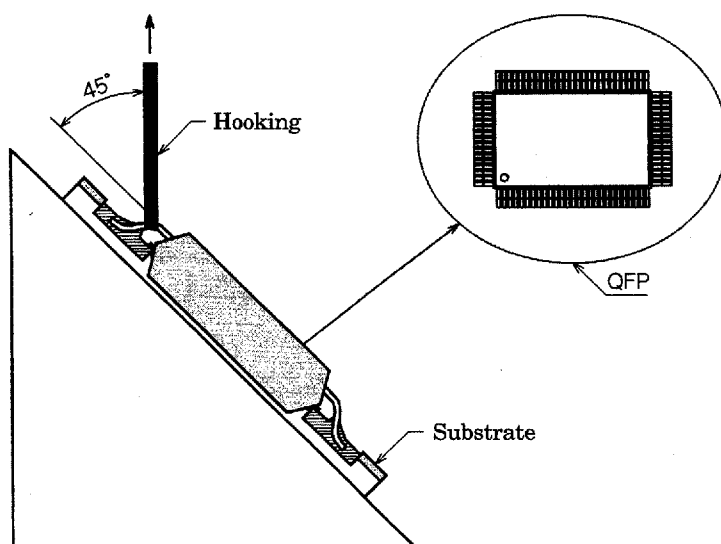


Fig. 1 Method for testing of lead pull strength

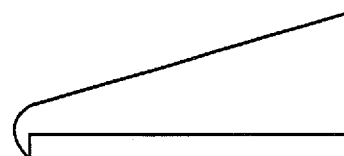


Fig. 2 Hook jig shape (an example)

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

- a) The maximum pull load is taken as a measured value.
- b) Which one of the solder, a terminal cut, and a pad peeling being a rupture position is observed with a suitable observing apparatus and recorded.

8 Recording of test results The 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 and classification of plating concerning a land and a component electrode on the substrate

- e) Classification of test piece
- f) Type of solder
- g) Type of flux and conditions for soldering atmosphere
- h) Soldering method (heating method, preheating temperature, soldering temperature, retention time, heating and cooling speed and the like)
- i) Pull load of solder joint
- j) Rupture position

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