

Semiconductor devices – Mechanical and climatic test methods —

Part 21: Solderability

The European Standard EN 60749-21:2005 has the status of a British Standard

ICS 31.080

National foreword

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 20, an inside back cover and a back cover.

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 5 December 2005

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ISBN 0 580 46191 2

Amendments issued since publication

Amd. No.	Date	Comments

**Semiconductor devices –
Mechanical and climatic test methods
Part 21: Solderability
(IEC 60749-21:2004)**

Dispositifs à semiconducteurs –
Méthodes d'essais mécaniques et
climatiques
Partie 21: Brasabilité
(CEI 60749-21:2004)

Halbleiterbauelemente –
Mechanische und klimatische
Prüfverfahren
Teil 21: Lötbarkeit
(IEC 60749-21:2004)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 47/1741/FDIS, future edition 1 of IEC 60749-21, prepared by IEC TC 47, Semiconductor devices, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60749-21 on 2004-12-07.

This mechanical and climatic test method, as it relates to solderability, is a complete rewrite of the test contained in Subclause 2.1, Chapter 2 of EN 60749:1999.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2005-09-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2008-01-01

Endorsement notice

The text of the International Standard IEC 60749-21:2004 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60068	NOTE Harmonized in the EN 60068 series (not modified).
IEC 60749	NOTE Harmonized in the EN 60749 series (not modified).
IEC 60749-15	NOTE Harmonized as EN 60749-15:2003 (not modified).
IEC 60749-20	NOTE Harmonized as EN 60749-20:2003 (not modified).

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SEMICONDUCTOR DEVICES – MECHANICAL AND CLIMATIC TEST METHODS –

Part 21: Solderability

1 Scope

This part of IEC 60749 establishes a standard procedure for determining the solderability of device package terminations that are intended to be joined to another surface using tin-lead (SnPb) or lead-free (Pb-free) solder for the attachment.

This test method provides a procedure for ‘dip and look’ solderability testing of through hole, axial and surface mount devices (SMDs) as well as an optional procedure for a board mounting solderability test for SMDs for the purpose of allowing simulation of the soldering process to be used in the device application. The test method also provides optional conditions for ageing.

This test is considered destructive unless otherwise detailed in the relevant specification.

NOTE 1 This test method is in general accord with IEC 60068, but due to specific requirements of semi-conductors, the following text is applied.

NOTE 2 This test method does not assess the effect of thermal stresses which may occur during the soldering process. Reference should be made IEC 60749-15 or IEC 60749-20.

NOTE 3 This mechanical and climatic test method as it relates to solderability, is a complete rewrite of the test contained in Subclause 2.1 of Chapter 2 of IEC 60749 (1996).

2 Test apparatus

This test method requires the following equipment.

2.1 Solder bath

The solder bath shall be not less than 40 mm in depth and not less than 300 ml in volume such that it can contain at least 1 kg of solder. The apparatus shall be capable of maintaining the solder at the specified temperature within ± 5 °C.

2.2 Dipping device

A mechanical dipping device capable of controlling the rates of immersion and emersion of the terminations and providing a dwell time (time of total immersion to the required depth) in the solder bath as specified shall be used.

2.3 Optical equipment

An optical microscope capable of providing magnification inspection from 10× to 20× shall be used.

2.4 Steam ageing equipment

A non-corrodible container and cover of sufficient size to allow the placement of specimens inside the vessel shall be used. The specimens shall be placed such that the lowest portion of the specimen is a minimum of 40 mm above the surface of the water. A suitable method of supporting the specimens shall be improvised using non-contaminating material.

NOTE During steam ageing, the test devices should be located in a manner so as to prevent water (steam condensate) from dripping on them.

2.5 Lighting equipment

A lighting system shall be used that will provide a uniform, non-glare, non-directional illumination of the specimen.

2.6 Materials

2.6.1 Flux

Unless otherwise detailed in the relevant specification, the flux shall consist of 25 % by weight colophony in 75 % by weight of a 99,5 % (min.) by weight 2-propanol (isopropanol) solvent. The specific gravity of the flux shall be maintained within the range of 0,838 to 0,913 at 25 °C. The specification shall be as follows:

Colophony

Colour	To WW colour specification or paler
Acid value (mg KOH/g colophony)	155 (minimum)
Softening point (ball and ring)	70 °C (minimum)
Flow point (Ubbelohde)	76 °C (minimum)
Ash	0,05 % (maximum).
Solubility	A solution of the colophony in an equal part by weight of 2-propanol (isopropanol) shall be clear, and after a week at room temperature there shall be no sign of a deposit.

2-propanol (isopropanol)

Purity	Minimum 99,5 % 2-propanol (isopropanol) by weight
Acidity as acetic acid	Maximum 0,002 % weight (other than carbon dioxide)
Non-volatile matter	Maximum 2 mg per 100 ml.

2.6.2 Solder

2.6.2.1 Tin-lead

Unless otherwise detailed in the relevant specification, the solder specification for SnPb shall be as follows:

Chemical composition

The composition in percentage by weight shall be as follows:

Tin	59 % to 61 %
Antimony	0,5 % maximum
Copper	0,1 % maximum
Arsenic	0,05 % maximum
Iron	0,02 % maximum
Lead	the remainder.

The solder shall not contain such impurities as aluminium, zinc or cadmium in amounts which will adversely affect the properties of the solder.