
Semiconductor devices - Mechanical and climatic test methods - Part 20:
Resistance of plastic- encapsulated SMDs to the combined effect of moisture and
soldering heat (IEC 60749-20:2002)

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English version

**Semiconductor devices -
Mechanical and climatic test methods
Part 20: Resistance of plastic-encapsulated SMDs to the combined effect
of moisture and soldering heat
(IEC 60749-20:2002)**

Dispositifs à semiconducteurs -
Méthodes d'essais mécaniques
et climatiques

Partie 20: Résistance des CMS à boîtier
plastique à l'effet combiné de l'humidité
et de la chaleur de soudage
(CEI 60749-20:2002)

Halbleiterbauelemente -

Mechanische und klimatische Prüfverfahren
Teil 20: Beständigkeit kunststoffverkappter
oberflächenmontierbarer Bauelemente
(SMD) gegenüber der kombinierten
Beanspruchung von Feuchte und Lötwärme
(IEC 60749-20:2002)

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This European Standard was approved by CENELEC on 2002-09-24. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of the International Standard IEC 60749-20:2002 was approved by CENELEC as EN 60749-20 on 2002-09-24.

The text of this International Standard was reproduced from IEC 60749:1996, chapter 2, subclause 2.3 without change. Therefore, it has not been submitted to vote a second time and is still based on document 47/1574/FDIS.

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) 2004-01-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-10-01

Each test method governed by this standard and which is part of the series is a stand-alone document, numbered EN 60749-2, EN 60749-3, etc. The numbering of these test methods is sequential, and there is no relationship between the number and the test method (i.e. no grouping of test methods). The list of these tests will be available in the CENELEC internet site and in the catalogue.

Updating of any of the individual test methods is independent of any other part.

Annexes designated "normative" are part of the body of the standard.

In this standard, annex ZA is normative.

Annex ZA has been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 60749-20:2002 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-2-20	1979	Basic environmental testing procedures Part 2: Tests - Test T: Soldering	HD 323.2.20 S3 ¹⁾	1988
IEC 60749-3	- ²⁾	Semiconductor devices - Mechanical and climatic test methods Part 3: External visual examination	EN 60749-3	2002 ³⁾

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¹⁾ HD 323.2.20 S3 includes A2:1987 to IEC 60068-2-20:1979.

²⁾ Undated reference.

³⁾ Valid edition at date of issue.

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**Dispositifs à semiconducteurs –
Méthodes d'essais mécaniques et climatiques –**

Partie 20:

**Résistance des CMS à boîtier plastique
à l'effet combiné de l'humidité et de la
chaleur de soudage**

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**Semiconductor devices –
Mechanical and climatic test methods –**

Part 20:

**Resistance of plastic-encapsulated SMDs
to the combined effect of moisture
and soldering heat**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SEMICONDUCTOR DEVICES –
MECHANICAL AND CLIMATIC TEST METHODS –

**Part 20: Resistance of plastic-encapsulated SMDs to
the combined effect of moisture and soldering heat**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60749-20 has been prepared by IEC technical committee 47: Semiconductor devices.

The text of this test method is reproduced from IEC 60749 Ed.2, chapter 2, subclause 2.3 without change. It has therefore not been submitted to vote a second time and is still based on the following documents:

FDIS	Report on voting
47/1574/FDIS	47/1576/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

Each test method governed by IEC 60749-1 and which is part of the series is a stand-alone document, numbered IEC 60749-2, IEC 60749-3, etc. The numbering of these test methods is sequential, and there is no relationship between the number and the test method (i.e. no grouping of test methods). The list of these tests will be available in the IEC Internet site and in the catalogue.

Updating of any of the individual test methods is independent of any other part.

The committee has decided that the contents of this publication will remain unchanged until 2007. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

The contents of the corrigendum of August 2003 have been included in this copy.

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INTRODUCTION

Activity within IEC technical committee 47, working group 2, includes the generation, coordination and review of climatic, electrical (of which only ESD, latch-up and electrical conditions for life tests are considered), mechanical test methods, and associated inspection techniques needed to assess the quality and reliability of the design and manufacture of semiconductor products and processes.

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SEMICONDUCTOR DEVICES – MECHANICAL AND CLIMATIC TEST METHODS –

Part 20: Resistance of plastic-encapsulated SMDs to the combined effect of moisture and soldering heat

1 Scope and object

This part of IEC 60749 applies to semiconductor devices (discrete devices and integrated circuits).

This test method provides a means of assessing the resistance to soldering heat of plastic-encapsulated surface mount devices (SMDs). This test is destructive.

NOTE This test is identical to the test method contained in 2.3 of chapter 2 of IEC 60749 (1996), amendment 2, apart from the addition of this clause and clause 2 and the subsequent renumbering.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-2-20:1979, *Environmental testing – Part 2: Tests – Test T: Soldering*
[SIST EN 60749-20:2004](#)

IEC 60749-3, *Semiconductor devices – Mechanical and climatic test methods – Part 3: External visual inspection*
[c09791909cb0/sist-en-60749-20-2004](#)

3 General description

Package cracking and electrical failure in plastic-encapsulated SMDs can result when soldering heat raises the vapour pressure of moisture which has been absorbed into SMDs during storage. These problems are assessed. In this test method, SMDs are evaluated for heat resistance after being soaked in an environment which simulates moisture being absorbed while under storage in a warehouse or dry pack.

4 Test apparatus and materials

a) Humidity chamber

The humidity chamber shall provide an environment complying with the temperature and relative humidity defined in item c) of clause 5.

b) Reflow soldering apparatus

The infra-red convection, the convection and the vapour-phase reflow soldering apparatus shall provide temperature profiles complying with the conditions of soldering heat defined in items d)1) and d)2) of clause 5. The settings of the reflow soldering apparatus shall be adjusted by temperature profiling of the top surface of the specimen while it is undergoing the soldering heat process, measured as shown in figure 1.