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Semiconductor devices - Mechanical and climatic test methods - Part 3: External visual examination (IEC 60749-3:2002)

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EUROPEAN STANDARD

**EN 60749-3**

NORME EUROPÉENNE

EUROPÄISCHE NORM

August 2002

ICS 31.080.01

Partly supersedes EN 60749:1999 + A1:2000 + A2:2001

English version

**Semiconductor devices -  
Mechanical and climatic test methods  
Part 3: External visual examination  
(IEC 60749-3:2002)**

Dispositifs à semiconducteurs -  
Méthodes d'essais mécaniques  
et climatiques  
Partie 3: Examen visuel externe  
(CEI 60749-3:2002)

Halbleiterbauelemente -  
Mechanische und klimatische  
Prüfverfahren  
Teil 3: Äußere Sichtprüfung  
(IEC 60749-3:2002)

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This European Standard was approved by CENELEC on 2002-07-02. 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.

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**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 document 47/1596/FDIS, future edition 1 of IEC 60749-3, prepared by IEC TC 47, Semiconductor devices, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60749-3 on 2002-07-02.

This mechanical and climatic test method, as it relates to external visual examination, is a complete rewrite of the test contained in clause 5, chapter 1 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) 2003-04-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2005-07-01

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## Endorsement notice

The text of the International Standard IEC 60749-3:2002 was approved by CENELEC as a European Standard without any modification.

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NORME  
INTERNATIONALE  
INTERNATIONAL  
STANDARD

CEI  
IEC

60749-3

Première édition  
First edition  
2002-04

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

**Partie 3:  
Examen visuel externe**

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**Part 3:  
External visual examination**

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Commission Electrotechnique Internationale  
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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SEMICONDUCTOR DEVICES –  
MECHANICAL AND CLIMATIC TEST METHODS –**

**Part 3: External visual examination**

**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 60749-3 has been prepared by IEC technical committee 47: Semiconductor devices.

The text of this standard is based on the following documents:

FDIS	Report on voting
47/1596/FDIS	47/1611/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 mechanical and climatic test method, as it relates to external visual examination, is a complete rewrite of the test contained in clause 5, chapter 1 of IEC 60749.

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

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.

## SEMICONDUCTOR DEVICES – MECHANICAL AND CLIMATIC TEST METHODS –

### Part 3: External visual examination

#### 1 Scope

The purpose of this part of IEC 60749 is to verify that the materials, design, construction, markings, and workmanship of a semiconductor device are in accordance with the applicable procurement document. External visual inspection is a non-destructive test and applicable for all package types. The test is useful for qualification, process monitor, or lot acceptance, or both.

#### 2 Test apparatus

Apparatus used in this test shall be capable of demonstrating device conformance to the applicable requirements, which may include optical equipment capable of magnification between 3× and 10× and a relatively large and accessible field of view such as an illuminated ring magnifier.

#### 3 Procedure

The device shall be examined in accordance with the requirements of the relevant specification and the criteria listed in clause 4. Where adherence of foreign material is in question, devices may be subjected to a clean filtered air stream (suction or expulsion) of 27 ms<sup>-1</sup> maximum, and reinspected.

#### 4 Failure criteria

Devices shall be considered a failure if they exhibit any of the following:

**4.1** Device design, terminal identification, markings (content, placement, and legibility), materials, construction, and workmanship, are not in accordance with the applicable procurement document.

**4.2** Visible evidence of corrosion, contamination or breakage (grossly bent or broken terminals, cracked seals – except for glass meniscus), defective (peeling, flaking, or blistering) or damaged plating or exposed base metal. (Discoloration of the finish shall not be cause for failure unless there is evidence of flaking, pitting or corrosion.)

**4.3** Terminals that are not intact and aligned in their normal location, free of sharp or unspecified terminal bends, and (for ribbon terminals) free of twist outside the normal terminal plane.

**4.4** Terminals that are not free of foreign material such as paint or other adherent deposits.

**4.5** Evidence of any non-conformance with the detail drawing or applicable procurement document, absence of any required feature, or evidence of damage, corrosion or contamination that will interfere with the normal application of the device.

**4.6** Defects or damage resulting from manufacturing, handling, testing, or the following:

- a) Cracked or broken packages. Surface scratches shall not be cause for failure, except where they violate other criteria stated herein for marking, finish, etc.
- b) Any chip-out dimension that exceeds 1,5 mm in any direction on the surface and has a depth that exceeds 25 % of the thickness of the affected package element (i.e. cover, base or wall).
- c) Any chip-out that exposes either sealing glass (not previously exposed prior to the chip-out) or any terminal frame material that is not intended to be exposed by design.

**5 Summary**

The following details shall be specified in the relevant specification:

- a) Requirements for markings and the terminal identification (see 4.1).
- b) Detailed requirements for materials, design, construction, and workmanship (see 4.1).
- c) Sample size.

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