



BSI Standards Publication

Semiconductor devices — Mechanical and climatic test methods —

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

National foreword

This British Standard is the UK implementation of EN 60749-20:2009. It is identical to IEC 60749-20:2008. It supersedes BS EN 60749-20:2003 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EPL/47, Semiconductors.

A list of organizations represented on this committee can be obtained on request to its secretary.

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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 60749-20:2008)**

Dispositifs à semiconducteurs -
Méthodes d'essais mécaniques
et climatiques -
Partie 20: Résistance
des CMS à boîtiers plastique
à l'effet combiné de l'humidité
et de la chaleur de brasage
(CEI 60749-20:2008)

Halbleiterbauelemente -
Mechanische und klimatische
Prüfverfahren -
Teil 20: Beständigkeit kunststoffverkappter
oberflächenmontierbarer Bauelemente
(SMD) gegenüber der kombinierten
Beanspruchung von Feuchte
und Lötwärme
(IEC 60749-20:2008)

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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 47/1989/FDIS, future edition 2 of IEC 60749-20, prepared by IEC TC 47, Semiconductor devices, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60749-20 on 2009-09-01.

This European Standard supersedes EN 60749-20:2003.

The main changes are as follows:

- to reconcile certain classifications of EN 60749-20 and those of IPC/JEDEC J-STD-020C;
- reference EN 60749-35 instead of Annex A of EN 60749-20:2003;
- update for lead-free solder;
- correct certain errors in EN 60749-20:2003.

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) 2010-06-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2012-09-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60749-20:2008 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

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	2008	Environmental testing - Part 2-20: Tests - Test T: Test methods for solderability and resistance to soldering heat of devices with leads	EN 60068-2-20	2008
IEC 60749-3	- ¹⁾	Semiconductor devices - Mechanical and climatic test methods - Part 3: External visual examination	EN 60749-3	2002 ²⁾
IEC 60749-35	- ¹⁾	Semiconductor devices - Mechanical and climatic test methods - Part 35: Acoustic microscopy for plastic encapsulated electronic components	EN 60749-35	2006 ²⁾

¹⁾ Undated reference.

²⁾ Valid edition at date of issue.

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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

This part of IEC 60749 provides a means of assessing the resistance to soldering heat of semiconductors packaged as plastic encapsulated surface mount devices (SMDs). This test is destructive.

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 60068-2-20:2008, *Environmental testing – Part 2-20: Tests – Test T: Test methods for solderability and resistance to soldering heat of devices with leads*

IEC 60749-3, *Semiconductor devices – Mechanical and climatic test methods – Part 3: External visual inspection*

IEC 60749-35, *Semiconductor devices – Mechanical and climatic test methods – Part 35: Acoustic microscopy for plastic encapsulated electronic components*

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.

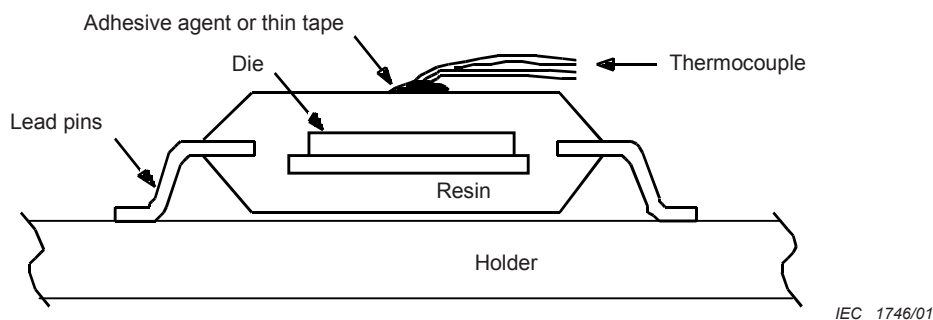
4 Test apparatus and materials

4.1 Humidity chamber

The humidity chamber shall provide an environment complying with the temperature and relative humidity defined in 5.3.

4.2 Reflow soldering apparatus

The infrared convection, the convection and the vapour-phase reflow soldering apparatus shall provide temperature profiles complying with the conditions of soldering heat defined in 5.4.2 and 5.4.3. 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.



NOTE The adhesive agent or thin tape should have good thermal conductivity.

Figure 1 – Method of measuring the temperature profile of a specimen

4.3 Holder

Unless otherwise detailed in the relevant specification, any board material, such as epoxy fibreglass or polyimide, may be used for the holder. The specimen shall be placed on the holder by the usual means and in a position as shown in Figure 1. If the position of the specimen, as shown in Figure 1, necessitates changing the shape of terminations and results in subsequent electrical measurement anomalies, a position that avoids changing the shape of terminations may be chosen, and this shall be specified in the relevant specification.

4.4 Wave-soldering apparatus

The wave-soldering apparatus shall comply with conditions given in 5.4.4. Molten solder shall usually be flowed.

4.5 Solvent for vapour-phase reflow soldering

Perfluorocarbon (perfluoroisobutylene) shall be used.

4.6 Flux

Unless otherwise detailed in the relevant specification, the flux shall consist of 25 % by weight of colophony in 75 % by weight of isopropyl alcohol, both as specified in Annex B of IEC 60068-2-20:2008.

4.7 Solder

Solder of composition as specified in Table 1 of IEC 60068-2-20:2008 shall be used.

5 Procedure

5.1 Initial measurements

5.1.1 Visual inspection

Visual inspection, as specified in IEC 60749-3, shall be performed before the test. Special attention shall be paid to external cracks and swelling, which will be looked for under a magnification of 40×.

5.1.2 Electrical measurement

Electrical testing shall be performed as required by the relevant specification.

5.1.3 Internal inspection by acoustic tomography

Unless otherwise detailed in the relevant specification, internal cracks and delamination in the specimen shall be inspected by acoustic tomography in accordance with IEC 60749-35.

5.2 Drying

Unless otherwise detailed in the relevant specification, the specimen shall be baked at 125 °C $\pm$ 5 °C for at least 24 h.

5.3 Moisture soak

5.3.1 General

Unless otherwise detailed in the relevant specification, moisture soak conditions shall be selected on the basis of the packing method of the specimen (see A.1.1). If baking the specimen before soldering is detailed in the relevant specification, the specimen shall be baked instead of being subject to moisture soak.

5.3.2 Conditions for non-dry-packed SMDs

The moisture soak condition shall be selected from Table 1, in accordance with the permissible limit of actual storage (see A.1.2.1).

Table 1 – Moisture soak conditions for non-dry-packed SMDs

Condition	Temperature °C	Relative humidity %	Duration time h	Permissible limit on actual storage
A1 or B1	85 $\pm$ 2	85 $\pm$ 5	168 $\pm$ 24	<30 °C, 85 % RH
RH: Relative humidity				
NOTE Conditions A1 and B1 indicate moisture soak for non-dry-packed SMDs under either method A or B.				

5.3.3 Moisture soak for dry-packed SMDs

5.3.3.1 General

Moisture soak conditions for dry-packed SMDs may be used as specified in method A, Table 2, or method B, Table 3. Moisture soak conditioning for dry-packed SMDs consists of two stages. The first stage of conditioning is intended to simulate moisturizing SMDs before opening the dry pack/dry cabinet. The second stage of conditioning is to simulate moisturizing SMDs during storage after opening the dry pack for soldering (floor life). Moisture soak conditioning for dry-packed SMDs shall be selected from method A or B. Method A shall be used when the relative humidity in the dry pack or dry cabinet is specified by the manufacturer as being between 10 % and 30 %. Method B shall be used when the relative humidity in the dry pack or dry cabinet is specified by the manufacturer as being below 10 %.