IEC 60749-30

Edition 1.1 2011-08

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Semiconductor devices – Mechanical and climatic test methods – Part 30: Preconditioning of non-hermetic surface mount devices prior to reliability testing

Dispositifs à semiconducteurs – Méthodes d'essais mécaniques et climatiques – Partie 30: Préconditionnement des composants pour montage en surface non hermétiques avant les essais de fiabilité

IEC 60749-30:2005+A1:2011

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SEMICONDUCTOR DEVICES – MECHANICAL AND CLIMATIC TEST METHODS –

Part 30: Preconditioning of non-hermetic surface mount devices prior to reliability testing

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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This consolidated version of IEC 60749-30 consists of the first edition (2005) [documents 47/1790/FDIS and 47/1798/RVD] and its amendment 1 (2011) [documents 47/2019/CDV and 47/2075/RVC]. It bears the edition number 1.1.

The technical content is therefore identical to the base edition and its amendment and has been prepared for user convenience. A vertical line in the margin shows where the base publication has been modified by amendment 1. Additions and deletions are displayed in red, with deletions being struck through.

International Standard IEC 60749-30 has been prepared by IEC technical committee 47: Semiconductor devices.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

IEC 60749 consists of the following parts, under the general title *Semiconductor devices – Mechanical and climatic test methods:*

Part 1: General
Part 2: Low air pressure
Part 3: External visual inspection
Part 4: Damp heat, steady state, highly accelerated stress test (HAST)
Part 5: Steady-state temperature humidity bias life test
Part 6: Storage at high temperature
Part 7: Internal moisture content measurement and the analysis of other residual gases
Part 8: Sealing
Part 9: Permanence of marking
Part 10: Mechanical shock
Part 11: Rapid change of temperature – Two-fluid-bath method
Part 12: Vibration, variable frequency
Part 13: Salt atmosphere
Part 14: Robustness of terminations (lead integrity)
Part 15: Resistance to soldering temperature for through-hole mounted devices
Part 16: Particle impact noise detection (PIND)
Part 17: Neutron irradiation
Part 18: Ionizing radiation (total dose)
Part 19: Die shear strength
Part 20: Resistance of plastic-encapsulated SMDs to the combined effect of moisture and soldering heat
Part 21: Solderability
Part 22: Bond strength
Part 23: High temperature operating life
Part 24: Accelerated moisture resistance – Unbiased HAST
Part 25: Temperature cycling
Part 26: Electrostatic discharge (ESD) sensitivity testing – Human body model (HBM)
Part 27: Electrostatic discharge (ESD) sensitivity testing – Machine model (MM)
Part 28: Electrostatic discharge (ESD) sensitivity testing – Charged device model (CDM)[1]
Part 29: Latch-up test
Part 30: Preconditioning of non-hermetic surface mount devices prior to reliability testing[1]
Part 31: Flammability of plastic-encapsulated devices (internally induced)
Part 32: Flammability of plastic-encapsulated devices (externally induced)
Part 33: Accelerated moisture resistance – Unbiased autoclave
Part 34: Power cycling

[1] To be published

Part 35: Acoustic microscopy for non-hermetic, encapsulated electronic components[2]

Part 36: Acceleration, steady state.

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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

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2 In preparation

SEMICONDUCTOR DEVICES – MECHANICAL AND CLIMATIC TEST METHODS –

Part 30: Preconditioning of non-hermetic surface mount devices prior to reliability testing

1 Scope

This part of IEC 60749 establishes a standard procedure for determining the preconditioning of non-hermetic surface mount devices (SMDs) prior to reliability testing.

The test method defines the preconditioning flow for non-hermetic solid-state SMDs representative of a typical industry multiple solder reflow operation.

These SMDs should be subjected to the appropriate preconditioning sequence described in this standard prior to being submitted to specific in-house reliability testing (qualification and/or reliability monitoring) in order to evaluate long term reliability (impacted by soldering stress).

NOTE Correlation of moisture-induced stress sensitivity conditions (or moisture sensitivity levels (MSL)) in accordance with IEC 60749-20 and this specification and actual reflow conditions used are dependent upon identical temperature measurement by both the semiconductor manufacturer and the board assembler. Therefore, it is recommended that the temperature at the top of the package on the hottest moisture sensitive SMD during assembly be monitored to ensure that it does not exceed the temperature at which the components are evaluated.

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 60749-4, *Semiconductor devices – Mechanical and climatic test methods – Part 4: Damp heat, steady state, highly accelerated stress test (HAST)*

IEC 60749-5, *Semiconductor devices – Mechanical and climatic test methods – Part 5: Steady-state temperature humidity bias life test*

IEC 60749-11, *Semiconductor devices – Mechanical and climatic test methods – Part 11: Rapid change of temperature – Two-fluid-bath method*

IEC 60749-20:2008~~2~~, *Semiconductor devices – Mechanical and climatic test methods – Part 20: Resistance of plastic-encapsulated SMDs to the combined effects of moisture and soldering heat*

IEC 60749-24, *Semiconductor devices – Mechanical and climatic test methods – Part 24: Accelerated moisture resistance – Unbiased HAST*

IEC 60749-25:2003, *Semiconductor devices – Mechanical and climatic test methods – Part 25: Temperature cycling*

IEC 60749-33, *Semiconductor devices – Mechanical and climatic test methods – Part 33: Accelerated moisture resistance – Unbiased autoclave.*

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. In this test method, such problems are assessed and 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

This test method requires, as a minimum, access to the following equipment.

4.1 Moisture chamber

Moisture chamber(s) capable of operating at 85 °C/85 % RH (relative humidity), 85 °C/60 % RH, 85 °C/30 % RH, 30 °C/70 % RH and 30 °C/60 % RH. Within the chamber working area, temperature tolerance shall be ±2 °C and the RH tolerance shall be ±3 % RH.

4.2 Solder equipment

Solder equipment shall consist of the following.

a) 100 % convection reflow system capable of maintaining the reflow profiles required by this specification. This is the preferred equipment for solder reflow.

b) VPR (vapour phase reflow) chamber capable of operating from 215-219 °C and/or (235 ± 5) °C with appropriate fluids. The chamber shall be capable of heating the packages without collapsing the vapour blanket and re-condensing the vapour to minimize loss of the vapour phase soldering liquid. The vapour phase soldering fluid shall vaporize at the appropriate temperature specified above.

c) Infrared (IR)/convection solder reflow equipment capable of maintaining the reflow profiles required by this specification. It is recommended that this equipment use the IR to heat the air and not directly impinge upon the components under test.

d) Wave-solder equipment capable of maintaining the conditions of item ~~d)3) of Clause 5~~ 5.4.4 of IEC 60749-20:2008.

NOTE The moisture sensitivity condition (classification) test results are dependent upon the package body temperature, rather than board or lead temperature. Convection and VPR are known to be more controllable and repeatable than IR. When there are correlation problems between VPR, IR/convection, and convection, the convection results should be considered as the standard.

4.3 Optical microscope

Optical microscope (40X for external visual examination).

4.4 Electrical test equipment

Electrical test equipment capable of performing room temperature d.c. test and functional tests.