

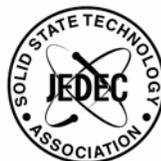
**Accelerated moisture resistance –
Unbiased HAST**

Without
IECNORM.COM. Click to view the full PDF of IEC PAS 62336:2002

PUBLICLY AVAILABLE SPECIFICATION



INTERNATIONAL
ELECTROTECHNICAL
COMMISSION



Reference number
IEC/PAS 62336

IECNORM.COM: Click to view the full PDF of IEC PAS 62386:2002

Withdrawn

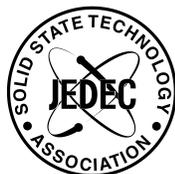
JEDEC STANDARD

Accelerated Moisture Resistance - Unbiased HAST

JESD22-A118

DECEMBER 2000

JEDEC SOLID STATE TECHNOLOGY ASSOCIATION



IECNORM.COM: Click to view the full PDF of IEC PAS 62386:2002

Withdrawn

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ACCELERATED MOISTURE RESISTANCE –
UNBIASED HAST**

FOREWORD

A PAS is a technical specification not fulfilling the requirements for a standard, but made available to the public and established in an organization operating under given procedures.

IEC-PAS 62336 was submitted by JEDEC and has been processed by IEC technical committee 47: Semiconductor devices.

The text of this PAS is based on the following document:

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document:

Draft PAS	Report on voting
47/1635/PAS	47/1645RVD

Following publication of this PAS, the technical committee or subcommittee concerned will investigate the possibility of transforming the PAS into an International Standard.

An IEC-PAS licence of copyright and assignment of copyright has been signed by the IEC and JEDEC and is recorded at the Central Office.

This PAS shall remain valid for no longer than 3 years starting from 2002-08. The validity may be extended for a single 3-year period, following which it shall be revised to become another type of normative document, or shall be withdrawn.

- 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 PAS may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

NOTICE

JEDEC standards and publications contain material that has been prepared, reviewed, and approved through the JEDEC Board of Directors level and subsequently reviewed and approved by the EIA General Counsel.

JEDEC standards and publications are designed to serve the public interest through eliminating misunderstandings between manufacturers and purchasers, facilitating interchangeability and improvement of products, and assisting the purchaser in selecting and obtaining with minimum delay the proper product for use by those other than JEDEC members, whether the standard is to be used either domestically or internationally.

JEDEC standards and publications are adopted without regard to whether or not their adoption may involve patents or articles, materials, or processes. By such action JEDEC does not assume any liability to any patent owner, nor does it assume any obligation whatever to parties adopting the JEDEC standards or publications.

The information included in JEDEC standards and publications represents a sound approach to product specification and application, principally from the solid state device manufacturer viewpoint. Within the JEDEC organization there are procedures whereby an JEDEC standard or publication may be further processed and ultimately become an ANSI/EIA standard.

No claims to be in conformance with this standard may be made unless all requirements stated in the standard are met.

Inquiries, comments, and suggestions relative to the content of this JEDEC standard or publication should be addressed to JEDEC Solid State Technology Association, 2500 Wilson Boulevard, Arlington, VA 22201-3834, (703)907-7560/7559 or www.jedec.org

Published by
JEDEC Solid State Technology Association 2000
2500 Wilson Boulevard
Arlington, VA 22201-3834

ACCELERATED MOISTURE RESISTANCE - UNBIASED HAST

(From JEDEC Board Ballot JCB-00-56, formulated under the cognizance of the JC-14.1 Subcommittee on Reliability Test Methods for Packaged Devices.)

1 Purpose

The Unbiased HAST is performed for the purpose of evaluating the reliability of non-hermetic packaged solid-state devices in humid environments. It is a highly accelerated test which employs temperature and humidity under non-condensing conditions to accelerate the penetration of moisture through the external protective material (encapsulant or seal) or along the interface between the external protective material and the metallic conductors which pass through it. Bias is not applied in this test to ensure the failure mechanisms potentially overshadowed by bias can be uncovered (e.g. galvanic corrosion). This test is used to identify failure mechanisms internal to the package and is destructive.

2 Scope

This test method applies primarily to moisture resistance evaluations and robustness testing, and may be used as an alternative to unbiased autoclave. Samples are subjected to a non-condensing, humid atmosphere, similar to the JESD-22-A101, "Steady State Temperature, Humidity and Bias Life Test", but with a higher temperature. For the temperature limits defined by this procedure, the test will typically generate the same failure mechanisms as those in an unbiased "85 °C/85%RH" Steady State Humidity Life Test, but caution must be used if higher temperatures are considered since non-realistic failure modes can be generated. The use of a non-condensing environment avoids many irrelevant external failures, e.g., pin-to-pin leakage or lead corrosion. However, because absorbed moisture typically decreases glass transition temperature for most polymeric materials, the combination of high humidity and high temperature ($> T_g$) may produce unrealistic material failures. Thus, caution is needed if and when Unbiased HAST is required for reliability or qualification purposes.

3 Apparatus

The test requires a pressure chamber capable of maintaining a specified temperature and relative humidity during ramp-up to, and ramp-down from, the specified test conditions.

3 Apparatus (cont'd)

3.1 Records

A permanent record of the temperature profile for each test cycle is recommended, so the stress conditions can be verified. Calibration records shall verify that the equipment avoids condensation on devices under test (DUTs) hotter than 50 °C during ramp-up and ramp-down for conditions of maximum thermal mass loading. Calibration records shall verify that, for steady state conditions and maximum thermal mass loading, test conditions are maintained within the tolerances specified in 3.1.

3.2 Devices Under Stress

Devices under stress must be placed in the chamber to minimize temperature gradients. Devices under stress shall be no closer than 3 cm from internal chamber surfaces, and must not be subjected to direct radiant heat from heaters. If devices are mounted on boards, the boards should be oriented to minimize interference with vapor circulation.

3.3 Ionic Contamination

Care must be exercised in the choice of any materials introduced into the chamber in order to minimize release of contamination, and minimize degradation due to corrosion and other mechanisms. Ionic contamination of the test apparatus shall be controlled to avoid test artifacts.

3.4 Distilled or Deionized Water

Distilled or deionized water with a minimum resistivity of 1 megohm-cm at room temperature shall be used.

4 Test conditions

Test conditions consist of a temperature, relative humidity, and duration.

Table 1 — Temperature, relative humidity and pressure

Test condition ^{3,4}	Temperature ¹ (dry bulb °C)	Relative humidity ¹ (%)	Temperature ² (wet bulb, °C)	Vapor pressure ² (psia/kPa)
A	130 ± 2	85 ± 5	124.7	33.3/230
B	110 ± 2	85 ± 5	105.2	17.7/122

NOTES

- 1 Tolerances apply to the entire usable test area.
- 2 For information only.
- 3 The test conditions are to be applied continuously except during any interim readouts. For interim readouts, devices should be returned to stress within the time specified in 5.4
- 4 The unbiased HAST duration is intended to meet or exceed an equivalent field lifetime under use conditions. The duration is established based on the acceleration of the stress (see JEP122). The stress duration is specified by internal qualification requirements, JESD47 or the applicable procurement document. Typical test durations are:

Condition	Duration
A	96 hours (-0,+2)
B	264 hours (-0, +2).

CAUTION: For plastic-encapsulated microcircuits, it is known that moisture reduces the effective glass transition temperature of the molding compound. Stress temperatures above the effective glass transition temperature may lead to failure mechanisms unrelated to operational use.

5 Procedure

The test devices shall be mounted in a manner that exposes them to a specified condition of temperature and humidity. Exposure of devices to conditions that result in condensation on them, particularly during ramp-up and ramp-down, shall be avoided. While devices are above 30 °C, R.H. must be ≥ 40% to ensure their moisture content is not reduced, i.e., inadvertant moisture bake out.

5 Procedure (cont'd)

5.1 Ramp-up

5.1.1 The time to reach stable temperature and relative humidity conditions shall be less than 3 hours.

5.1.2 Condensation shall be avoided by ensuring that the test chamber (dry bulb) temperature exceeds the wet-bulb temperature at all times, and that the rate of ramp up shall not be faster than a rate which ensures that the temperature of any DUT does not lag below the wet bulb temperature.

5.1.3 The dry- and wet-bulb temperature set points shall be maintained so that the relative humidity is not less than 50 % after significant heating begins. In a dry laboratory, the chamber ambient may initially be drier than this.

5.2 Ramp-down

5.2.1 The first part of ramp-down to a slightly positive gauge pressure (a wet bulb temperature of about 104 °C) shall be long enough to avoid test artifacts due to rapid depressurization, but shall not exceed 3 hours.

5.2.2 The second part of ramp-down from a wet bulb temperature of 104 °C to room temperature shall occur with the chamber vented. There is no time restriction, and forced cooling of the vessel is permitted.

5.2.3 Condensation on devices shall be avoided in both parts of the ramp down by ensuring that the test chamber (dry bulb) temperature exceeds the wet-bulb temperature at all times.

5.2.4 Ramp-down should maintain the moisture content of the molding compound encapsulating the die. Therefore, the relative humidity shall not be less than 50 % during the first part of the ramp-down, see 5.2.1.

5.3 Test Clock

The test clock starts when the temperature and relative humidity reach the set points, and stops at the beginning of ramp-down.

5 Procedure (cont'd)

5.4 Readout

Electrical test shall be performed not later than 48 hours after the end of ramp-down. Note: For intermediate readouts, devices shall be returned to stress within 96 hours of the end of ramp-down. The rate of moisture loss from devices after removal from the chamber can be reduced by placing the devices in sealed moisture barrier bags, the bags should be non-vacuum sealed without a N₂ purge and without dessicant. When devices are placed in sealed bags, the "test window clock" runs at 1/3 of the rate of devices exposed to the laboratory ambient. Thus the 130 °C/85 %R.H. test window can be extended to as much as 144 hours, and the time to return to stress to as much as 288 hours by enclosing the devices in sealed moisture barrier bags.

5.5 Handling

Suitable hand-covering shall be used to handle devices, boards and fixtures. Contamination control is important in any highly accelerated moisture stress test.

6 Failure criteria

A device will be considered to have failed if parametric limits are exceeded, or if functionality cannot be demonstrated under nominal and worst-case conditions as specified in the applicable procurement document or data sheet.

7 Safety

Follow equipment manufacturer's recommendations and local safety regulations.

8 Summary

The following details shall be specified in the applicable procurement document:

- (a) Test duration
- (b) Test conditions
- (c) Measurements after test.