

Temperature cycling

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INTERNATIONAL
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Reference number
IEC/PAS 62178

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JEDEC STANDARD

Temperature Cycling

JESD22-A104-A

(Revision of Test Method A104 - previously published in JESD22-B)

DECEMBER 1989

ELECTRONIC INDUSTRIES ASSOCIATION
ENGINEERING DEPARTMENT



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IEC-PAS 62178 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
47/1451/PAS	47/1484/RVD

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TEST METHOD A104-A
TEMPERATURE CYCLING

(From JEDEC Council Ballot JCB-88-38A, formulated under the cognizance of JC-14.1 Committee on Reliability Test Methods for Packaged Devices.)

1. PURPOSE

This test is conducted to determine the resistance of a part to extremes of high- and low-temperatures, and to the effect of alternate exposures to these extremes.

1.1 Terms and Definitions

1.1.1 Load

The specimens under test and the fixtures holding those specimens during test. Maximum load shall be determined by using the worst-case load temperature with specific specimen loading. Monolithic loads used to simulate loading may not be appropriate when air circulation is reduced by load configuration. The maximum loading must meet the specified conditions.

1.1.2 Monitoring Sensor

The temperature sensor that is located and calibrated so as to indicate the same temperature as at the worst-case indicator specimen location. The worst-case indicator specimen location is identified during the periodic characterization of the worst-case load temperature.

1.1.3 Worst-Case Load Temperature

The temperature of specific specimens as indicated by thermocouples imbedded in their bodies. These indicator specimens shall be located at the center and at each corner of the load. The worst-case load temperature is determined at periodic intervals.

1.1.4 Working Zone

The volume in the chamber(s) in which the temperature of the load is controlled within the limits specified in Table 1.

1.1.5 Specimen

The device or individual piece being tested.

1.1.6 Transfer Time

The elapsed time between specimen removal from one temperature extreme and introduction into the other.

1.1.7 Maximum Load

The largest load for which the worst-case load temperature meets the timing requirements (see 3.1).

1.1.8 Dwell Time

The time from introduction of the load into the chamber until the load is transferred out of the chamber.

2. APPARATUS

The chamber(s) used shall be capable of providing and controlling the specified temperatures in the working zone(s) when the chamber is loaded with a maximum load. The thermal capacity and air circulation must enable the working zone and loads to meet the specified conditions and timing (see 3.1). Worst-case load temperature shall be continually monitored during test by indicators or recorders reading the monitoring sensor(s). Direct heat conduction to specimens shall be minimized.

3. PROCEDURE

Specimens shall be placed in such a position with respect to the airstream that there is substantially no obstruction to the flow of air across and around the specimen. When special mounting is required, it shall be specified. The specimen shall then be subjected to the specified condition for the specified number of cycles performed continuously. This test shall be conducted for a minimum of 10 cycles using test condition C. One cycle consists of steps 1 and 2 or the applicable test condition and must be completed without interruption to be counted as a cycle. Completion of the total number of cycles specified for the test may be interrupted for the purpose of test chamber loading or unloading of device lots or as the result of power or equipment failure. However, if the number of interruptions for any reason exceeds 10% of the total number of cycles specified, the test must be restarted from the beginning.

3.1 Timing

The total transfer time from hot to cold or from cold to hot shall not exceed one minute. The load may be transferred when the worst-case load temperature is within the limits specified in Table 1. However, the dwell time shall not be less than 10 minutes and the load shall reach the specified temperature within 15 minutes.

Table 1
Temperature Cycling Test Conditions

Condition A	Low Temperature (°C)	High Temperature (°C)
A	-55 (+0, -10)	+85 (+10, -0)
B	-55 (+0, -10)	+125 (+10, -0)
C	-65 (+0, -10)	+150 (+10, -0)
D	-65 (+0, -10)	+200 (+10, -0)*
F	-65 (+0, -10)	+175 (+10, -0)*
G	-40 (+0, -10)	+125 (+10, -0)
H	-55 (+0, -10)	+150 (+10, -0)

***CAUTION:** May exceed glass transition temperature of plastic packages.

NOTE: Recommended cycles for lot acceptance screen = 10 cycles.
Recommended cycles for qualification = 1000 cycles.

3.2 Measurements

Hermeticity tests, for hermetic devices, visual examination, and electrical measurements that consist of parametric and functional tests, shall be taken as specified in the applicable procurement document.