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Test Method A105-B

Power and Temperature Cycling

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ELECTRONIC INDUSTRIES ASSOCIATION
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POWER AND TEMPERATURE CYCLING

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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**
47/1514/PAS	47/1544/RVD

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TEST METHOD A105-B
POWER AND TEMPERATURE CYCLING

(From Council Ballot JCB-95-85, formulated under the cognizance of JC-14.1 Committee on Reliability Test Methods for Packaged Devices)

1 Purpose

The power and temperature cycling test is performed to determine the ability of a device to withstand alternate exposures at high and low temperature extremes with operating biases periodically applied and removed. It is intended to simulate worst case conditions encountered in typical applications.

The power and temperature cycling test is considered destructive. It is intended for device qualification.

2 Apparatus

The apparatus required for this test shall consist of a controlled temperature chamber capable of producing the specified temperatures within the specified transition times. Sockets or other mounting means shall be provided within the chamber so that reliable electrical contact can be made to the device terminals in the specified circuit configuration. Power supplies and biasing networks shall be capable of maintaining the specified operating conditions throughout the testing period despite normal variations in line voltages or ambient temperatures. The test circuitry should also be designed so that existence of abnormal or failed devices does not alter the specified conditions for other units on test. Care should be taken to avoid possible damage from transient voltage spikes or other conditions that might result in electrical, thermal, or mechanical overstress.

3 Procedure

When special mounting or heat sinking is required, the details shall be specified in the applicable procurement document. The power should then be applied and suitable checks made to assure that all devices are properly biased. During the test, the power applied to the devices shall be alternately cycled 5 minutes on 5 minutes off unless otherwise specified in the applicable procurement document. The devices shall concurrently be cycled between temperature extremes for the specified number of cycles. The time at the high and low temperature extremes shall be sufficient to allow the total mass of each device under test to reach the specified temperature extremes with no power applied. The low temperature to high temperature transition or reverse sequence is acceptable.

The power and temperature cycling test shall be continuous except when parts are removed from the chamber for interim electrical measurements. If the test is interrupted as a result of power or equipment failure, the test may restart from the point of stoppage.

3.1 Test conditions

The electrical bias circuit shall be specified in the applicable procurement document. The device shall be subjected to the test conditions derived from table 1 as illustrated in figure 1.

3.2 Precautions

Since case and junction temperatures of some devices can be significantly greater than ambient temperature, the circuit should be structured so that the maximum rated case or junction temperature shall not be exceeded. Precautions should be taken to avoid electrical damage and thermal runaway. If LN2 is used, care must be taken to avoid direct exposure of the parts and boards to the LN2.

The test setup should be monitored initially and at the conclusion of a test interval to establish that all devices are being stressed to the specified requirements. Deviations must be corrected prior to further cycling to assure the validity of the qualification data.

Table 1 — Test conditions

Test Condition	Temperature Extremes Degrees C.	Transition Time Between Temperature Extreme, Max.	Dwell Time at Each Temperature Extreme, Min.
A	-40(+0, -10) to +85(+10,-0)	20 minutes	10 minutes
B	-40(+0, -10) to + 125(+10, -10)	30 minutes	10 minutes

NOTE — Recommended temperature cycles for qualification= 1000.

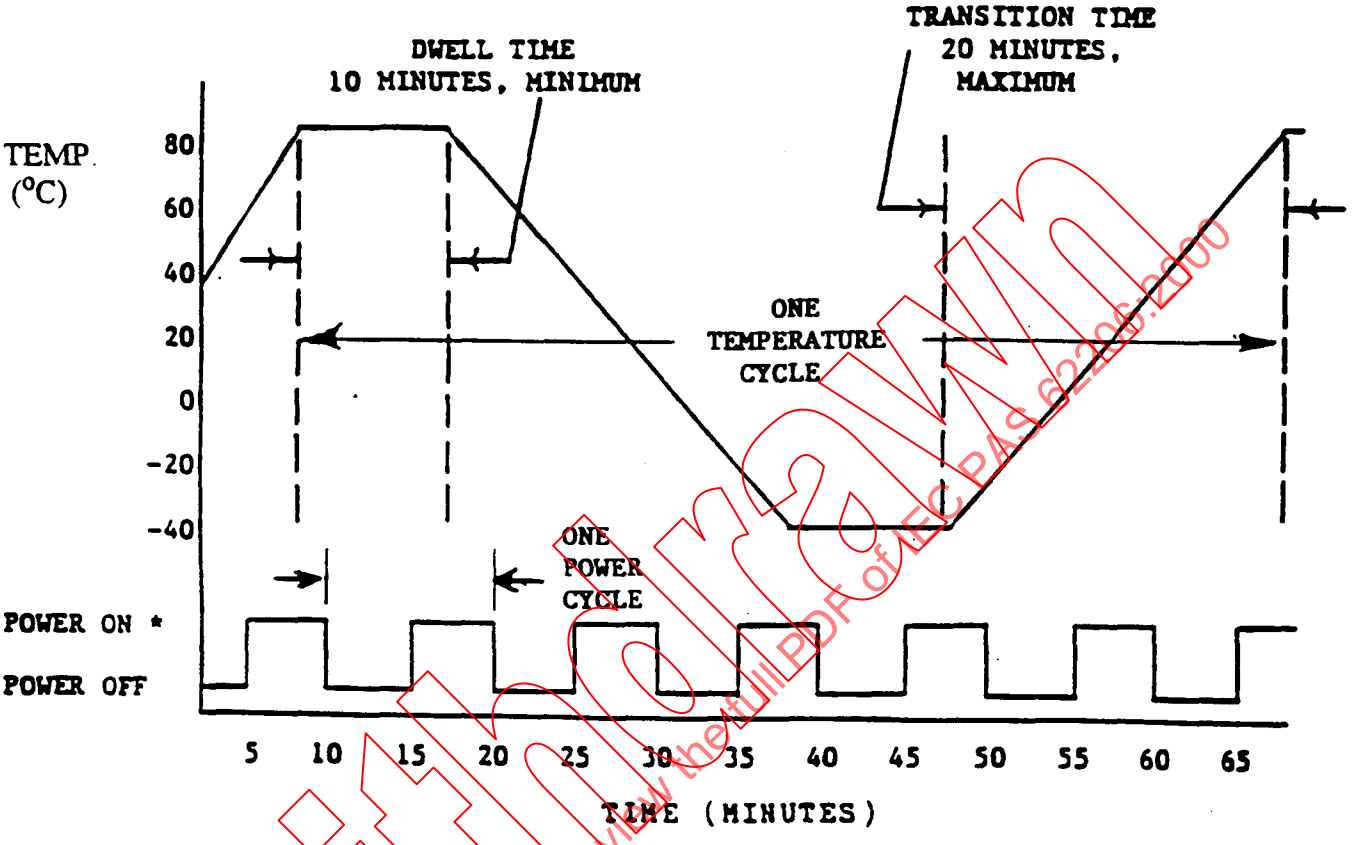

Figure 1 — Typical power and temperature cycle test condition A

* Power cycle need not be synchronized with temperature cycle.

3.3 Measurements

The electrical measurements shall be made at intervals per the applicable procurement document.

The electrical measurements shall consist of parametric and functional tests specified in the applicable procurement document.

4 Failure criteria

A device is defined as a failure if parametric limits are exceeded or if functionality cannot be demonstrated under nominal and worst case conditions specified in the applicable procurement document. Mechanical damage such as cracking, or breaking of the package will also be considered a failure provided such damage was not induced by fixturing or handling.