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Users Guide for IPC-TM-650, Method 2.6.27, Thermal Stress, Convection Reflow Assembly Simulation

Developed by the Thermal Stress Test Methodology Subcommittee (D-32) of the Rigid Printed Board Committee (D-30) of IPC

Users of this publication are encouraged to participate in the development of future revisions.

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1 EXECUTIVE SUMMARY

The intention of this document is to aid users of IPC-TM-650, Method 2.6.27, "*Thermal Stress, Convection Reflow Assembly Simulation*." The reason for this test method is that IPC-TM-650, Method 2.6.8, *Thermal Stress, Plated-Through Holes* (thermal stress by solder float) is no longer considered adequate for simulating the assembly process and stresses that many products now see. Over many years the assembly process has continued to diverge from wave soldering, with the addition of top, and then bottom, surface mount devices, large BGA packages where solder joints are hidden, an ever increasing density of devices which increase the thermal mass and thermal stress needed to melt solder, and more recently the switch to higher melt temperature, lead-free solders. In summary, adding more and more cycles of the Method 2.6.8 solder float was not doing an acceptable job of screening out printed boards that would then fail during assembly due to the very different thermal stresses encountered. This document was developed by the IPC D-32 Thermal Stress Test Method Subcommittee that developed IPC-TM-650, Method 2.6.27, with the understanding that the test method will require special equipment and the proper set-up and calibration of that equipment.

1.1 Purpose The IPC-TM-650, Method 2.6.27, is intended to establish a relative ability of printed boards, or representative coupons, to survive the thermal excursions associated with assembly and rework in a tin/lead or lead-free application using a convection oven, or alternate equipment with the capability to match the reflow profile of a convection oven. The test embraces relative robustness of the copper interconnection and dielectric materials subjected to the strain and resulting stress associated with a standardized thermal profile. The purpose is to establish an objective measurement of relative robustness ranking or comparing variables, or establishing minimum reliability requirements for copper interconnections and dielectric material in a printed board. The purpose of the test method is to provide the procedure for conditioning and reflowing of the test specimen prior to evaluation for compliance to the applicable performance specification, i.e., IPC-6012, IPC-6013, IPC-6018, etc.

The primary purpose of this document is to address concerns and considerations related to IPC-TM-650, Method 2.6.27. This document embraces how this test method was intended for use and the rationale behind some of the protocols and requirements. This document provides an adjunct document that improves the understanding, application, and the implication of results from using this test method.

2 APPLICABLE DOCUMENTS

2.1 IPC[1]

IPC-TM-650 Test Methods Manual[2]

2.6.8 Thermal Stress, Plated-Through Holes
2.6.27 Thermal Stress, Convection Reflow Assembly Simulation

IPC-1601 Printed Board Handling and Storage Guidelines

IPC-6010 Family of Board Performance Documents

IPC-7530 Guidelines for Temperature Profiling for Mass Soldering Processes (Reflow & Wave)

2.2 Joint Industry Standards[3]

IPC/JEDEC J-STD-020 Moisture/Reflow Sensitivity Classification for Plastic Integrated Circuit Surface Mount Devices

1. www.ipc.org
2. Current and revised IPC Test Methods are available on the IPC website (www.ipc.org/html/testmethods.htm).
3. www.ipc.org