ASSOCIATION CONNECTING
ELECTRONICS INDUSTRIES

IPC-9504

Assembly Process Simulation for Evaluation of Non-IC Components (Preconditioning Non-IC Components)

ANSI/IPC-9504

June 1998

A standard developed by IPC

2215 Sanders Road, Northbrook, IL 60062-6135
Tel. 847.509.9700 Fax 847.509.9798
www.ipc.org

Table of Contents

1.0 SCOPE 1
1.1 Non-IC Component Evaluations 1
1.2 Process Limitation 1

2.0 APPLICABLE DOCUMENTS 1
2.1 Institute for Interconnecting and Packaging Electronic Circuits (IPC) 1
2.2 Joint Industry Standards 1
2.3 Electronic Industries Association 1

3.0 TERMS AND DEFINITIONS 1

4.0 APPLICATIONS AND OBJECTIVES 2
4.1 Objectives 2
4.2 Process Simulations 2
4.3 Applications 2

5.0 APPARATUS 3

6.0 REQUIREMENTS 3

7.0 RECOMMENDATIONS 3

8.0 COMPONENT CLASSIFICATION 4

9.0 COMPONENT STORAGE PROCESS PRECONDITIONING SELECTION AND PROCESS FLOW 4

10.0 PRECONDITIONING TEST PROCEDURES 9
10.1 Moisture Exposure 9
10.1.1 Preliminary Bake 9
10.1.2 Moisture Sensitivity Levels 9
10.2 Component Placement 9
10.2.1 Application 10
10.2.2 Application 10
10.2.3 Application 10
10.3 Soldering Process Exposure 10
10.3.1 Soldering Process Compatibility Levels 10
10.4 Chemical Exposure 12
10.4.1 Water Soluble Flux Exposure 12
10.4.2 Aliphatic or Terpene Hydrocarbon Cleaning 13
10.4.3 Aqueous Detergent Total Immersion Cleaning 13
10.4.4 Deionized Water Total Immersion Cleaning 13
10.5 Acceptance Criteria 13

11.0 SOLDERING PROCESS COMPATIBILITY MATRIX 13

Figures

Figure 1 Application of IPC-9504 2
Figure 2 Assembly Process Simulation 6
Figure 2 Assembly Process Simulation (continued) 7
Figure 3 Infrared/Convection Reflow Thermal Profile 10
Figure 4 Wave Solder Thermal Profile (TH Components) 11
Figure 5 Wave Solder Thermal Profile (SM Components) 12

Tables

Table 1 Moisture Sensitivity Floor Life Levels 4
Table 2 Soldering Process Compatibility Levels Test Conditions 5
Table 3 Chemical Compatibility Levels 5
Table 4 Soldering Process Compatability Matrix 14

Assembly Process Simulation for Evaluation of Non-IC Components (Preconditioning Non-IC Components)

1.0 SCOPE

1.1 Non-IC Component Evaluations This document describes manufacturing process simulations for use with applicable component specifications to assure that electronic components can meet expected reliability requirements after exposure to assembly factory processes. It is not intended as an assembly production specification or a stand-alone qualification document. The procedure consists of a set of assembly process simulations that can be performed by either the component user or manufacturer prior to reliability testing as specified in the applicable component qualification and reliability monitoring documents. The simulations include alternative conditions depending on the component type, physical characteristics and anticipated use. The levels defined can be used for describing either expected performance characteristics by the manufacturer or the required characteristics for the users assembly process.

It is expected that a single component would be evaluated for a subset of the alternative conditions. For example, large connectors might be qualified utilizing the lower of two reflow temperature ranges while smaller packages, which typically become much hotter during infrared or convection reflow, might be qualified for the higher range. Similarly, components with physical characteristics that prohibit total immersion cleaning would not be evaluated for this type of cleaning process.

Unless otherwise specified, this document applies to both surface-mount (SM) reflowed components and through-hole (TH) components, which are wave soldered or reflowed. For wave solder of SM components, user and supplier should work together to identify appropriate procedures.

1.2 Process Limitation This document is not intended as an assembly production specification. The ranges of times and temperatures for component evaluations are considered to be outside the optimal conditions for assembly processes. The component body temperature, time at maximum temperature, and thermal spike, etc., in the actual assembly process should at no time exceed the lower limits of the specified test conditions with which the component is evaluated per this document.

2.0 APPLICABLE DOCUMENTS

2.1 Institute for Interconnecting and Packaging Electronic Circuits (IPC)[1]

IPC-AC-62 Aqueous Cleaning Handbook

IPC-OI-645 Standard for Visual Optical Inspection Aids

IPC-TM-650 Test Methods Manual

Method 2.6.9.1 Test to Determine Sensitivity of Electronic Components to Ultrasonic Energy

IPC-SM-817 General Requirements for Dielectric Surface Mounting Adhesives

2.2 Joint Industry Standards[1]

J-STD-002 Solderability Tests for Component Leads, Terminations, Lugs, Terminals, and Wires

J-STD-020 Moisture-Induced Sensitivity Classification for Plastic Integrated Circuit Surface Mount Devices

2.3 Electronic Industries Association[2]

EIA-541 Packaging Material Standards for ESD Sensitive Items

EIA-625 Requirements for Handling Electrostatic-Discharge-Sensitive (ESDS) Devices

JESD22-A113 Preconditioning of Plastic Surface Mount Devices Prior to Reliability Testing

3.0 TERMS AND DEFINITIONS

Spike The peak temperature of a component lead on the solder side of the board while in contact with molten solder minus its temperature prior to entering the wave. This parameter is also referred to sometimes as the ''delta T'' or thermal shock.

Ramp Rate Greatest temperature difference in four consecutive seconds in the entire reflow thermal profile divided by four.

1. IPC, 2215 Sanders Road, Northbrook, IL 60062 www.ipc.org
2. EIA, 2500 Wilson Blvd., Arlington, VA 22201