IPC-9502

PWB Assembly Soldering
Process Guideline for
Electronic Components
Table of Contents

1 SCOPE................................................................. 1

2 APPLICABLE DOCUMENTS ........................................ 1
   2.1 IPC........................................................................ 1
   2.2 Joint Industry Standards ..................................... 1
   2.3 Electronic Industries Association ....................... 1

3 TERMS AND DEFINITIONS........................................ 1

4 APPLICATIONS AND OBJECTIVES......................... 1

5 COMPONENT COMPATIBILITY REQUIREMENTS ........ 2
   5.1 Process Compatibility................................. 2
   5.1.1 Soldering Processes ..................................... 2
   5.1.2 Chemical Exposure – Flux and Cleaners .......... 2
   5.1.2.1 Water Soluble Flux Exposure ...................... 2
   5.2 Other Processes............................................. 2

6 PCB ASSEMBLY PROCESS COMPATIBILITY LIMITS .... 4
   6.1 235°C Oven Reflow Soldering Process .............. 4
   6.1.1 235°C Oven Reflow Thermal Specification .... 4
   6.2 220°C Reflow Solder Process ....................... 5
   6.2.1 220°C Oven Reflow Thermal Specification ...... 5
   6.3 Wave Solder TH 180°C Preheat ...................... 6
   6.3.1 Top Side Wave Solder Thermal Specification .. 6
   6.4 Wave Solder TH 160°C Preheat ...................... 7
   6.4.1 Top Side Wave Solder Thermal Specification .. 7
   6.5 Wave Solder SM 255°C – 130°C Spike ............ 8
   6.5.1 Wave Solder SM 255°C – 130°C Spike Thermal Specification ................. 8
   6.6 Wave Solder SM 255°C – 100°C Spike ............ 9
   6.6.1 Wave Solder SM 255°C – 100°C Spike Thermal Specification ................. 9
   6.7 Hand Solder TH & SM................................. 10
   6.8 Vapor Phase 217-219°C Max ......................... 10
   6.9 Cleaning Process......................................... 10
   6.9.1 Wash Specification..................................... 10
   6.9.2 Drying Specification.................................. 10
   6.10 No Clean Process..................................... 10

Figures

   Figure 1 Document Relationship.......................... 2
   Figure 2 Maximum Component Body Profile - Reflow
     T(max) ≤ 235°C ............................................. 4
   Figure 3 Maximum Component Body Profile - Reflow
     T(max) ≤ 220°C ............................................. 5
   Figure 4 Wave Solder TH 180°C - Preheat Profile
     Body Temperature Top Side ............................ 6
   Figure 5 Wave Solder TH 160°C - Preheat Profile
     Body Temperature Top Side ............................ 7
   Figure 6 Component Body Temperature 130°C SM
     Bottom Side .............................................. 8
   Figure 7 Component Body Temperature - 100°C
     Spike SM Bottom Side .................................. 9

Tables

   Table 1 Moisture Sensitivity Floor Life Levels ........ 2
   Table 2 Soldering Process Limits.......................... 3
   Table 3 Chemical Compatibility Levels ................ 3
PWB Assembly Soldering Process Guideline for Electronic Components

1 SCOPE
This document describes manufacturing solder process limits that components subjected to IPC-9501, IPC-9503, IPC-9504 and J-STD-020 would survive. It does not include optimum conditions for assembly, but rather guides to assure components are not damaged.

This document applies to both surface-mount (SM) and through-hole (TH) components that are wave soldered, reflowed or hand soldered. This document is intended to complement other industry documents, listed in applicable documents.

Note: This document does not address the increased temperature requirements of lead-free solders.

2 APPLICABLE DOCUMENTS

2.1 IPC
IPC-T-50 IPC Terms and Definitions
IPC-AC-62 Aqueous Post Solder Cleaning Handbook
2.6.9.1 Test to Determine Sensitivity of Electronic Components to Ultrasonic Energy
IPC-SM-786 Procedures for Characterizing and Handling of Moisture/Reflow Sensitive ICs
IPC-SM-817 General Requirements for Dielectric Surface Mounting Adhesives
IPC-7711 Rework of Electronic Assemblies
IPC-9501 PWB Assembly Process Simulation
IPC-9503 Moisture Sensitivity Classification for Non-IC Components
IPC-9504 Assembly Process Simulation for Evaluation of Non-IC Components

2.2 Joint Industry Standards
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
JESD22-A113 Preconditioning of Plastic Surface Mount Devices Prior to Reliability Testing

3 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 reflow. 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.

4 APPLICATIONS AND OBJECTIVES
The objectives of the document in combination with IPC-9501, IPC-9503, IPC-9504 and J-STD-020 are to:
• Maintain a common definition of the thermal and chemical SMT and TH assembly process requirements that are used to assure compatibility between components and assembly processes.
• Facilitate the development and manufacture of robust components by establishing a set of levels for solder process compatibility.

The use of this document is illustrated in Figure 1 which shows typical steps and relationships of this document and decision points in flow chart form. The intent is to provide the process levels that the component could be exposed to during the assembly process.

The processes described include:
• Storage
• Soldering of both surface-mount and through-hole components.
• Exposure to corrosive fluxes (water soluble).
• Exposure to cleaning materials.

The conditions provide levels for the assembly process to assure that parts are not damaged.

The following procedures should be followed:
1. Review component process exposure levels.
2. Optimize the process parameters based on maximizing reliability and yields.