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October 2012

JOINT INDUSTRY STANDARD

Handling, Packing,
Shipping and
Use of Moisture,
Reflow, and Process
Sensitive Devices



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IPC/JEDEC J-STD-033D



Handling, Packing, Shipping and Use of Moisture, Reflow, and Process Sensitive Devices

A joint standard developed by the JEDEC JC-14.1 Committee on Reliability Test Methods for Packaged Devices and the B-10a Plastic Chip Carrier Cracking Task Group of IPC

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

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Acknowledgment

Any document involving a complex technology draws material from a vast number of sources across many continents. While the principal members of the Plastic Chip Carrier Cracking Task Group (B-10a) of the Packaged Electronic Components Committee (B-10) are shown below, it is not possible to include all of those who assisted in the evolution of this standard. To each of them, the members of the IPC extend their gratitude.

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Table of Contents

1 FOREWORD	1	3.3.1 Description	4
1.1 Purpose	1	3.3.2 Materials	4
1.2 Scope	1	3.3.3 Labels	6
1.3 Assembly Processes	1	3.3.4 Moisture Barrier Bag Sealing	7
1.3.1 Mass Reflow	1	3.3.5 Dry-Pack Precautions	7
1.3.2 Localized Heating	1	3.3.6 Shelf Life	3
1.3.3 Socketed Devices	1	4 DRYING	8
1.3.4 Point-to-Point Soldering	1	4.1 Post Exposure to Factory Ambient	10
1.3.5 Aqueous Cleaning	1	4.1.1 Any Duration Exposure	10
1.4 Reliability	2	4.1.2 Short Duration Exposure	10
1.5 Terms and Definitions	2	4.2 General Considerations for Baking	11
1.5.1 Active Desiccant	2	4.2.1 High Temperature Carriers	11
1.5.2 Bar Code Label	2	4.2.2 Low Temperature Carriers	11
1.5.3 Bulk Reflow	2	4.2.3 Paper and Plastic Container Forms	11
1.5.4 Carrier	2	4.2.4 Bakeout Times	11
1.5.5 Desiccant	2	4.2.5 ESD Protection	11
1.5.6 Floor Life	2	4.2.6 Reuse of Carriers	11
1.5.7 Humidity Indicator Card (HIC)	2	4.2.7 Solerability Limitations	11
1.5.8 Manufacturer's Exposure Time (MET)	2	5 USE	11
1.5.9 Moisture-Barrier Bag (MBB)	2	5.1 Incoming Bag Inspection	11
1.5.10 Moisture-Sensitive Identification (MSID)	2	5.1.1 Upon Receipt	11
1.5.11 Moisture-Sensitivity Level (MSL)	2	5.1 Device Inspection	12
1.5.12 Rework	2	5.2 Floor Life	12
1.5.13 Process-Sensitivity Level (PSL)	2	5.3 Safe Storage	12
1.5.14 Shelf Life (of a device in a sealed MBB)	2	5.3.1 Dry Pack	12
1.5.15 SMD	3	5.3.2 Shelf Life	12
1.5.16 Solder Reflow	3	5.3.3 Dry Atmosphere Cabinet	12
1.5.17 Water Vapor Transmission Rate (WVTR)	3	5.4 Reflow	12
2 APPLICABLE DOCUMENTS (Normative)	3	5.4.1 Opened MBB	12
2.1 American Society for Testing and Materials (ASTM)	3	5.4.2 Reflow Temperature Extremes	12
2.2 Electronic Industries Alliance (EIA, JEDEC)	3	5.4.3 Additional Thermal Profile Parameters	13
2.3 IPC Standards	3	5.4.4 Multiple Reflow	13
2.4 Joint Industry Standards	3	5.4.5 Maximum Reflow Passes	13
2.5 Department of Defense	3	5.5 Drying Indicators	13
3 DRY PACKING	3	5.5.1 Excess	13
3.1 Requirements	3	5.5.2 Floor Life or Ambient Temperature/Humidity Exceeded	13
3.2 Drying of SMD Packages and Carrier Materials Before Being Sealed in MBBs	4	5.5.3 Level 6 SMD Packages	13
3.2.1 Drying Requirements - Levels 2a - 5a	4	6 BOARD REWORK	13
3.2.2 Drying Requirements for Carrier Materials	4	6.1 Device Removal, Rework and Remount	13
3.2.3 Drying Requirements	4	6.1.1 Removal for Failure Analysis	14
3.2.4 Excess Time Between Bake and Bag	4	6.1.2 Removal and Remount	14
3.3 Dry Pack	4	6.2 Baking of Populated Boards	14

7 DERATING DUE TO FACTORY ENVIRONMENTAL CONDITIONS 14

APPENDIX A Test Method for Reversible (Type 1) RH Spots on a Humidity Indicator Card (HIC) used with Electronic Device Packaging 16

APPENDIX B Derivation of Bake Tables 17

APPENDIX C Desiccant Unit Absorption Capacity Test Method for Verification 18

APPENDIX D Changes in J-STD-033D 19

Figures

Figure 3-1 Typical Dry-Pack Configuration for Moisture-Sensitive SMD Packages in Shipping Tubes 4

Figure 3-2A Humidity Indicator Card (HIC) – Type 1 Example 5

Figure 3-2B Humidity Indicator Card (HIC) – Type 2 Example 5

Figure 3-3 Moisture-Sensitive Identification Label (Examples) 6

Figure 3-4A Caution Label (Examples with MSL only) 7

Figure 3-4B Caution Label (Examples with MSL and PSL) 7

Figure 3-5 MBB with No Evacuation (Example) 8

Figure 3-6 MBB with Recommended Light Air Evacuation (Example) 8

Figure 3-7 MBB with Too Much (Full) Evacuation (Example) 8

Figure A-1 Photo of Testing Apparatus 16

Tables

Table 3-1 Dry-Packing Requirements 4

Table 3-2 Typical Reversible (Type 1) HIC Spot Compliance 6

Table 4-1 Reference Conditions for Drying Mounted or Unmounted SMD Packages 9

Table 4-2 Supplier Bake: Default Baking Times Used Prior to Dry Pack 10

Table 4-3 Resetting or Pausing the Floor-Life Clock at User Site 10

Table 5-1 Moisture Classification Level (MSL) and Floor Life per J-STD-020 12

Table 7-1 Recommended Equivalent Total Floor Life (days) @ 20 °C, 25 °C, 30 °C, 35 °C For ICs with Novolac, Diphenyl and Multifunctional Epoxies (Reflow at same temperature at which the device was classified) Maximum Percent Relative Humidity 15

Handling, Packing, Shipping and Use of Moisture, Reflow, and Process Sensitive Devices

1 FOREWORD

The advent of surface mount devices (SMDs) introduced a new class of quality and reliability concerns regarding damage such as “cracks and delamination” from the solder reflow process. This document describes the standardized levels of floor-life exposure for moisture/reflow sensitive SMDs along with the handling, packing and shipping requirements necessary to avoid moisture/reflow related failures. Companion documents J-STD-020, J-STD-075 and JEP113 define the classification procedure and the labeling requirements, respectively.

For moisture sensitivity, moisture from atmospheric humidity enters permeable packaging materials by diffusion. Assembly processes used to solder SMDs to printed circuit boards (PCBs) expose the entire package body to temperatures higher than 200 °C. During solder reflow, the combination of rapid moisture expansion, materials mismatch, and material interface degradation can result in cracking and/or delamination of critical interfaces within the device.

Typical solder reflow processes of concern for all devices are convection, convection/IR, infrared (IR) vapor phase (VPR), hot air rework tools, and wave solder, including full immersion.

Non-semiconductor devices may exhibit additional process sensitivities beyond moisture sensitivity such as thermal sensitivity, flux sensitivity or cleaning process sensitivity.

1.1 Purpose The purpose of this document is to provide manufacturers and users with standardized methods for handling, packing, shipping, and use of moisture/reflow and process sensitive devices that have been classified to the levels defined in J-STD-020 or J-STD-075. These methods are provided to avoid damage from moisture absorption and exposure to solder reflow temperatures that can result in yield and reliability degradation. By using these procedures, safe and damage-free reflow can be achieved. The dry-packing process defined herein provides a minimum shelf life of 12 months from the seal date.

1.2 Scope This standard applies to all devices subjected to bulk solder reflow processes during PCB assembly, including plastic encapsulated packages, process sensitive devices and other moisture sensitive devices made with moisture-permeable materials (epoxies, silicones, etc.) that are exposed to the ambient.

1.3 Assembly Processes

1.3.1 Mass Reflow This standard applies to bulk solder reflow assembly by convection, convection/IR, infrared (IR), and vapor phase (VPR) processes. It does not apply to bulk solder reflow processes that immerse the device bodies in molten solder (e.g., wave soldering bottom mounted devices). Such processes are not allowed for many SMDs and are not covered by the device qualifications standards used as a basis for this document.

1.3.2 Localized Heating This standard also applies to moisture/reflow sensitive SMD packages that are removed or attached singly by local ambient heating, i.e., “hot air rework.” See Clause 6.

1.3.3 Socketed Devices

This standard does not apply to SMD packages that are socketed and not exposed to solder reflow temperatures during either bulk reflow or rework of adjacent devices. Such SMD packages are not at risk and do not require moisture precautionary handling.

1.3.4 Point-to-Point Soldering This standard does not apply to SMD packages in which only the leads are heated to reflow the solder, e.g., hand-soldering, hot bar attach of gull wing leads, and through hole by wave soldering. The heat absorbed by the package body from such operations is typically much lower than for bulk surface mount reflow or hot air rework and moisture precautionary measures are typically not needed.

1.3.5 Aqueous Cleaning For non-cavity SMDs typical short term aqueous cleaning processes will not impact the floor life (internal moisture content). Special consideration should be given to non-hermetic cavity packages.