



IPC-7095E

Design and Assembly Process Guidance for Ball Grid Arrays (BGAs)

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Developed by the Ball Grid Array Task Group (5-21f) of the Assembly and Joining Committee (5-20) of IPC

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

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Design and Assembly Process Guidance for Ball Grid Arrays (BGAs)

1 SCOPE

This document describes design and assembly implementation for ball grid array (BGA) and fine-pitch BGA (FBGA) technology, focusing on inspection, rework and reliability issues associated with design and assembly of printed boards using these packages.

1.1 Purpose The purpose of this document is to provide useful and practical information to those who use or are considering using BGAs. The target audiences for this document are managers, designers and process engineers who are responsible for design, assembly, inspection and rework processes of printed boards and printed board assemblies.

1.1.1 Intent This document describes how to successfully implement robust design and assembly processes for printed board assemblies using BGAs as well as ways to troubleshoot some common anomalies which can occur during BGA assembly. For accept/reject criteria and requirements for BGA assemblies, see IPC J-STD-001 and IPC-A-610.

1.2 Use of “Lead” For readability and translation, this document uses the noun “lead” only to describe leads of a component (sometimes referred to as terminations). The metallic element “lead” is always written as Pb.

1.3 Abbreviations and Acronyms Periodic table elements are abbreviated in this document. See Appendix B for full spellings of abbreviations (including elements) and acronyms used in this document.

1.4 Terms and Definitions Other than those terms listed below, the definitions of terms used in this document are in accordance with IPC-T-50.

1.4.1 Solder-Mask-Defined (SMD) BGA Land A printed board land with a solder mask aperture diameter equal to the diameter of the land on the BGA.

1.4.2 Non-Solder-Mask Defined (NSMD) BGA Land A printed board land with a solder mask aperture diameter larger than the diameter of the land on the BGA. Also known as Cu-defined BGA land.

1.4.3 Nonwet Open (NWO) One metallurgical mass formed from a BGA ball and reflowed solder paste (or flux) which has incomplete or no wetting to the printed board land.

1.4.4 Head-on-Pillow (HoP) A solder joint comprised of two metallurgically distinct masses formed from a BGA ball and reflowed solder paste which has incomplete or no coalescence.

2 APPLICABLE DOCUMENTS

2.1 IPC¹

IPC-T-50 Terms and Definitions for Printed Boards and Printed Board Assemblies

IPC-D-279 Design Guidelines for Reliable Surface Mount Technology Printed Board Assemblies

IPC-A-610 Acceptability of Electronic Assemblies

IPC-TM-650 Test Methods Manual²

2.4.53 Dye and Pull Test Method (Formerly Known as Dye and Pry)

IPC-SM-785 Guidelines for Accelerated Reliability Testing of Surface Mount Attachments

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

IPC-CC-830 Qualification and Performance of Electrical Insulating Compound for Printed Wiring Assemblies

IPC-HDBK-830 Guidelines for Design, Selection and Application of Conformal Coatings

IPC-1602 Standard for Printed Board Handling and Storage

IPC-1751 Generic Requirements for Declaration Process Management

1. www.ipc.org

2. Current and revised IPC Test Methods are available on the IPC Web site (www.ipc.org/test-methods)