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IPC J-STD-030

Guideline for Selection and Application of Underfill Material for Flip Chip and Other Micropackages

Developed by the Underfill Adhesives for Flip Chip Applications Task Group (5-24f) of the Assembly and Joining Processes Committee (5-20) of IPC

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

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Guideline for Selection and Application of Underfill Material for Flip Chip and other Micropackages

1 SCOPE

This document provides users of underfill material with guidance in selecting and evaluating underfill material. Underfill material is used to increase reliability of electronic devices by two methods: alleviate CTE mismatch (between the electronic package and the assembly substrate) and/or increase mechanical strength. Materials used in underfill applications should not adversely affect device reliability (e.g., ionic impurities, alpha emitters) nor degrade electrical performance. When correctly selected and applied, underfill material should increase the life of the assembled solder joints.

Types of underfill materials currently available in the market include:

- Capillary Flow Underfill
- No-Flow/Fluxing Underfill
- Removable/Reworkable Underfill
- Molded Underfill (not within scope of document)
- Wafer Applied Underfill (not within scope of document)

1.1 Introduction This guideline covers polymer based underfill materials intended for use in electronic packaging assembly applications to relieve stress on joints that interconnect flip chips (FC), chip scale packages (CSP) and ball grid arrays (BGA) to an interconnecting substrate (see Figure 1-1).

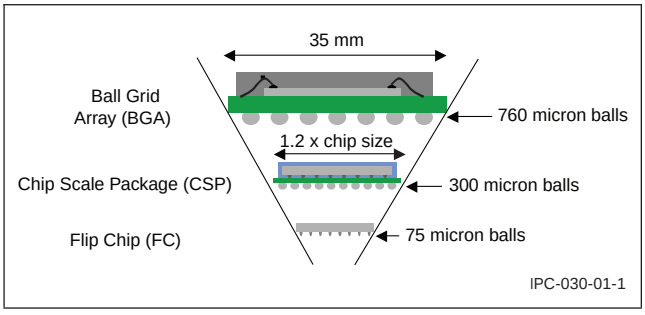

Figure 1-1 Comparison of Various Sized Array Packages

1.2 Purpose The purpose of this document is to help in identifying underfill materials whose properties are compatible with component assembly joints to reduce thermo-mechanical stress so that performance of the assembly is enhanced. The additional role of underfill is protecting the device from environmental factors and increasing strength. Materials used in underfill applications should not adversely affect device reliability (no ionic impurities and no alpha emitters) nor degrade electrical performance. Evaluation methods are provided in the document that are intended to be used for assessing underfill material performance in specific applications as well as troubleshooting failures and how to avoid failures. This document represents the compiled knowledge and experience of the IPC Underfill Adhesives for Flip Chip Applications Task Group.

2 APPLICABLE DOCUMENTS

2.1 IPC[1]

IPC-T-50 Terms and Definitions for Interconnecting and Packaging Electronic Circuits

IPC-TM-650 Test Methods Manual[2]

2.3.18 Gel Time, Prepreg Materials

2.4.28 Adhesion, Solder Mask (Non-Melting Metals)

2.4.34.1 Solder Paste Viscosity - T-Bar Spindle Method (Applicable at Less Than 300,000 Centipose)

2.4.34.3 Solder Paste Viscosity - Spiral Pump Method (Applicable at Less Than 300,000 Centipose)

2.4.34.4 Paste Flux Viscosity - T-Bar Spindle Method

2.6.1 Fungus Resistance Printed Wiring Materials

2.6.3.1 Moisture and Insulation Resistance - Solder Mask

2.6.3.2 Moisture and Insulation Resistance, Flexible Base Dielectric

2.6.3.3 Surface Insulation Resistance, Fluxes

2.6.14.1 Electrochemical Migration Resistance Test

IPC-SM-782 Surface Mount Design and Land Pattern Standard

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

IPC-SM-840 Qualification and Performance of Permanent Solder Mask

IPC-9201 Surface Insulation Resistance Handbook

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