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IPC/JEDEC-9707

Spherical Bend Test Method for Characterization of Board Level Interconnects

Developed by the SMT Attachment Reliability Test Methods Task Group (6-10d) of the Product Reliability Committee (6-10) of IPC

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

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Table of Contents

FOREWORD 1

INTRODUCTION 1

1 SCOPE 1

2 APPLICABLE DOCUMENTS 1

3 TERMS AND DEFINITIONS 2

4 SAMPLE SIZE 2

5 APPARATUS AND SETUP 3

5.1 Mechanical Load Frame. 3

5.2 Spherical Transient Bend Test Fixture. 3

5.3 Data Acquisition Equipment. 3

6 TEST VEHICLES 4

6.1 Component Sample 4

6.2 Printed Board Material 4

6.3 Test Board Thickness and Metal Layer Count 4

6.4 Test Board and Package Surface Finish. 4

6.5 Test Board and Package Land Pads.. 4

6.6 Test Board Layout. 4

6.7 Test Board Daisy-Chain Links. 5

6.8 Board Assembly 6

6.9 Storage and Aging 6

6.10 Strain Gages 6

7 TEST PROCEDURE 7

7.1 Integrity Test. 7

7.2 Determine Target Strains 7

7.3 System Set-up 9

7.4 Transient Board Flexure 9

8 FAILURE CRITERIA AND ANALYSIS 11

8.1 Failure Criteria 11

8.2 Analysis and Reporting 11

ANNEX A 12

A.1 Cross Sectioning. 12

A.1.1 Cross-Sectioning Outside Rows or Outside Columns 12

A.1.2 Diagonal Cross-Sectioning 12

A.2 Dye & Pry. 12

FIGURES

Figure 5-1 Example of a Spherical Bend Test Fixture with Alignment Pins [Photo courtesy of Intel Corporation] 3

Figure 6-1 Example Test Board Layout (Topside View) 5

Figure 6-2 Example Strain Gage Placement. Strain Gage Rosette on the BGA corner spans the 1st and 2nd Perimeter Interconnect Rows.. 6

Figure 7-1 Test Flow Procedure 7

Figure 7-2 Two example Fixtures with Board Positioning [Diagram on left, courtesy of Intel Corporation; Diagram on right, courtesy of Endicott Interconnect Technologies, Inc.] 7

Figure 7-3 Example Board Strain Response during Manufacturing In-circuit Testing (left), and Strain Rate of One Strain Gage Element based on a Line of Best Fit (right) 8

Figure 7-4 Typical Test Profile for Target Strain Determination 8

Figure 7-5 Example Measurements Taken during Determination of Target Strains 9

Figure 7-6 Load Pin Profile for System Set-up 9

Figure 7-7 A displacement Profile for a Given Strain Target and the Corresponding Strain Response 10

Figure 8-1 Interconnect Fracture Modes (BGA Devices) [Diagram taken from IPC/JEDEC-9702] 11

Figure A-1 Illustrations of Cross-sectioning Techniques for Rows/Columns with Arrows Depicting Recommended Grind direction (left) and Diagonals (right) 12

Figure A-2 Cross-sectional Detail (left) and Dye & Pry Detail (right) 12

TABLES

Table 5-1 Recommended Load Frame Capabilities 3

Table 5-2 Example Transient Bend Test Fixture 3

Table 6-1 Test Vehicle Parameters 4

Table 6-2 Test Board Layout 5

Table 8-1 Recommended Items to Report with Transient Spherical Bend Result 11

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Spherical Bend Test Method for Characterization of Board Level Interconnects

FOREWORD

This standard on spherical transient bend testing is intended to characterize the maximum allowable strain that a surface mount component's board level interconnects can withstand in flexural loading. This standard supplements existing standards that address mechanical shock or impact during shipping, handling, or field operation (including IPC/JEDEC-9702, a monotonic bend test method that cannot characterize maximum strain levels as described in this standard).

INTRODUCTION

Semiconductor devices are assembled in a variety of package configurations and are used in a multitude of applications. Given the diversity of package and printed board layouts, as well as end-use conditions, it is not feasible to establish a single strain limit requirement related to spherical transient bend testing for all package sets and printed board configurations. However, a maximum allowable strain limit specific to a particular Printed Circuit Assembly (PCA) may be established using the method discussed in this standard. In addition, non-experimental analysis techniques, such as finite element simulation, may also be used in conjunction with testing to define strain limits for an expanded envelope of printed board and package attributes.

A four-point monotonic bend test methodology is detailed in IPC/JEDEC-9702; this methodology enables the characterization of the fracture strength due to flexural loading of a surface mount component's board level interconnects. The four-point bend test method only addresses simple planar bending and may not reflect more complex and damaging bend modes that a PCA undergoes in the manufacturing and assembly process. This standard establishes a spherical bend test method that envelopes maximum strain levels for manufacturing, assembly, and handling flexure events, enabling the determination of maximum strain levels to be used as guidance during those events.

1 SCOPE

This standard specifies a common method of establishing strain limits of board-level device interconnects under spherical bending conditions, the worst-case flexure condition that can occur during conventional printed board/system assembly, manufacturing, and test operations. This method is applicable to surface mounted Ball Grid Array (BGA) components larger than 15.0 mm on a side with organically based substrates, attached to printed boards using conventional solder reflow technologies. While it is possible to test alternate or smaller packages, some of the tests may need to be modified. Spherical bend test pass/fail requirements are typically specific to each device application and are outside the scope of this document. Applicability of this test method and its associated parameters should be based on expected manufacturing conditions.

2 APPLICABLE DOCUMENTS

The following normative documents contain provisions that, through reference in this text, constitute provisions of this standard. The latest edition of each normative document applies.

2.1 IPC[1]

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

IPC 9701 Performance Test Methods and Qualification Requirements for Surface Mount Solder Attachments

IPC/JEDEC-9702 Monotonic Bend Characterization of Board-Level Interconnects

IPC/JEDEC-9703 Mechanical Shock Test Guidelines for Solder Joint Reliability

IPC/JEDEC-9704 Printed Wiring Board Strain Gage Test Guideline

IPC-7093 Design and Assembly Process Implementation for Bottom Termination Components

IPC-TM-650 Test Methods Manual[2]

2.1.1 Microsectioning, Manual Method

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