IPC-HDBK-9798

Handbook for Press-fit Standard for Automotive Requirements and other High-Reliability Applications

Developed by the Cold Joining Press-fit Handbook Task Group (5-21n) of the Assembly & Joining Committee (5-20) of IPC

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

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1 SCOPE

This document provides guidelines and supporting information for manufacturing electronic assemblies using compliant press-fit technology. The intent is to explain the ‘‘how-to’’ and ‘‘why’’ information, and fundamentals for these processes.

Additional detailed information can be found in documents referenced within each individual section. Users are encouraged to use those referenced documents to better understand the applicable subject areas.

This handbook is supporting the IPC-9797 standard.

1.1 Applicability This handbook is for guidance only. The design concepts, guidelines, and procedures presented in this document are not requirements, and this document is not binding, unless separately and specifically included by the applicable contract, approved drawing(s), or purchase order.

1.2 Measurement Units This standard uses International System of Units (SI units) per ASTM SI10, IEEE/ASTM SI 10, Section 3 [Imperial English equivalent units are in brackets for convenience]. The SI units used in this standard are millimeters (mm) [in] for dimensions and dimensional tolerances, Celsius (°C) [°F] for temperature and temperature tolerances, grams (g) [oz] for weight, and lux (lx) [footcandles] for illuminance.

Note: This standard uses other SI prefixes (ASTM SI10, Section 3.2) to eliminate leading zeros (for example, 0.0012 mm becomes 1.2 µm) or as an alternative to powers-of-ten (3.6×10^3 mm becomes 3.6 m).

1.2.1 Verification of Dimensions When an inspection is done on an assembly, measuring dimensions and determining percentages listed in the standard are not required unless there is a doubt or a question is raised about the acceptance of the product. When there is a doubt or a question is raised, then a referee determination should be implemented, at which time measurements should be made or percentages calculated using the referee magnifications defined in the standard. For determining conformance to the specifications in this standard, round all observed or calculated values “to the nearest unit” in the last right-hand digit used in expressing the specification limit, in accordance with the rounding method of ASTM Practice E29. For example, specifications of 2.5 mm max, 2.50 mm max, or 2.500 mm max, round the measured value to the nearest 0.1 mm, 0.01 mm, or 0.001 mm, respectively, and then compare to the specification number cited.

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

1.4 Abbreviations and Acronyms Periodic table elements are abbreviated in the standard. See Appendix A for abbreviations, including elements and acronyms used in this standard.

1.5 Terms and Definitions Other than those terms listed in IPC-9797, the definitions of terms used in this handbook are in accordance with IPC-T-50.

2 APPLICABLE DOCUMENTS

2.1 IPC Documents[1]

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

IPC-6012 Qualification and Performance Specification for Rigid Printed Boards

IPC-6012EA Automotive Applications Addendum to IPC-6012E, Qualification and Performance Specification for Rigid Printed Boards

IPC-9797 Press-fit Standard for Automotive Requirements and other High-Reliability Applications

IPC-A-600 Acceptability of Printed Boards

IPC-4552 Specification for Electroless Nickel/Immersion Gold (ENIG) Plating for Printed Boards

IPC-4553 Specification for Immersion Silver Plating for Printed Boards

1 www.ipc.org
2 www.iec.ch
3 www.astm.org

IPC-4554 Specification for Immersion Tin Plating for Printed Circuit Boards

IPC-1602 Standard for Printed Board Handling and Storage

IPC-TM-650 Test Methods Manual

2.6.25 Conductive Anodic Filament (CAF) Resistance Test: X-Y Axis

2.2 International Electrotechnical Commission Documents[2]

IEC 60512-2-1 Connectors for electronic equipment – Tests and measurements – Part 2-1: Electrical continuity and contact resistance tests – Test 2a: Contact resistance – Millivolt level method

IEC 60068-1 Environmental testing – Part 1: General and guidance

IEC 60352-5 Solderless connections – Part 5: Press-in connections – General requirements, test methods and practical guidance

IEC 60721-3-1 Classification of environmental conditions – Part 3-1: Classification of groups of environmental parameters and their severities – Storage

Future IEC/TR 60068-3-82 (to be published 2022) Environmental Testing – Part 3-82: Supporting documentation and guidance − confirmation of the performance of whisker test method

2.3 American Society for Testing and Materials[3]

ASTM E29 Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

ASTM SI10, IEEE/ASTM SI 10 American National Standard for Metric Practice

3 INTRODUCTION TO PRESS-FIT TECHNOLOGY

3.1 Background of Press-fit Technology Press-fit technology is going back to the 1970s. It was initially used in the telecommunication industry, starting with solid pins and moving later to compliant variants. Press-fit pins with compliant press-fit zones were standardized in the 80s, becoming a standalone IEC standard (IEC 60352-5) in 2004. The press-fit technology was further developed to meet the requirements of high performance/harsh environment (IPC Class 3) electronic products. This finally triggered the preparation of the IPC-9797 Press-fit Standard for Automotive Requirements and Other High Reliability Applications. Typical fields of application are single-pin insertion as well as the assembly of connectors integrated in housings.

3.2 Press-Fit Technology Press-fit technology establishes an electro-mechanical connection between a compliant press-fit zone and press-fit plated-through hole (PPTH) of a printed board (PB). In the contact areas, between the surfaces of the compliant

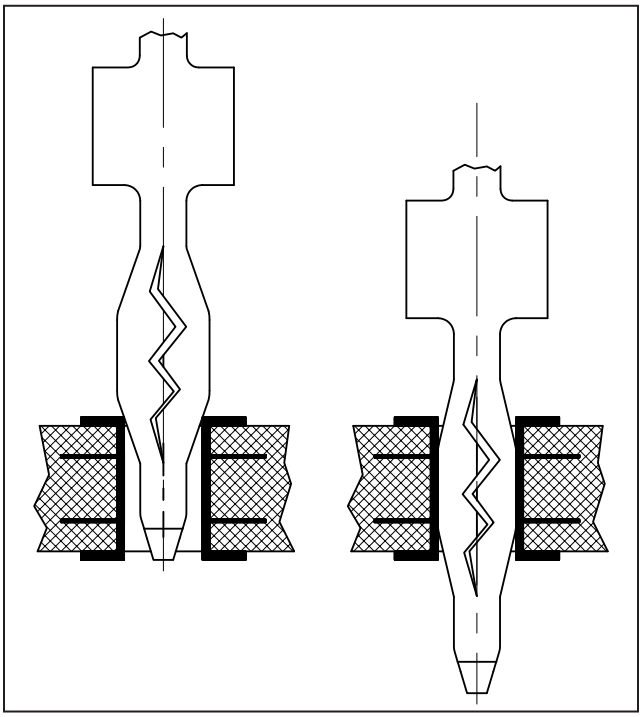

Figure 3-1 Compliant Press-Fit Zone in PPTH

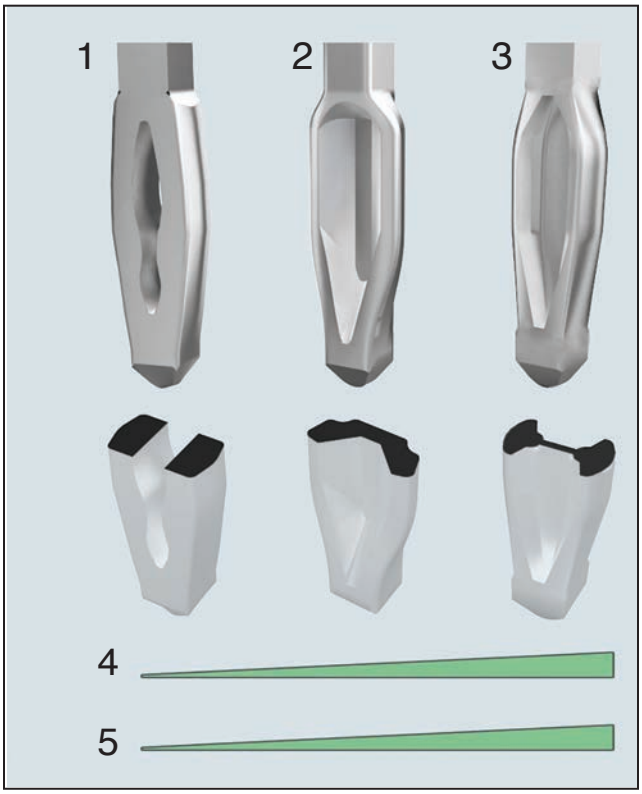

Figure 3-2 Examples of Different Styles of Compliant Press-Fit Zones [1]

1. Eye of the Needle
2. Spring Shape
3. Cracking Zone
4. Spring Stiffness
5. Plastic Deformation