Reliability of Electronics – Role of Solder Joint Voids

SYLLABUS

INSTRUCTOR INFORMATION:

Instructor: Dr. Jennie Hwang

Email: jennie.hwang@h-techgroup.com

Phone: 216-577-3284 MOBILE

Best time to call: Between 3:00PM to 5:00PM ET USA. Leave message anytime.

PROGRAM DESCRIPTION

The increasing prominence of lead-free solder joints, advanced packaging techniques (like BTCs and PoPs), miniaturized electronics with intricate solder joints, and heightened requirements for solder joint reliability in high-performance, harsh-environment products has intensified the industry's focus on solder joint voids.

This course aims to enhance product reliability and maintain high production yields by offering comprehensive insights into solder joint voids. We will explore the origins of these voids, understand their causes, and analyze their impacts on solder joint efficacy and overall product dependability.

By juxtaposing standard acceptance criteria against actual performance, we'll delineate strategies to diminish void occurrences in both array solder ball joints (such as PoP, BGA, CSP) and lead-frame solder joints (like QFP, BTC). In conclusion, we'll emphasize the most detrimental sources of voids to reliability, underscoring the importance of their prevention.

LEARNING AND PERFORMANCE OBJECTIVES

This course comprising two (2) 2-hour sessions over a week, offers in-depth knowledge about the effects of solder joint voids on product reliability. Designers, engineers, researchers, managers, and business decision-makers can gain an understanding solder joint properties, how they relate to the occurrence of voids and how to reduce voids.

Attendees are encouraged to bring their own selected systems for deliberation.

COURSE STRUCTURE

- Instructor and participants meet online twice per week from the comfort of their own home.
- Participants can view recorded online sessions to review course content and class discussions.
- Participants apply key concepts to create a real-world design from concept to completion.
- All required materials are included in the course.
- Course materials are accessible 24/7 on the new IPC Edge Learning Management System.
- The course can be accessed on virtually any device with an Internet connection and major web browser, including Chrome, Firefox, Safari, Edge, and Internet Explorer.

SUPPLEMENTAL MATERIALS

- Book: (ISBN-0-07-143048-2) "*Lead-free Implementation: A Guide to Manufacturing*" McGraw-Hill, New York, 2005, Jennie S. Hwang.
- Book: (ISBN-0 901 150 401) "*Environment-Friendly Electronics—Lead Free Technology*", Electrochemical Publications, LTD, Great Britain, 2001, Jennie S. Hwang.
- Book: (ISBN-0-07-031749-3) "*Modern Solder Technology for Competitive Electronics Manufacturing*", McGraw-Hill, New York, 1996, Jennie S. Hwang.
- Book: (ISBN-0-90-115029-0*)"IC Ball Grid Array & Fine Pitch Peripheral Interconnections*", Electrochemical Publications, LTD, Great Britain, 1995, Jennie S. Hwang.
- Book: In Japanese, "*Solder Paste: Technology and Applications for Surface Mount, Hybrid Circuits, and IC Component Manufacturing*", Industrial Research, Japan 1990, Jennie S. Hwang.
- Book: (ISBN-0442-2075-49) "*Solder Paste: Technology and Applications for Surface Mount, Hybrid Circuits, and IC Component Manufacturing*", Van Nostrand Reinhold, New York, 1988, Jennie S. Hwang.

IPC STANDARDS COVERED (PROVIDED WITH COURSE)

- IPC-J-STD-001 - Revision J - Addendum - Space and Military
- Space and Military Applications Electronic Hardware Addendum to IPC J-STD-001J Requirements for Soldered Electrical and Electronic Assemblies
- IPC-A-610 - Revision J - Addendum - Telecom
- Telecom Addendum to IPC-A-610 Revision H Acceptability of Electronic Assemblies
- IPC-J-STD-001 and IPC-A-610 - Revision J - Addendum - Automotive
- Automotive Addendum to IPC J-STD-001H Requirements for Soldered Electrical and Electronic Assemblies and IPC-A-610H Acceptability of Electronic Assemblies
- IPC-7093, Design and Assembly Process Implementation for Bottom Termination (BTC) Components
- IPC-7095 Design and Assembly Process Implementation for BGAs

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

COURSE SCHEDULE

WEEK 1

Topics include:

Session-1 will focus on the potential effects and causes

- Likely impact on Reliability
- Different sources and causes of voids
- Factors contributing to each of the sources and causes including surface finish
- Case studies
- Role of solder alloy composition

Session-2 will focus on mitigating approaches

- BGA voiding – additional factors
- BTC solder joint voids – thermal pads
- Voids criteria vs. applications
- Inspection
- Summary & recommendations

ASSIGNMENT:

Participants to bring further questions and issues for discussion.

ABOUT THE SPEAKER – DR. JENNIE S. HWANG

The International Hall of Famer of Women in Technology, Dr. Hwang brings deep knowledge and comprehensive experience to this course through both hands-on and advisory capacities. She has provided solutions to the most challenging and toughest issues in production yield and high-reliability products, covering commercial and military applications.

Dr. Hwang, a long-standing pioneer in SMT manufacturing and lead-free implementation, is the author of seven internationally-used textbooks and 750+ publications; a featured speaker in innumerable international/national events; has received numerous honors/ awards; on the Board of NYSE Fortune 500 companies and various civic, government, and university boards and committees (e.g., DoD - Globalization Committee, DoD - Forecasting Future Disruptive Technologies Committee; National Materials & Manufacturing Board; Board Chair of Army Science and Technology; and NIST Technical Assessment Board). She is Chair of the Artificial Intelligence Committee of DoD/National Academies; Chair of the National Laboratory Assessment Board; Chair of the Assessment Board of Army Research Laboratory; Chair of the

Assessment Board of Army Engineering Centers; and Chair of the panel of the National Artificial Intelligence Institute of NSF.

Her formal education includes the Harvard Business School Executive Program; and four academic degrees in Metallurgical Engineering and Materials Science, Physical Chemistry, Organic Chemistry, and liquid Crystal Science (Ph.D. M.S., M.S., B.S.).

She has held senior executive positions with Lockheed Martin Corp. and CEO of International Electronic Materials Corp., among others. She is also an invited distinguished adj. Professor of Engineering School of Case Western Reserve University and serves on the University's Board of Trustees. Further Info: www.JennieHwang.com