BTC Packaging & Assembly: Materials, Processes, Reliability

SYLLABUS

INSTRUCTOR INFORMATION

Instructor: Dr. Jennie Hwang

Email: jennie.hwang@h-techgroup.com

Phone: (216) 577-3284 (Mobile)

Availability: Between 3 p.m. and 5 p.m., Eastern Standard Time, USA. You may leave a message anytime.

PROGRAM DESCRIPTION

As the demand for electronics miniaturization and higher circuit density grows, Bottom-Termination Components (BTCs) have become essential in modern Integrated Circuit (IC) packaging. This course focuses on BTC packaging and downstream manufacturing assembly, covering various BTC configurations such as QFN, LGA, MLF, SON, and DFN in both periphery-leaded and solder-ball array packages.

This course is designed for anyone involved in BTC assembly or seeking a comprehensive understanding of its impact on electronics manufacturing. Through it, you will explore best practices for BTC assembly, including:

- Solder material properties and their impact on joint reliability
- PCB assembly processes optimized for BTCs
- Common production challenges and real-world solutions
- BTC solder joint reliability for both lead-free and tin-lead products
- Strategies for ensuring robust BTC solder interconnections

This course is led by an International Hall of Famer of Women in Technology who has authored several globally recognized books on lead-free technology, electronics manufacturing, and reliability. With a proven track record of solving some of the industry's toughest reliability and production challenges, your instructor brings deep expertise through hands-on experience and advisory roles in both commercial and military applications.

By the end of this course, you'll have the knowledge and practical insights needed to achieve high-yield production and build reliable BTC assemblies in today's demanding electronics industry.

LEARNING AND PERFORMANCE OBJECTIVES

In this course, you will:

- Acquire general knowledge in all relevant aspects of BTC packaging and assembly
- Acquire specific knowledge on key areas of BTCs that require attention on the production floor
- Help achieve high-yield, low-defect production related to BTC assembly
- Have the opportunity to discuss individual issues

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-7093A: Design and Assembly Process Implementation for Bottom Termination SMT Components*
- *IPC-7525C: Stencil Design Guidelines*
- *IPC-7526A: Stencil and Misprinted Board Cleaning Handbook*

- *IPC-CH-65B: Guidelines for Cleaning of Printed Boards and Assemblies*
- *IPC-9201A: Surface Insulation Resistance Handbook*
- *IPC-6012F: Qualification and Performance Specification for Rigid Printed Boards*

COURSE SCHEDULE

Focusing on BTC assembly in materials, processes, and reliability, the course is mapped out to balance real-world hands-on practice and the engineering fundamentals behind the sound practice.

Topics include:

- Overall package evolution: Semiconductor to packages
- BTC: Drivers, challenges, types, substrates
- Assembling: Performing solder paste, critical characteristics
- Solder paste printing: Desired performance, process parameters, stencil design for thermal pad, squeegee properties
- Assembling: PCB land design, component placement
- Reflow techniques: Optimal profile, best practice
- BTC rework: Key steps
- Effects of surface finish on BTC assembly
- Relative solderability of surface finishes
- Study: Effects of surface finish ENIG vs Cu (Ni thickness)
- Study: Effects of surface Finish ENEPIG (Pd thickness)
- Effects of bare PCB
- BTC solder joint reliability: Fundamentals, factors
- Case Studies: MLF/LGA vs. BGA; CSP/QFN vs. BGA; QFN vs. TSOP
- BTC solder joint reliability: Effects of surface finish
- BTC solder joint reliability: Fillet, package design, land size, board thickness, underfill
- LGA reliability challenges
- BTC voids: Thermal pad, solder joint
- BTC prevalent production defects: Prevention, remedies
- Concluding remarks

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