

The background of the cover is a high-magnification micrograph of a solder joint, showing a complex, crystalline structure with various shades of brown and tan. A dark blue vertical bar is on the left side. In the center, there is a horizontal strip showing a series of solder joints on a substrate, with a small white arrow pointing to the right.

# **Solder Joint Reliability**

*Theory and Applications*

**Edited by John H. Lau**

# Solder Joint Reliability Theory And Applications

**Rao K. Mahidhara**



## **Solder Joint Reliability Theory And Applications:**

**Solder Joint Reliability** John H. Lau, 1991-05-31 Looks at how solder joint reliability is influenced by flux reactions solder paste reflow methods wave soldering and cleaning Explores failure mechanisms and includes practical methods for testing analysis and life prediction of solder joints subjected to conditions of fatigue creep stress relaxation shock and vibration For engineers and designers involved in electronics packaging Annotation copyrighted by Book News Inc Portland OR

Solder Joint Reliability John H. Lau, 2014-02-23 Solders have given the designer of modern consumer commercial and military electronic systems a remarkable flexibility to interconnect electronic components The properties of solder have facilitated broad assembly choices that have fueled creative applications to advance technology Solder is the electrical and mechanical glue of electronic assemblies This pervasive dependency on solder has stimulated new interest in applications as well as a more concerted effort to better understand materials properties We need not look far to see solder being used to interconnect ever finer geometries Assembly of micropassive discrete devices that are hardly visible to the unaided eye of silicon chips directly to ceramic and plastic substrates and of very fine peripheral leaded packages constitute a few of solder's uses There has been a marked increase in university research related to solder New electronic packaging centers stimulate applications and materials engineering and science departments have demonstrated a new vigor to improve both the materials and our understanding of them Industrial research and development continues to stimulate new application and refreshing new packaging ideas are emerging New handbooks have been published to help both the neophyte and seasoned packaging engineer

Solder Joint Reliability John H. Lau, 2014-09-01 *Solder Joint Reliability of BGA, CSP, Flip Chip, and Fine Pitch SMT Assemblies* John H. Lau, Yi-hsin Pao, 1997 The explosive growth of high density packaging has created a tremendous impact on the electronic assembly and manufacturing industry Ball grid array BGA chip scale package CSP and solder bumped flip chip technologies are taking the lead in this advanced manufacturing process Many major equipment makers and leading electronic companies are now gearing up for these emerging and advanced packaging technologies For these technologies solder is the electrical and mechanical glue and thus solder joint reliability is one of the most critical issues in the development of these technologies This book is a one stop guide to the state of the art of solder joint reliability problem solving methods or choose a creative high performance robust and cost effective design and high yield manufacturing process for their interconnect systems will be able to do so with this unique sourcebook It meets the reference needs of design material process equipment manufacturing quality control product assurance reliability component packaging vendor marketing and system engineers and technical managers working in electronic packaging and interconnection This book is structured to provide readers with the necessary know how for practical on the job problem solving guidance The book covers the solder joint reliability of BGA CSP flip chip and FPT assemblies completely proceeding from the theoretical basics to applications Specific areas covered include Definition of reliability life distribution failure rate

mean time to failure etc Some well known life distributions Accelerated testing Parameter estimation of life distributions Acceleration factors for solders Solder mechanics plasticity creep and constitutive equations Design material and manufacturing processes of BGA CSP flip chip and FTP Failure analysis and root cause of failure for BGA CSP flip chip and FPT solder joints Design for reliability of BGA CSP flip chip and FPT solder joints Solder joint reliability of CBGA PBGA DBGA and TBGA assemblies under thermal fatigue mechanical bending and twisting and shock and vibration conditions solder joint reliability of flip chip e g high temperature and eutectic solder bumped flip chips on ceramic and PCB assemblies under thermal fatigue mechanical pulling shearing bending and twisting and shock and vibration conditions Solder joint reliability of CSP e g LG Semicon s Mitsubishi s Motorola s Tessera s NEC s nitto Denko s and Toshiba s assemblies under thermal fatigue and mechanical bending conditions Solder joint reliability of PQFP and TSOP assemblies under thermal fatigue mechanical bending and twisting and vibration conditions

**Microelectronics Packaging Handbook** Rao Tummala,Eugene J. Rymaszewski,Alan G. Klopfenstein,1997-01-31 This thoroughly revised and updated three volume set continues to be the standard reference in the field providing the latest in microelectronics design methods modeling tools simulation techniques and manufacturing procedures Unlike reference books that focus only on a few aspects of microelectronics packaging these outstanding volumes discuss state of the art packages that meet the power cooling protection and interconnection requirements of increasingly dense and fast microcircuitry Providing an excellent balance of theory and practical applications this dynamic compilation features step by step examples and vital technical data simplifying each phase of package design and production In addition the volumes contain over 2000 references 900 figures and 250 tables Part I Technology Drivers covers the driving force of microelectronics packaging electrical thermal and reliability It introduces the technology developer to aspects of manufacturing that must be considered during product development Part II Semiconductor Packaging discusses the interconnection of the IC chip to the first level of packaging and all first level packages Electrical test sealing and encapsulation technologies are also covered in detail Part III Subsystem Packaging explores board level packaging as well as connectors cables and optical packaging

**Lead-Free Electronics** Edwin Bradley,Carol A. Handwerker,Jasbir Bath,Richard D. Parker,Ronald W. Gedney,2007-10-26 Based on the results of a more than two year study Lead Free Electronics iNEMI Projects Lead to Successful Manufacturing is the first practical primary reference to cover Pb free solder assembly as well as the analysis and reasoning behind the selection of Sn Ag Cu as the recommended Pb free replacement for Sn Pb Reflecting the results of a two year study Lead Free Electronics iNEMI Projects Lead to Successful Manufacturing provides full coverage of the issues surrounding the implementation of Pb free solder into electronic board assembly This book is extremely timely most electronic manufacturers are going to change over to Pb free soldering by 2006 to meet new European laws All manufacturers around the globe are going to be affected by this change The text provides specific results from the thirty company NEMI project activities It contains integrated and fully

documented book chapters with references to existing published work in the area These serve as tremendous resources for engineers and companies faced with making the switch to Pb free solder assembly

**Green Electronics Manufacturing** John X. Wang,2012-07-25 Going green is becoming a major component of the mission for electronics manufacturers worldwide While this goal seems simplistic it poses daunting dilemmas Yet to compete effectively in the global economy manufacturers must take the initiative to drive this crucial movement Green Electronics Manufacturing Creating Environmental Sensible Products provides you with a complete reference to design develop build and install an electronic product with special consideration for the product s environmental impacts during its whole life cycle The author discusses how to integrate the state of the art technologies of finite element method FEM modeling simulation and testing to create environmental sensible products of satisfying global environmental regulations such as Restriction of Hazardous Substances ROHS compliance He covers enabling techniques such as advanced fatigue life modeling crack propagation analysis and probabilistic robust design of lead free electronics The book also explores how risk engineering methodology empowers practitioners with effective tools such as buckling analysis of tin whiskers With its emphasis on reducing parts rationing materials and reusing components to make products more efficient to build green electronics intertwines today s electronics with manufacturing strategies of global sourcing concurrent engineering and total quality Implemented through product and process design it can help you achieve sustainability to support future generations and at the same time preserve our natural resources Green Electronics Manufacturing Creating Environmental Sensible Products gives you the tools to create environmental sensible products while maintaining electronics quality and reliability

**Design and Reliability of Solders and Solder Interconnections** Rao K. Mahidhara,1997 The reliability of solders and solder joints is an important factor in the durability and design of electronic packages This volume addresses issues of reliability such as microstructural stability in service creep fatigue creep fatigue interactions and thermomechanical fatigue of bulk solders and solder joints

**Microvias** John H. Lau,Ricky S. W. Lee,2001-04-26 State of the art introduction to high density interconnect technology The first ever book on this hot topic Microvias Low Cost High Density Interconnects gives you a thorough look at the technology that s changing the nature of printed circuit boards and driving the mobile electronic revolution A must for electronics and mechanical engineers John Lau and Ricky Lee s intensive introduction to microvia technology expertly covers all major techniques You get important details on mechanical NC drilling laser drilling photo defined chemical and plasma etching and conductive ink formation You also get a survey of the work of leading companies and their products including Canon Compaq Fujitsu Limited Gore Hitachi Chemical Co Ividen IBM JCI JVC K S X Lam Kyocera JME Matsushita Mitsubishi NEC Samsung Sheldahl Shinko Toshiba

**Proceedings of the Technical Conference** ,1995 **Advanced MEMS Packaging** John H. Lau,Cheng Kuo Lee,C. S. Premachandran,Yu Aibin,2009-10-22 A comprehensive guide to 3D MEMS packaging methods and solutions Written by experts in the field Advanced MEMS Packaging serves as a valuable reference

for those faced with the challenges created by the ever increasing interest in MEMS devices and packaging This authoritative guide presents cutting edge MEMS microelectromechanical systems packaging techniques such as low temperature C2W and W2W bonding and 3D packaging This definitive resource helps you select reliable creative high performance robust and cost effective packaging techniques for MEMS devices The book will also aid in stimulating further research and development in electrical optical mechanical and thermal designs as well as materials processes manufacturing testing and reliability Among the topics explored Advanced IC and MEMS packaging trends MEMS devices commercial applications and markets More than 360 MEMS packaging patents and 10 3D MEMS packaging designs TSV for 3D MEMS packaging MEMS wafer thinning dicing and handling Low temperature C2C C2W and W2W bonding Reliability of RoHS compliant MEMS packaging Micromachining and water bonding techniques Actuation mechanisms and integrated micromachining Bubble switch optical switch and VOA MEMS packaging Bolometer and accelerameter MEMS packaging Bio MEMS and biosensor MEMS packaging RF MEMS switches tunable circuits and packaging

**An Analysis of Global and Localized Creep Strains and Creep Properties of Non-composite and Composite Lead-free Solders at Room and Elevated Temperatures** Jeffrey Lee McDougall,1998 The Metal Science of Joining M. J. Cieslak,1992 This reference source provides information on the fundamental principles and techniques of metal joining technology including welding brazing and soldering applications for the use of microelectronics aerospace and petrochemical engineers who have no formal training in the technology Proceedings of the ... International Symposium on Microelectronics ,2000

Proceedings ,2004 **Reliability of RoHS-Compliant 2D and 3D IC Interconnects** John H. Lau,2010-10-22 Proven 2D and 3D IC lead free interconnect reliability techniques Reliability of RoHS Compliant 2D and 3D IC Interconnects offers tested solutions to reliability problems in lead free interconnects for PCB assembly conventional IC packaging 3D IC packaging and 3D IC integration This authoritative guide presents the latest cutting edge reliability methods and data for electronic manufacturing services EMS on second level interconnects packaging assembly on first level interconnects and 3D IC integration on microbumps and through silicon via TSV interposers Design reliable 2D and 3D IC interconnects in RoHS compliant projects using the detailed information in this practical resource Covers reliability of 2D and 3D IC lead free interconnects CCGA PBGA WLP PQFP flip chip lead free SAC solder joints Lead free SACX solder joints Low temperature lead free SnBiAg solder joints Solder joints with voids high strain rate and high ramp rate VCSEL and LED lead free interconnects 3D LED and 3D MEMS with TSVs Chip to wafer C2W bonding and lead free interconnects Wafer to wafer W2W bonding and lead free interconnects 3D IC chip stacking with low temperature bonding TSV interposers and lead free interconnects Electromigration of lead free microbumps for 3D IC integration Journal of Electronic Packaging ,2004

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