

Solder Mechanics

A State of the Art Assessment



D.R. Frear, W.B. Jones, K.R. Kinsman

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Michael Hosking, Frederick G. Yost



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Mechanics of Solder Alloy Interconnects Darrel R. Frear, Steven N. Burchett, Harold S. Morgan, John H. Lau, 1994-01-31

The Mechanics of Solder Alloy Interconnects is a resource to be used in developing a solder joint reliability assessment Each chapter is written to be used as a stand alone resource for a particular aspect of materials and modeling issues With this gained understanding the reader in search of a solution to a solder joint reliability problem knows where in the materials and modeling communities to go for the appropriate answer **Solder Mechanics** D. R. Frear, 1991 **Solder Mechanics** D.

R. Frear, W. B. Jones, K. R. Kinsman, 1991-01-01 *Lead-Free Electronic Solders* KV Subramanian, 2007-06-28 Even though the effect of lead contamination on human health has been known for decades very little attention has been paid to lead based solders used in electronics until recently This comprehensive book examines all the important issues associated with lead free electronic solder It collects the work of researchers recognized for their significant scientific contributions in the area **The Mechanics of Solder Alloy Wetting and Spreading** Michael Hosking, Frederick G. Yost, 2012-12-06 In 1992

Congress passed the Defense Manufacturing Engineering Education Act with the intent of encouraging academic institutions to increase their emphasis on manufacturing curricula The need for this incentive to integrate the academic and industrial communities was clear gaps in manufacturing science were inhibiting the evolution of new manufacturing technologies that are required for the U S to maintain a competitive posture in the world marketplace The Army Research Laboratory and Sandia National Laboratories sought to contribute to the congressional intent by initiating a new series of graduate level college textbooks The goal was to focus next generation scientists onto issues that were common to the needs of the commercial market the affordability of DoD weapons systems and the mobilization readiness of the U S Armed Forces The textbook The Mechanics of Solder Wetting and Spreading was written in this spirit by nationally renowned scientists for academe and industry Research ers using the book are encouraged to formulate programs that will establish scien tific correlations between manufacturing process controls and product reliability Such correlations are essential to the building of a new electronics industry which is based upon the futuristic concepts of Virtual Factories Prototyping and Testing

Lead-Free Solder Interconnect Reliability Dongkai Shangguan, 2005 Soldering Processes and Equipment Michael G.

Pecht, 1993-08-30 Addresses the key aspects of modern soldering technology and the methods used in the manufacturing process of microelectronic chips and electronic circuit boards Demonstrates how to control contamination during cleaning procedures Covers material dynamics of heat soldering incurred during the assembly of diverse substances Features techniques to assure reliability and quality control during the manufacturing process and emphasizes the importance of rework in the soldering industry Handbook of Lead-Free Solder Technology for Microelectronic Assemblies Karl J.

Puttlitz, Kathleen A. Stalter, 2004-02-27 This reference provides a complete discussion of the conversion from standard lead

tin to lead free solder microelectronic assemblies for low end and high end applications Written by more than 45 world class researchers and practitioners the book discusses general reliability issues concerning microelectronic assemblies as well as factors specif

Green Electronics/Green Bottom Line Lee H Goldberg,1999-11-05 Environmentally safe engineering is one of the hottest and most controversial topics in technical circles Though many publications offer theory and intellectual discussion of the topic this book provides practical hands on advice including hints and tips from the nation s top engineers Green Electronics Green Bottom Line offers practical advice for engineers and managers who want or need to incorporate environmental issues into the design process The emerging discipline of Design for the Environment DfE combines engineering know how with environmental awareness Topics include international policy issues such as ISO 14000 materials selection e g for recyclability manufacturing concerns like no flux processes and design issues such as power consumption Real world cases show how these elements can be included in everyday designs Each chapter opens with a topical cartoon and lively story interview or editorial The discussion will then move to specific engineering issues and their economic and social context The last section explores larger possibilities and new directions still to be explored by engineers concerned with education health and environmental quality Contributors include engineers from Motorola Analog Devices Dupont Compaq Nortel AMD and Apple Computer and academics from universities in the US Canada the UK and Europe as well as the Rocky Mountain Institute An everyday guide to environmentally sound electronics design Contributors include top engineers from the biggest electronics manufacturers and most prestigious universities Real world cases illustrate topics giving concepts the reader can apply immediately

Fatigue of Electronic Materials Scott A. Schroeder,Michael R. Mitchell,1994 Unlike earlier electronic circuits today s microelectronic devices demand that solder serve structural as well as electrical ends and do so at relatively high temperature for years Fatigue and failure of the solder has therefore become an issue in the industry Nine studies from a May 1993 sympos

Quality Conformance and Qualification of Microelectronic Packages and Interconnects Michael G. Pecht,Abhijit Dasgupta,John W. Evans,Jillian Y. Evans,1994-12-13 All packaging engineers and technologists who want to ensure thatthey give their customers the highest quality most cost effectiveproducts should know that the paradigm has shifted It has shiftedaway from the MIL STDs and other government standards and testprocedures that don t cost effectively address potential failuremechanisms or the manufacturing processes of the product It hasshifted decisively towards tackling the root causes of failure andthe appropriate implementation of cost effective process controls qualityscreens and tests This book s groundbreaking science based approach to developingqualification and quality assurance programs helps engineers reach a new level of reliability in today s high performancemicroelectronics It does this with powerful Techniques for identifying and modeling failure mechanismsearlier in the design cycle breaking the need to rely on fielddata Physics of failure product reliability assessment methods thatcan be proactively implemented throughout the design andmanufacture of the product Process controls that decrease variabilities in the end productand

reduce end of line screening and testing A wide range of microelectronic package and interconnect configurations for both single and multi chip modules is examined including chip and wire bonds tape automated TAB flip TAB flip chip bonds high density interconnects chip on board designs COB MCM 3 D stack and many more The remaining package elements such as die attachment case and lid leads and lid and lead seals are also discussed in detail The product of a distinguished team of authors and editors this book's guidelines for avoiding potential high risk manufacturing and qualification problems as well as for implementing ongoing quality assurance are sure to prove invaluable to both students and practicing professionals For the professional engineer involved in the design and manufacture of products containing electronic components here is a comprehensive handbook to the theory and methods surrounding the assembly of microelectronic and electronic components The book focuses on computers and consumer electronic products with internal subsystems that reflect mechanical design constraints cost limitations and aesthetic and ergonomic concerns Taking a total system approach to packaging the book systematically examines basic chip and computer architecture design and layout interassembly and interconnections cooling scheme materials selection including ceramics glasses and metals stress vibration and acoustics and manufacturing and assembly technology 1994 0 471 53299 1 800 pp INTEGRATED CIRCUIT HYBRID AND MULTICHIP MODULE PACKAGE DESIGN GUIDELINES A Focus on Reliability Michael Pecht This comprehensive guide features a uniquely organized time phased approach to design development qualification manufacture and in service management It provides step by step instructions on how to define realistic system requirements define the system usage environment identify potential failure modes characterize materials and processes by the key control label factors and use experiment step stress and accelerated methods to ensure optimum design before production begins Topics covered include detailed design guidelines for substrate wire and wire tape automated and flip chip bonding element attachment and case lead lead and lid seals incorporating dimensional and geometric configurations of package elements manufacturing and assembly conditions materials selection and loading conditions 1993 0 471 59446 6 454 pp Springer Handbook of Electronic and Photonic Materials Safa Kasap, Peter Capper, 2007-08-01 Electronic materials is a truly interdisciplinary subject that encompasses a number of traditional disciplines such as materials science electrical engineering chemical engineering mechanical engineering physics and chemistry This unique handbook provides broad coverage of a wide range of electronic and photonic materials starting from fundamentals and building up to advanced topics and applications Its wide coverage with clear illustrations and applications and its chapter sequencing and logical flow make this a very useful and useable handbook Each chapter has been prepared either by expert researchers or instructors who have been teaching the subject at a university or in corporate laboratories Unlike other handbooks that concentrate on a narrow field and have chapters that start at an advanced level the present handbook starts at a senior undergraduate level and builds up the subject matter in easy steps and in a logical flow Wherever possible the sections are logically sequenced to allow those who need a quick overview of a particular topic

immediate access to it. Additional valuable features include the practical applications used as examples, details on experimental techniques, useful tables that summarize equations and most importantly properties of various materials. Each chapter is full of clear color illustrations that convey the concepts and make the subject matter enjoyable to read and understand. An extensive glossary aids readers from adjacent fields. The Handbook constitutes an essential reference for today's electrical engineers, materials scientists, and physicists.

Microstructural Characterization of Tin-silver Eutectic Solder (96.5Sn/3.5Ag) Alloyed with Small Concentrations of Lead (Pb) Lawrence Gerard Vettrano, 2002

Modeling and Simulation for Microelectronic Packaging Assembly Shen Liu, Yong Liu, 2011-08-24

Although there is increasing need for modeling and simulation in the IC package design phase, most assembly processes and various reliability tests are still based on the time-consuming test and try out method to obtain the best solution. Modeling and simulation can easily ensure virtual Design of Experiments (DoE) to achieve the optimal solution. This has greatly reduced the cost and production time, especially for new product development. Using modeling and simulation will become increasingly necessary for future advances in 3D package development. In this book, Liu and Liu allow people in the area to learn the basic and advanced modeling and simulation skills to help solve problems they encounter. Models and simulates numerous processes in manufacturing reliability and testing for the first time. Provides the skills necessary for virtual prototyping and virtual reliability qualification and testing. Demonstrates concurrent engineering and co design approaches for advanced engineering design of microelectronic products. Covers packaging and assembly for typical ICs, optoelectronics, MEMS, 2D, 3D, SiP, and nano interconnects. Appendix and color images available for download from the book's companion website. Liu and Liu have optimized the book for practicing engineers, researchers, and post graduates in microelectronic packaging and interconnection design, assembly, manufacturing, electronic reliability, quality, and semiconductor materials. Product managers, application engineers, sales, and marketing staff who need to explain to customers how the assembly, manufacturing, reliability, and testing will impact their products will also find this book a critical resource. Appendix and color version of selected figures can be found at www.wiley.com/go/liu_packaging.

Proceedings of the XII Space Photovoltaic Research and Technology Conference (SPRAT XII), 1993

Reflow Soldering Processes Ning-Cheng Lee, 2002-01-24

Focused on technological innovations in the field of electronics packaging and production, this book elucidates the changes in reflow soldering processes, its impact on defect mechanisms, and accordingly the troubleshooting techniques during these processes in a variety of board types. Geared toward electronics manufacturing process engineers, design engineers, as well as students in process engineering classes, *Reflow Soldering Processes and Troubleshooting* will be a strong contender in the continuing skill development market for manufacturing personnel. Written using a very practical, hands-on approach, *Reflow Soldering Processes and Troubleshooting* provides the means for engineers to increase their understanding of the principles of soldering, flux, and solder paste technology. The author facilitates learning about other essential topics such as area array

packages including BGA CSP and FC designs bumping technique assembly and rework process and provides an increased understanding of the reliability failure modes of soldered SMT components With cost effectiveness foremost in mind this book is designed to troubleshoot errors or problems before boards go into the manufacturing process saving time and money on the front end The author s vast expertise and knowledge ensure that coverage of topics is expertly researched written and organized to best meet the needs of manufacturing process engineers students practitioners and anyone with a desire to learn more about reflow soldering processes Comprehensive and indispensable this book will prove a perfect training and reference tool that readers will find invaluable Provides engineers the cutting edge technology in a rapidly changing field Offers in depth coverage of the principles of soldering flux solder paste technology area array packages including BGA CSP and FC designs bumping technique assembly and the rework process

Robust Design of Microelectronics Assemblies Against Mechanical Shock, Temperature and Moisture E-H Wong, Y.-W. Mai, 2015-05-23 Robust Design of Microelectronics Assemblies Against Mechanical Shock Temperature and Moisture discusses how the reliability of packaging components is a prime concern to electronics manufacturers The text presents a thorough review of this important field of research providing users with a practical guide that discusses theoretical aspects experimental results and modeling techniques The authors use their extensive experience to produce detailed chapters covering temperature moisture and mechanical shock induced failure adhesive interconnects and viscoelasticity Useful program files and macros are also included Discusses how the reliability of packaging components is a prime concern to electronics manufacturers Presents a thorough review of this important field of research providing users with a practical guide that discusses theoretical aspects experimental results and modeling techniques Includes program files and macros for additional study

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

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