

Thermal Cycling: Ensuring Reliability and Durability in Electronic Components



Reliability Of Electronic Components

Eugene R. Hnatek



Reliability Of Electronic Components:

Reliability of Electronic Components Titu I. Băjenescu, Marius I. Băzu, 2012-12-06 The first detailed studies of electronic components reliability were undertaken to improve the performance of communications and navigational systems used by the American army The techniques then developed were subsequently refined and applied to equipment used for many other applications where high reliability was of paramount importance for example in civil airline electronic systems The evolution of good and reliable products is the responsibility of technical and professional persons engineers and designers These individuals cannot succeed unless they are given adequate opportunity to apply their arts and mysteries so as to bring the end product to the necessary level of satisfaction Few managements however are yet aware of the far greater potential value of the reliability of their products or services Yet customer satisfaction depends in most cases far more on the reliability of performance than on quality in the industrial sense There was a time when reliable design could be prescribed simply as picking good parts and using them right Nowadays the complexity of systems particularly electronic systems and the demand for ultrahigh reliability in many applications mean that sophisticated methods based on numerical analysis and probability techniques have been brought to bear particularly in the early stages of design on determining the feasibility of systems

Component Reliability for Electronic Systems Titu I. Băjenescu, Marius I. Băzu, 2010 The main reason for the premature breakdown of today's electronic products computers cars tools appliances etc is the failure of the components used to build these products Today professionals are looking for effective ways to minimize the degradation of electronic components to help ensure longer lasting more technically sound products and systems This practical book offers engineers specific guidance on how to design more reliable components and build more reliable electronic systems Professionals learn how to optimize a virtual component prototype accurately monitor product reliability during the entire production process and add the burn in and selection procedures that are the most appropriate for the intended applications Moreover the book helps system designers ensure that all components are correctly applied margins are adequate wear out failure modes are prevented during the expected duration of life and system interfaces cannot lead to failure

Corrosion and Reliability of Electronic Materials and Devices Robert B. Comizzoli, Robert Peter Frankenthal, James Douglas Sinclair, 1999

Electronics Reliability-Calculation and Design Geoffrey W. A. Dummer, Norman B. Griffin, 2013-10-22 Electronics Reliability Calculation and Design provides an introduction to the fundamental concepts of reliability The increasing complexity of electronic equipment has made problems in designing and manufacturing a reliable product more and more difficult Specific techniques have been developed that enable designers to integrate reliability into their products and reliability has become a science in its own right The book begins with a discussion of basic mathematical and statistical concepts including arithmetic mean frequency distribution median and mode scatter or dispersion of measurements and the normal and binomial distributions Separate chapters deal with techniques for calculating equipment and system reliability

safety and derating factors and the effects of constructional methods on reliability Subsequent chapters cover environmental effects on reliability improved reliability through microelectronics or integrated circuits and failure rates for electronic components Each chapter concludes with questions to enable students to test their understanding of the topics discussed This book offers students an introduction to the subject of reliability in a form that is easily assimilated It also serves as a reference to the various aspects contributing towards increased reliability of both electronic equipment and complete systems

Practical Reliability Of Electronic Equipment And Products Eugene R. Hnatek, 2002-10-25 Examining numerous examples of highly sensitive products this book reviews basic reliability mathematics describes robust design practices and discusses the process of selecting suppliers and components He focuses on the specific issues of thermal management electrostatic discharge electromagnetic compatibility printed wiring assembly environmental stress testing and failure analysis The book presents methods for meeting the reliability goals established for the manufacture of electronic product hardware and addresses the development of reliable software The appendix provides example guidelines for the derating of electrical and electromechanical components

Optimizing the Air Force Acquisition Strategy of Secure and Reliable Electronic Components National Academies of Sciences, Engineering, and Medicine, Division on Engineering and Physical Sciences, Air Force Studies Board, Committee on Optimizing the Air Force Acquisition Strategy of Secure and Reliable Electronic Components: A Workshop, 2016-09-12 In 2012 the National Defense Authorization Act NDAA section 818 outlined new requirements for industry to serve as the lead in averting counterfeits in the defense supply chain Subsequently the House Armed Services Committee in its report on the Fiscal Year 2016 NDAA noted that the pending sale of IBM's microprocessor fabrication facilities to Global Foundries created uncertainty about future access of the United States to trusted state of the art microelectronic components and directed the Comptroller General to assess the Department of Defense's DoD's actions and measures to address this threat In this context the National Academies of Sciences Engineering and Medicine convened a workshop to facilitate an open dialogue with leading industry academic and government experts to

- 1 define the current technological and policy challenges with maintaining a reliable and secure source of microelectronic components
- 2 review the current state of acquisition processes within the Air Force for acquiring reliable and secure microelectronic components and
- 3 explore options for possible business models within the national security complex that would be relevant for the Air Force acquisition community

This publication summarizes the results of the workshop

Reliability of electronic components Charles Eric Jowett, 1966

Failure Analysis Marius Bazu, Titu Bajenescu, 2011-03-08 Failure analysis is the preferred method to investigate product or process reliability and to ensure optimum performance of electrical components and systems The physics of failure approach is the only internationally accepted solution for continuously improving the reliability of materials devices and processes The models have been developed from the physical and chemical phenomena that are responsible for degradation or failure of electronic

components and materials and now replace popular distribution models for failure mechanisms such as Weibull or lognormal. Reliability engineers need practical orientation around the complex procedures involved in failure analysis. This guide acts as a tool for all advanced techniques, their benefits and vital aspects of their use in a reliability programme. Using twelve complex case studies, the authors explain why failure analysis should be used with electronic components when implementation is appropriate and methods for its successful use. Inside you will find detailed coverage on a synergistic approach to failure modes and mechanisms along with reliability physics and the failure analysis of materials, emphasizing the vital importance of cooperation between a product development team. It involves the reasons why failure analysis is an important tool for improving yield and reliability by corrective actions, the design stage, highlighting the concurrent engineering approach and DfR (Design for Reliability) failure analysis during fabrication, covering reliability monitoring, process monitors and package reliability, reliability testing after fabrication, including reliability assessment at this stage and corrective actions, a large variety of methods such as electrical methods, thermal methods, optical methods, electron microscopy, mechanical methods, X-Ray methods, spectroscopic, acoustical and laser methods, new challenges in reliability testing such as its use in microsystems and nanostructures. This practical yet comprehensive reference is useful for manufacturers and engineers involved in the design, fabrication and testing of electronic components, devices, ICs and electronic systems as well as for users of components in complex systems wanting to discover the roots of the reliability flaws for their products.

Determining the Reliability of Electronic Components in Theory and Practice H. T. Dewaide, P. Popkema, 1971. *Progress Report on Reliability of Electronic Equipment* United States. Department of Defense. Research and Development Board. Ad Hoc Group on Reliability of Electronic Equipment, United States. Research and Development Board. Committee on Electronics. Ad Hoc Group on Reliability of Electronic Equipment, 1952. *Reliability and Failure of Electronic Materials and Devices* Milton Ohring, 1998-06-12. Suitable as a reference work for reliability professionals or as a text for advanced undergraduate or graduate students, this book introduces the reader to the widely dispersed reliability literature of microelectronic and electronic optional devices. Reliability and Failure of Electronic Materials and Devices integrates a treatment of chip and packaging level failures within the context of the atomic mechanisms and models used to explain degradation and the statistical handling of lifetime data. Electromigration, dielectric radiation damage and the mechanical failure of contacts and solder joints are among the failure mechanisms considered. An underlying thread of the book concerns product defects, their relation to yield and reliability, the role they play in failure and the way they are experimentally exposed. The reader will gain a deeper physical understanding of failure mechanisms in electronic materials and devices, acquire skills in the mathematical handling of reliability data and better appreciate future technology trends and the reliability issues they raise. Discusses reliability and failure on both the chip and packaging levels. Handles the role of defects in yield and reliability. Includes a tutorial chapter on the mathematics of reliability. Focuses on electromigration.

dielectric breakdown hot electron effects electrostatic discharge corrosion radiation damage and the mechanical failure of packages contacts and solder joints Considers defect detection methods and failure analysis techniques **Reliability of Electronic Components** C. E. Jowett,1960 **Reliability and Failure of Electronic Equipment, Systems, and Mathematical Models** Carlotta M. Vidoni,1964 Structural Integrity and Reliability in Electronics W.J. Plumbridge,R.J. Matela,A. Westwater,2007-05-08 Knowledge itself is soon obsolete It is a blunt instrument Only by understanding can problems be solved and progress achieved Reliability in performance of electronic equipment in the face of demands for continuing miniaturisation and the anticipated abolition of lead containing solders represents a major engineering challenge The involvement of numerous disciplines such as electrical electronic mechanical manufacturing and materials engineering together with physicists and computer specialists adds to the complexity of the situation Nevertheless with electronics being the World s largest industrial sector the potential rewards to the winners are substantial This book aims to provide the ingredients for understanding together with knowledge of reliability in interconnection technology and of the implementation of lead free solders It is strongly contended that such a combination forms the necessary basis for greater structural integrity and enhanced performance The text is essentially in three parts The intentions of the Part I component The Materials Perspective Chapters 1 6 are to present a snapshot of the current but rapidly changing global scene and to establish a firm understanding of the fundamentals surrounding interconnection performance With potential readers possessing a broad spectrum of knowledge and expertise this is essential It could be argued that the reason for the limited progress made in this field to date has been due to the difficulties encountered in communicating effectively across the discipline boundaries **AI Techniques for Reliability Prediction for Electronic Components** Bhargava, Cherry,2019-12-06 In the industry of manufacturing and design one major constraint has been enhancing operating performance using less time As technology continues to advance manufacturers are looking for better methods in predicting the condition and residual lifetime of electronic devices in order to save repair costs and their reputation Intelligent systems are a solution for predicting the reliability of these components however there is a lack of research on the advancements of this smart technology within the manufacturing industry AI Techniques for Reliability Prediction for Electronic Components provides emerging research exploring the theoretical and practical aspects of prediction methods using artificial intelligence and machine learning in the manufacturing field Featuring coverage on a broad range of topics such as data collection fault tolerance and health prognostics this book is ideally designed for reliability engineers electronic engineers researchers scientists students and faculty members seeking current research on the advancement of reliability analysis using AI **Proceedings, 1956 Electronic Components Symposium** ,1956 **Reliability of Military Electronic Equipment** United States. Advisory Group on Reliability of Electronic Equipment,1957 **Reliability by Design** A. C. Brombacher,1992-05-18 Describes a method tested on three practical circuits two switch mode power supplies and one motordrive to use in reliably assessing the

design process of electronic systems and circuits focusing on high volume consumer electronics Coverage includes the development of susceptibility models for practical components such as the medium power Schottky diode a high voltage bipolar transistor and an integrated circuit the use of stressor susceptibility models in analyzing practical circuits a technique for using stressor susceptibility interaction in circuit optimization and much more **Component Reliability for Electronic Systems** Titu I. Băjenescu,2010 *Reliability in electrical and electronic components and systems* E. Lauger,Jørgen Møltoft,1982

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