OMB No. 0094157748529

Automotive Electronics Reliability Handbook

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Practical Reliability Of Electronic Equipment And Products
The Electronic Packaging Handbook
Electronic Failure Analysis Handbook
Case Studies in Reliability and Maintenance
Automotive Engineering
Reliability Characterisation of Electrical and Electronic Systems
Reliability of Organic Compounds in Microelectronics and Optoelectronics
The Reliability Handbook
Reliability Engineering Handbook
Design and the Reliability Factor
V2V/V2I Communications for Improved Road Safety and Efficiency
Handbook of Reliability Engineering
Solid State Lighting Reliability Part 2
Design Reliability
Handbook of Performability Engineering
Standard Handbook of Electronic Engineering, 5th Edition

Handbook of Reliability, Availability, Maintainability and Safety in Engineering Design
Automotive Electronics Reliability
Power Electronic Packaging
Product Development Process and Checklist for Vehicle Electronic Systems
Product Reliability, Maintainability, and Supportability Handbook

Automotive Electronics Reliability Handbook *OMB No. 0094157748529* *edited by*

CHACE MCGEE

Practical Reliability Of Electronic Equipment And Products

Automotive Electronics Reliability Handbook This handbook was designed to provide the automotive electronics community with an understanding of the concepts, principles, and methodologies concerning all aspects of automotive electronic systems reliability engineering. Chapters include: Reliability Terminology Associated with Automotive Electronics; Reliability Theory; Reliability Data Analysis; Regression Analysis; Reliability Specification and Allocation; Reliability Prediction; Reliability Design Guidelines; FMEA, FTA, and SCA; Reliability Demonstration and Reliability Growth. The handbook is based upon information from several sources, which are listed at

the end of each chapter.

The Electronic Packaging Handbook

CRC Press
The Standard Handbook of Electronics Engineering has defined its field for over thirty years. Spun off in the 1960's from Fink's Standard Handbook of Electrical Engineering, the Christiansen book has seen its markets grow rapidly, as electronic engineering and microelectronics became the growth engine of digital computing. The EE market has now undergone another seismic shift—away from computing and into communications and media. The Handbook will retain much of its evergreen basic material, but the key applications sections will now focus upon communications, networked media, and medicine—the eventual destination of the majority of graduating EEs these days.

Electronic Failure Analysis Handbook

John Wiley & Sons
This textbook reviews the methodologies of reliability prediction as currently used in industries such as electronics, automotive, aircraft, aerospace, off-highway, farm machinery, and others. It then discusses why these are not successful; and, presents methods developed by the authors

for obtaining accurate information for successful prediction. The approach is founded on approaches that accurately duplicate the real world use of the product. Their approach is based on two fundamental components needed for successful reliability prediction; first, the methodology necessary; and, second, use of accelerated reliability and durability testing as a source of the necessary data. Applicable to all areas of engineering, this textbook details the newest techniques and tools to achieve successful reliabilitypredi ction and testing. It demonstrates practical examples of the implementatio n of the approaches described. This book is a tool for engineers, managers, researchers, in industry, teachers, and students. The reader will learn the importance of the interactions of the influencing factors and the interconnectio ns of safety and human factors in product prediction and testing.

Case Studies in Reliability and Maintenance

Springer

This book provides a comprehensiv e presentation of the most advanced research results and technological developments enabling understanding

, qualifying and mitigating the soft errors effect in advanced electronics, including the fundamental physical mechanisms of radiation induced soft errors, the various steps that lead to a system failure, the modelling and simulation of soft error at various levels (including physical, electrical, netlist, event driven, RTL, and system level modelling and simulation), hardware fault injection, accelerated radiation testing and natural environment testing, soft error oriented test structures, process-level, device-level, cell-level, circuit-level, architectural-level, software level and system level soft error mitigation techniques. The book contains a comprehensive presentation of most recent advances on understanding , qualifying and mitigating the soft error effect in advanced electronic systems, presented by academia and industry experts in reliability, fault tolerance, EDA, processor, SoC and system design, and in particular, experts from industries that have faced the soft error impact in terms of product reliability and related business issues and were in the forefront of the countermeasures taken by these companies at

multiple levels in order to mitigate the soft error effects at a cost acceptable for commercial products. In a fast moving field, where the impact on ground level electronics is very recent and its severity is steadily increasing at each new process node, impacting one after another various industry sectors (as an example, the Automotive Electronics Council comes to publish qualification requirements on soft errors), research and technology developments and industrial practices have evolve very fast, outdating the most recent books edited at 2004.

Automotive Engineering

McGraw Hill Professional
Providing a comprehensive approach to both the art and science of reliability engineering, this volume covers all aspects of the field, from basic concepts to accelerated testing, including SPC, designed experiments, human factors, and reliability management. It also presents the theory of reliability systems and its application as prescribed by industrial and government standards.

Reliability Characterisation of Electrical and Electronic Systems CRC Press
A unique book that describes the practical processes

necessary to achieve failure free equipment performance, for quality and reliability engineers, design, manufacturing process and environmental test engineers. This book studies the essential requirements for successful product life cycle management. It identifies key contributors to failure in product life cycle management and particular emphasis is placed upon the importance of thorough Manufacturing Process Capability reviews for both in-house and outsourced manufacturing strategies. The readers? attention is also drawn to the many hazards to which a new product is exposed from the commencement of manufacture through to end of life disposal. Revolutionary in focus, as it describes how to achieve failure free performance rather than how to predict an acceptable performance failure rate (reliability technology rather than reliability engineering) Author has over 40 years experience in the field, and the text is based on classroom tested notes from the reliability technology course he taught at Massachusetts Institute of Technology (MIT), USA Contains graphical interpretations of

mathematical models together with diagrams, tables of physical constants, case studies and unique worked examples

Reliability of Organic Compounds in Microelectronics and Optoelectronics

CRC Press Since it is impossible to be all inclusive and cover every aspect of the design/validation process, this document can be used as a basis for preparation of a more comprehensive and detailed plan that reflects the accumulated "lessons learned" at a particular company. The following areas are addressed in this document: 1Contemporary perspective including common validation issues and flaws. 2A Robustness Validation (RV) process based on SAE J1211 handbook and SAE J2628. 3Design checklists to aid in such a RV process. This report is a major update to the original one dated 1998. It is much more comprehensive in its scope and detail. The main purpose is to condense information from a number of sources relating to the design of electronic modules. It is especially useful for some new players on the automotive electronics scene who may not know how to sort

the "wheat from the chaff" and what to focus on.
The Reliability Handbook SAE International
As engineering systems become more and more complex, industry has recognized the importance of system and product reliability and places ever increasing emphasis on it during the design phase. Despite its efforts, however, industry continues to lose billions of dollars each year because of unexpected system failures. Therefore, it becomes increasingly important for designers and engineers to have a solid grounding in reliability engineering and keep abreast of new developments and research results.
Reliability Engineering Handbook
Springer
Dependability and cost effectiveness are primarily seen as instruments for conducting international trade in the free market environment. These factors cannot be considered in isolation of each other. This handbook considers all aspects of performability engineering. The book provides a holistic view of the entire life cycle of activities of the product, along with the associated cost of environmental preservation at each stage, while maximizing the performance.
Design and

the Reliability Factor
McGraw Hill Professional
Practical Reliability of Electronic Equipment and Products will help electrical, electronics, manufacturing, mechanical, systems design, and reliability engineers; electronics production managers; electronic circuit designers; and upper-level undergraduate and graduate students in these disciplines.

V2V/V2I Communications for Improved Road Safety and Efficiency
CRC Press
Millions of automobile accidents occur worldwide each year. Some of the most serious are rear-end crashes, side crashes within intersections, and crashes that occur when cars change lanes or drift into a lane. The holy grail of traffic safety is to avoid automobile accidents altogether. To that end, major automakers, governments, and universities are working on systems that allow vehicles to communicate with one another as well as the surrounding infrastructure (V2V/V2I for short). These systems show promise for such functions as intersection assist, left-turn assist, do-not-pass warning, advance warning of a vehicle braking ahead, forward-collision

warning, and blind-spot/lane-change warning. This compendium explores the challenges in developing these systems and provides the latest developments in V2V/V2I technology. It begins with a series of overview news stories and articles from SAE's magazines on the progress in this technology. This is followed by a series of technical papers on V2V/V2I dealing with the many technical aspects of design of these systems as well as discussions of such key issues as the need for extreme reliability assurances and traffic congestion overloads on the systems. Some of most interesting discussions in the book include: • Overview of a large-scale test in Germany to address reliability. • Effectiveness of different antennas and receivers that are used in various intersections settings, such as intersections where there are tall buildings or no buildings, and where high transmission power lines are located that can cause signal interference. • Various ways to communicate between vehicles and how messages are relayed to drivers. • Dedicated short range communicatio n protocol for vehicle safety applications, which shows

promise for combining and processing large amounts of information. Editor Ronald K. Jurgen prepared this book to be of use to engineers at automakers and electronic component suppliers; software engineers; computer systems analysts and architects; academics and researchers within the electronics, computing, and automotive industries; legislators, managers and other decision-makers in the government highway sector; traffic safety professionals; and insurance and legal practitioners. Mr. Jurgen served on the editorial staff of IEEE Spectrum for 30 years and is the editor of several electronics-related handbooks and several other electronics-related compendiums published by SAE International.

Handbook of Reliability Engineering

CRC Press

This book aims to provide a comprehensive reference into the critical subject of failure and degradation in organic materials, used in optoelectronics and microelectronics systems and devices. Readers in different industrial sectors, including microelectronics, automotive, lighting, oil/gas, and petrochemical will benefit from this

book. Several case studies and examples are discussed, which readers will find useful to assess and mitigate similar failure cases. More importantly, this book presents methodologies and useful approaches in analyzing a failure and in relating a failure to the reliability of materials and systems.

Solid State Lighting Reliability Part 2 McGraw Hill Professional

An emerging trend in the automobile industry is its convergence with information technology (IT). Indeed, it has been estimated that almost 90% of new automobile technologies involve IT in some form. Smart driving technologies that improve safety as well as green fuel technologies are quite representative of the convergence between IT and automobiles. The smart driving technologies include three key elements: sensing of driving environments, detection of objects and potential hazards and the generation of driving control signals including warning signals. Although radar-based systems are primarily used for sensing the driving environments, the camera has gained importance in advanced driver assistance systems (ADAS). This book covers system-on-a-chip (SoC) designs—including both

algorithms and hardware—related with image sensing and object detection by using the camera for smart driving systems. It introduces a variety of algorithms such as lens correction, super resolution, image enhancement and object detections from the images captured by low-cost vehicle camera. This is followed by implementation issues such as SoC architecture, hardware accelerator, software development environment and reliability techniques for automobile vision systems. This book is aimed for the new and practicing engineers in automotive and chip-design industries to provide some overall guidelines for the development of automotive vision systems. It will also help graduate students understand and get started for the research work in this field.

Design Reliability IET

Use this guide to become an instant expert on today's leading edge auto electronic technologies--stability control; object detection; collision warning; adaptive cruise control; and more. --

Handbook of Performability Engineering Springer Science & Business Media

The main aims of power electronic

converter systems (PECS) are to control, convert, and condition electrical power flow from one form to another through the use of solid state electronics. This book outlines current research into the scientific modeling, experimentation, and remedial measures for advancing the reliability, availability, system robustness, and maintainability of PECS at different levels of complexity.

Standard Handbook of Electronic Engineering, 5th Edition

DEStech Publications, Inc

This document addresses robustness of electrical/electronic modules for use in automotive applications. Where practical, methods of extrinsic reliability detection and prevention will also be addressed. This document primarily deals with electrical/electronic modules (EEMs), but can easily be adapted for use on mechatronics, sensors, actuators and switches. EEM qualification is the main scope of this document. Other procedures addressing random failures are specifically addressed in the CPI (Component Process Interaction) section 10. This document is to be used within the context of the Zero Defect concept for component

manufacturing and product use.It is recommended that the robustness of semiconductor devices and other components used in the EEM be assured using SAE J1879 OCT2007, Handbook for Robustness Validation of Semiconductor Devices in Automotive Applications.The emphasis of this document is on hardware and manufacturing failure mechanisms, however, other contemporary issues as shown in Figure 1 need to be addressed for a thorough Robustness Validation. A Pareto of contemporary issues is shown in Figure 1. Although this document addresses many of the issues shown, however some are outside the scope of this document and will need to be addressed for a thorough RV process application. Examples of issues outside the scope of this document are system interactions, interfaces, functionality, HMI (Human-Machine Interface) and software. At the time of publication of this handbook, a system level Robustness Validation handbook, which addresses these issues, had been initiated. In late 2006 Members of the SAE International Automotive Electronic Systems Reliability Standards Committee and ZVEI

(German Electrical and Electronic Manufacturers ` Association) formed a joint task force to update SAE Recommended Practice J1211 NOV1978 "Recommended Environmental Practices for Electronic Equipment Design." The 1978 of version of SAE J1211* was written in an era when electronics were first being introduced to the automobile. There was a high level of concern that the harsh environmental conditions experienced in locations in the vehicle could have a serious negative affect on the reliability of electronic components and systems. Some early engine control modules (ECMs) had failure rates in the 350 failures per million hours (f/106 hrs) range, or expressed in the customer's terms, a 25% probability of failure in the first 12 months of vehicle ownership. At that time, warranty data was presented in R/100 (repairs per 100 vehicles) units, for example, 25 R/100 at 12 months.In these early years, when the automotive electronics industry was in it's infancy, a large percentage of these were "hard" catastrophic and intermittent failures exacerbated by exposure to environmental

extremes of temperature (40 °C to +85 °C); high mechanical loads from rough road vibration and rail shipment; mechanical shocks of up to 100g from handling and crash impact; severe electrical transients, electrostatic discharge and electromagnetic interference; large swings in electrical supply voltage; reverse electrical supply voltage; and exposure to highly corrosive chemicals (e.g., road salt and battery acid). The focus of the 1978 version of J1211 was on characterizing these harsh vehicle environment for areas of the vehicle (engine compartment, instrument panel, passenger compartment, truck, under body, etc.) and suggesting lab test methods which design engineers could use to evaluate the performance of their components and systems at or near the worst-case conditions expected in the area of the vehicle where their electrical/electronic components would be mounted. By testing their prototypes at the worst case conditions (i.e., at the product's specification limits) described in the 1978 version of J1211 designers were able to detect and design out weaknesses and thereby

reduce the likelihood of failure due to environmental factors.By the mid-1980s, it became common practice to specify "test-to-pass" (zero failures allowed) environmental conditions-based reliability demonstration life tests with acceptance levels in the 90% to 95% reliability range (with confidence levels of 70% to 90%). This translates to approximately 5 to 20 f/106 hrs. The sample size for these tests was determined using binomial distribution statistical tables and this would result in a requirement to test 6 to 24 test units without experiencing a failure. If a failure occurred, the sample size would have to be increased and the testing continued without another failure till the "bogie" was reached. The environmental conditions during the test were typically defined such that the units under test were operated at specification limits based on J1211 recommended practices (e.g., 40°C and +85°C) for at least some portion of the total test time. The "goal" of passing such a demonstration test was often very challenging and the "test-analyze-fix" programs that resulted, although very time-consuming and expensive, produced much-needed

reliability growth. Reliability improved significantly in the late 1980s and early 1990s and vehicle manufactures and their suppliers began expressing warranty data in R/1000 units instead of R/100 units.By the turn of the century automobile warranty periods had increased from 12 months to 3, 4, 5 (and even 10 years for some systems) and most manufacturers had started specifying life expectancies for vehicle components of 10, 15 and sometimes 20 years. And by this time several vehicle manufacturers and their best electrical/electronic component suppliers had improved reliability to the point where warranty data was being expressed in parts-per-million (ppm) in the triple, double and even single-digit range. This translates to failure rates in the 0.05 f/106 hrs range and better! The achievement of such high reliability is not the result of test-to-pass reliability demonstration testing based on binomial distribution statistical tables. With this method, reliability demonstration in the 99.99% to 99.9999% range would require thousands of test units! On the contrary, the methods and techniques used by engineering

teams achieving such reliability excellence did not require increasingly large sample sizes, more expensive and lengthy testing, or more engineers. It is about working smarter, not harder; and about systems-level robust design and robustness validation thinking rather than component-level "test-to-pass" thinking.The task force leaders and members were of the strong opinion that the 2008 version of SAE J1211 should document the state-of-the-art methods and techniques being used by leading companies and engineering teams to achieve ultra-high reliability while at the same time reducing overall cost life-cycle and shortening time-to-market. The SAE International Automotive Electronic Systems Reliability Standards Committee and ZVEI (German Electrical and Electronic Manufacturers ` Association) are hopeful that this Handbook for Robustness Validation of Automotive Electrical/Electronic Modules will help many companies and engineering teams make the transition from the 1980s "cookbook" reliability demonstration approach to a more effective, economically feasible knowledge-

based Robustness Validation approach.* Relevant information and data from SAE J1211 NOV1978 is preserved in SAE J2837 "Environmental Conditions and Design Practices for Automotive Electronic Equipment: Reference Data from SAE J1211 NOV1978"

Handbook of Reliability, Availability, Maintainability and Safety in Engineering Design

DEStech Publications, Inc
In the past four years we have witnessed rapid development in technology and significant market penetration in many applications for LED systems. New processes and new materials have been introduced; new standards and new testing methods have been developed; new driver, control and sensing technologies have been integrated; and new and unknown failure modes have also been presented. In this book, Solid State Lighting Reliability Part 2, we invited the experts from industry and academia to present the latest developments and findings in the LED system reliability arena. Topics in this book cover the early failures and critical steps in LED

manufacturing ; advances in reliability testing and standards; quality of colour and colour stability; degradation of optical materials and the associated chromaticity maintenance; characterizati on of thermal interfaces; LED solder joint testing and prediction; common failure modes in LED drivers; root causes for lumen depreciation; corrosion sensitivity of LED packages; reliability management for automotive LEDs, and lightning effects on LEDs. This book is a continuation of Solid State Lighting Reliability: Components to Systems (published in 2013), which covers reliability aspects ranging from the LED to the total luminaire or system of luminaires. Together, these two books are a full set of reference books for Solid State Lighting reliability from the performance of the (sub-) components to the total system, regardless its complexity. *Automotive Electronics Reliability* SAE International Electrical and electronic reliability is a critical issue for automakers and suppliers as well as car buyers and dealers. The burden of reliability falls most heavily on automotive E/E engineers, system and software developers, component suppliers, and tools vendors.

This book explores ways that the automotive industry continues to add E/E features while maintaining if not improving overall reliability. This book helps executives, decision-makers, and managers to quickly grasp the key drivers associated with E/E reliability in the automotive market. Academics who teach electronics and automotive engineering will also be interested in the book, as well as those in government who legislate and regulate automotive electronics. Author John Day interviewed nearly 50 experts on all facets of E/E systems and reliability during preparation of this manuscript. In addition, he culled information from press releases and presentations. He synthesized a massive amount of information and data into an easy-to-digest manuscript that gives a clear picture of the current state of E/E reliability and where the technology it is headed.

Power Electronic Packaging

John Wiley & Sons

This document should be used as guidance for non-handbook based reliability predictions conducted on automotive electronics products. It presents a method that

utilizes warranty and field repair data to calculate the failure rates of individual electronic components and predict the reliability of the entire electronic system. It assumes that the user has access to a database containing field return data with classification of components, times to failure, and a total number of components operating in the field. In early design activities (typically before the hardware is built), a reliability prediction is often required for the electronic components and systems in order to assess their future reliability and in many cases to meet customer specifications. Those specifications may include the allocated reliability for a particular electronic unit and in the cases of functional safety products to meet the ASIL (Automotive Safety and Integrity Level) requirement specified by the international functional safety standard ISO 26262.This Recommended Practice (RP) document will provide guidance on performing reliability predictions for automotive electronic products utilizing field return data or any other types of failure data available to an automotive electronics

supplier. This document will cover the possible sources of data, types of the data required, ways to collect it, and the methodology of how to process these data to calculate the failure rates and the expected reliability. This document will also include a case study based on the data obtained by Delphi Electronics & Safety, a Tier 1 automotive supplier to illustrate the process of reliability prediction based on field return data.

Product Development Process and Checklist for Vehicle Electronic Systems

Springer Science & Business Media

Sophisticated infotainment systems, lane departure warning, adaptive cruise control, and blind-spot monitoring are increasingly common in cars today. The proliferation of automotive electronics and other “smart” features has increased the market for automotive semiconductor devices and the number of sensors per vehicle. Yet, more chips and greater functionality translate to further networking/communications activity within the car, and that raises the prospect of potentially serious errors. How to minimize them by design is the focus of this book, which contains seven of SAE International’s handpicked

technical papers, covering: • A way to calculate the reliability of priority-driven, real-time components with respect to timing failures, resulting in a realistic estimate of each component's reliability. • A delayed-decision cycle detection method that can detect and prevent spoofing attacks with high accuracy. • An AUTOSAR-compliant automotive platform for meeting reliability and timing constraints. • An eight-point process for determining the cause of failures with real-world cases in which the process was used. • The use of accelerated reliability and durability testing technology for better performance estimation. • How to achieve reliable sensor-fusion despite system complexity and inconsistency. • How to improve domain controller availability while maintaining functional safety in mixed-criticality automotive safety systems.

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