

Automotive Electronics Reliability Handbook

Steven J. Flint, Society of Automotive Engineers

Automotive Electronics Reliability Handbook, 1987 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.

Automotive Electronics Reliability Ronald K Jurgen, 2010-08-10 Vehicle reliability problems continue to be the news because of major vehicle recalls from several manufacturers. This book includes 40 SAE technical papers, published from 2007 through 2010, that describe the latest research on automotive electronics reliability technology. This book will help engineers and researchers focus on the design strategies being used to minimize electronics reliability problems, and how to test and verify those strategies. After an overview of durability, risk assessment, and failure mechanisms, this book focuses on state-of-the-art techniques for reliability-based design, and reliability testing and verification. Topics include: powertrain control monitoring distributed automotive embedded systems model-based design x-by-wire systems battery durability design verification fault tree analysis The book also includes editor Ronald K. Jurgen's introduction, "Striving for Maximum Reliability in a Highly Complex Electronic Environment", and a concluding section on the future of electronics reliability, including networking technology, domain control units, the use of AUTOSAR, and embedded software.

Handbook for Robustness Validation of Automotive Electrical/Electronic Modules Automotive Electronic Systems Reliability Standards, 2012 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 for Robustness Validation of Semiconductor Devices in Automotive Applications Automotive Electronic Systems Reliability Standards, 2014 This document will primarily address intrinsic reliability of electronic components for use in automotive electronics. Where practical, methods of extrinsic reliability detection and prevention will also be addressed. The current handbook primarily focuses on integrated circuit subjects, but can easily be adapted for use in discrete or

passive device qualification with the generation of a list of failure mechanisms relevant to those components. Semiconductor device qualification is the main scope of the current handbook. Other procedures addressing extrinsic defects are particularly mentioned in the monitoring chapter. Striving for the target of Zero Defects in component manufacturing and product use it is strongly recommended to apply this handbook. If it gets adopted as a standard, the term shall will represent a binding requirement. This document does not relieve the supplier of the responsibility to assure that a product meets the complete set of its requirements. Error and issue corrections with latest state of art updates.

Reliability Prediction for Automotive Electronics Based on Field Return Data Automotive Electronic Systems Reliability Standards, 2017 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.

GLOSSARY OF RELIABILITY TERMINOLOGY ASSOCIATED WITH AUTOMOTIVE ELECTRONICS Automotive Electronic Systems Reliability Standards, 1988 This compilation of terms, acronyms and symbols was drawn from usage which should be familiar to those working in automotive electronics reliability. Terms are included which are used to describe how items, materials and systems are evaluated for reliability, how they fail, how failures are modeled and how failures are prevented. Terms are also included from the disciplines of designing for reliability, testing and failure analysis as well as the general disciplines of Quality and Reliability Engineering. This glossary is intended to augment SAE J1213, Glossary of Automotive Electronic Terms. Not applicable.

Automotive Electronics Handbook Ronald K. Jurgen, 1999 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. --

Automotive E/E/ Reliability John Day, 2011-11-15 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.

Improving the Reliability and Safety of Automotive Electronics E. Zanoni, P. Pavan, 1993

Reliability Prediction of Automotive Electronics James H. Derr, Society of Automotive Engineers, 1985

Automotive Electronics and Systems Reliability, 2007

Automotive Electronics for Safety, and Reliability Bosch, 1983

Automotive Electronics for Safety, Comfort, and Reliability Bosch (Stuttgart),.

Handbook of Automotive Power Electronics and Motor Drives Ali Emadi, 2017-12-19 Initially, the only electric loads encountered in an automobile were for lighting and the starter motor. Today, demands on performance, safety, emissions, comfort, convenience, entertainment, and communications have seen the working-in of seemingly innumerable advanced electronic devices. Consequently, vehicle electric systems require larger capacities and more complex configurations to deal with these demands. Covering applications in conventional, hybrid-electric, and electric vehicles, the Handbook of Automotive Power Electronics and Motor Drives provides a comprehensive reference for automotive electrical systems. This authoritative handbook features contributions from an outstanding international panel of experts from industry and academia, highlighting existing and emerging technologies. Divided into five parts, the Handbook of Automotive Power Electronics and Motor Drives offers an overview of automotive power systems, discusses semiconductor devices, sensors, and other components, explains different power electronic converters, examines electric machines and associated drives, and details various advanced electrical loads as well as battery technology for automobile applications. As we seek to answer the call for safer, more efficient, and lower-emission vehicles from regulators and consumer insistence on better performance, comfort, and entertainment, the technologies outlined in this book are vital for engineering advanced vehicles that will satisfy these criteria.

The Role of Reliability Engineering in Automotive Electronics Joseph P. Tomase, Society of Automotive Engineers, 1989

Reliability Prediction of Automotive Electronics Steven J. Flint, Society of Automotive Engineers, 1981

Automotive Electronics for Safety, Comfort and Reliability Robert Bosch GmbH., 1985

Automotive Electronics Reliability , 1987

Predictive Methodology for Automotive Electronics Reliability in the 1980's J. B. King, Society of Automotive Engineers, 1981

Automotive Electronics Reliability Ronald K Jurgen, 2010-08-10 Vehicle reliability problems continue to be the news because of major vehicle recalls from several manufacturers. This book includes 40 SAE technical papers, published from 2007 through 2010, that describe the latest research on automotive electronics reliability technology. This book will help engineers and researchers focus on the design strategies being used to minimize electronics reliability problems, and how to test and verify those strategies. After an overview of durability, risk assessment, and failure mechanisms, this book focuses on state-of-the-art techniques for reliability-based design, and reliability testing and verification. Topics include: powertrain control monitoring distributed automotive embedded systems model-based design x-by-wire systems battery durability design verification fault tree analysis The book also includes editor Ronald K. Jurgen's introduction, "Striving for Maximum Reliability in a Highly Complex Electronic Environment", and a concluding section on the future of electronics reliability, including networking technology, domain control units, the use of AUTOSAR, and embedded software.

The Enigmatic Realm of **Automotive Electronics Reliability Handbook** : Unleashing the Language is Inner Magic

In a fast-paced digital era where connections and knowledge intertwine, the enigmatic realm of language reveals its inherent magic. Its capacity to stir emotions, ignite contemplation, and catalyze profound transformations is nothing short of extraordinary. Within the captivating pages of **Automotive Electronics Reliability Handbook** a literary masterpiece penned by way of a renowned author, readers set about a transformative journey, unlocking the secrets and untapped potential embedded within each word. In this evaluation, we shall explore the book's core themes, assess its distinct writing style, and delve into its lasting impact on the hearts and minds of those that partake in its reading experience.

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Table of Contents Automotive Electronics Reliability Handbook

1. Understanding the eBook Automotive Electronics Reliability Handbook
 - The Rise of Digital Reading Automotive Electronics Reliability Handbook
 - Advantages of eBooks Over Traditional Books
2. Identifying Automotive Electronics Reliability Handbook
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Automotive Electronics Reliability Handbook
 - User-Friendly Interface
4. Exploring eBook Recommendations from Automotive Electronics Reliability Handbook
 - Personalized Recommendations
 - Automotive Electronics Reliability Handbook User Reviews and Ratings
 - Automotive Electronics Reliability Handbook and Bestseller Lists
5. Accessing Automotive Electronics Reliability Handbook Free and Paid eBooks
 - Automotive Electronics Reliability Handbook Public Domain eBooks
 - Automotive Electronics Reliability Handbook eBook Subscription Services
6. Navigating Automotive Electronics Reliability Handbook eBook Formats
 - ePub, PDF, MOBI, and More
 - Automotive Electronics Reliability Handbook Compatibility with Devices
 - Automotive Electronics Reliability Handbook Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Automotive Electronics Reliability Handbook
 - Highlighting and Note-Taking Automotive Electronics Reliability Handbook

- Handbook
 - Interactive Elements Automotive Electronics Reliability Handbook
- 8. Staying Engaged with Automotive Electronics Reliability Handbook
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Automotive Electronics Reliability Handbook
- 9. Balancing eBooks and Physical Books Automotive Electronics Reliability Handbook
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Automotive Electronics Reliability Handbook
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Automotive Electronics Reliability Handbook

- Setting Reading Goals Automotive Electronics Reliability Handbook
- Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Automotive Electronics Reliability Handbook
 - Fact-Checking eBook Content of Automotive Electronics Reliability Handbook
 - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
- 14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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