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Microcircuit Aging/Wearout for Aerospace, Other High-Performance Industries

Sherlock contributes to publication of SAE ARP6338A

Beltsville, MD – March 12, 2019 – DfR Solutions played an integral role in the recent publication of the SAE International Revision A of Aerospace Recommended Practice 6338: "Process for Assessment and Mitigation of Early Wearout of Life-limited Microcircuits." Lloyd Condra of DfR Solutions led the SAE Working Group that published the revision, which included technical content based on DfR Solutions research.

The revision is a result of an eight-month project by the SAE Avionics Process Management Committee (APMC) to address this persistent problem for the avionics industry. DfR Solutions was invited to participate in this project due to its long-standing involvement with the aerospace industry and deep research into aging and wearout of microcircuits. Its innovative Sherlock Automated Design Analysis™ software includes a microcircuit aging/wearout module which provides an efficient and effective method for aerospace engineers to address aging/wearout in their system designs.

The new revision (SAE ARP6338A) includes updates to the physics-based mathematical models used to assess the likelihood of failure of microcircuits in aerospace, automotive, defense, and other high performance (AADHP) industries. It also describes requisite attributes of software needed to apply the method effectively and efficiently.

Background

Microcircuit aging and early wearout was first observed as a problem in the aerospace industry in 2001, because aerospace electronics are typically required to last for decades, compared to other types of electronics such as cell phones and computers. The leading aerospace companies immediately began to conduct research into the aging/wearout phenomena through the Aerospace Vehicle Systems Institute ("AVSI"), including research contracts with DfR Solutions. AVSI is a research cooperative comprised of aerospace, government, and academia to solve problems common to its membership. That research resulted in the publication of the original SAE ARP6338 document in 2015; and it is now considered the most effective, and acceptable, means to address microcircuit aging/wearout in aerospace electronics system design and certification.

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SAE ARP6338A addresses the major microcircuit aging/wearout mechanisms: electromigration, hot carrier injection, time-dependent dielectric breakdown, and negative bias temperature instability. Microcircuit aging/wearout analysis is extremely complex, and sophisticated software is required to conduct it effectively and efficiently. Revision A details the essential attributes of such software, including (a) science-based acceleration-models, (b) data-based, (c) application-specific, (d) updated regularly, and (e) easy to use.

"SAE ARP6338A tackles a complex technical issue that has vexed the aerospace industry for almost two decades, and is becoming of increasing concern to the automotive, server, and other high-performance, high-reliability electronics industries," said Dr. Craig Hillman, CEO of DfR Solutions. "Sherlock is the premier software tool for microcircuit aging/wearout analysis, and the only one known to possess all the essential attributes described in SAE ARP6338A," said Hillman. "We are extremely proud to have contributed so significantly to this important industry effort to advance technology through design excellence."

About DfR Solutions:

DfR Solutions is world-renowned for its expertise in applying Reliability Physics Analysis to electronics technologies and is a leading provider of quality, reliability, and durability research and consulting to the electronics industry. The company pioneered the use of Reliability Physics with its innovative Sherlock Automated Design Analysis™ software providing crucial insights and solutions early in product design and throughout the product life cycle. DfR Solutions empowers its customers to accelerate and maximize product development while saving time, managing resources, and improving customer satisfaction. The company supports Fortune 500 clients in every industry including aerospace/avionics, automotive, consumer, industrial, medical, military, solar and telecommunications. For more information about DfR Solutions, visit www.dfrsolutions.com.

About SAE International:

SAE International is a global association committed to being the ultimate knowledge source for the engineering profession. By engaging nearly 200,000 engineers, technical experts and volunteers each year, we drive knowledge and expertise across a broad spectrum of industries. We act on two priorities: encouraging a lifetime of learning for mobility engineering professionals and setting the standards for industry engineering. We strive for a better world through the work of our philanthropic SAE Foundation, including programs like A World in Motion® and the Collegiate Design Series™ www.sae.org.

About AVSI:

AVSI is a cooperative research environment comprised of major aerospace companies and government organizations working along with academia to solve problems common to its members. AVSI provides a predefined framework for cooperative research allowing members to save money through cost sharing and to solve problems outside the scope of a single organization.

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Recently, other AADHP industries, such as automotive and servers, have observed aging and early wearout of microcircuits in their electronic systems, and concern over the issue is growing widespread as microcircuit technology continues to progress. www.avsi.aero.com.

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