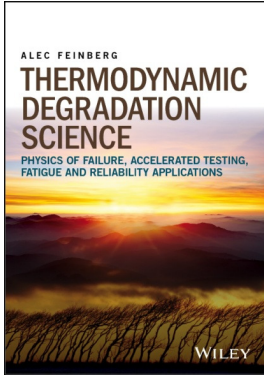


Physics of Failure Tools, Mechanisms, Modeling and New Methods **by Dr. Alec Feinberg**

Join us for a webinar on May 23, 2018 at 8:30 am - 12:30 pm Pacific (California) Cost \$400, group discounts available!

[Register here!](#)

There are many aspects to the science of physics of failure. In this course we approach the subject by dividing it up into four main sections:



Physics of Failure

- *Tools*
- *Mechanisms*
- *Modeling*
- *And Measurement Techniques*

This course is an in depth approach to physics of failure.

It is designed for the engineer who wants a good knowledge base including the state-of-the-art in this area.

The following outline provides an overview for each section

Physics of Failure Tools

- SEM (FE-SEM, EDS)
- Digital Microscopy
- Focused Ion Beam
- Real Time Radiology, X-Ray Maps
- C-SAM
- Thermal Imaging
- FTIR
- Scanning Auger
- Atomic Force Microscopy
- SIMS
- Other Tools Including ESD Simulator
- Sample Preparations

Physics of Failure Mechanisms

- Diffusion - Substitutional, Kirkendall
- Intermetallics - Au Embrittlement, Purple Plague
- Bond wire failures - non stick, intermetallic
- Eight Types of Corrosion - Area effect, and Prevention
- Dendritic Growth, Ag Migration & Electromigration
- Modes of Mechanical Failure
- Fatigue Failure
- Wear
- Stress-Strain – Yielding, Vibration,
- CTE's Mismatch, Thermal Fatigue
- Electronic Failure modes from shock, vibration
- Creep, Solder Creep, Creep Resistance in Plastics
- Organic contamination

- Popcorn Cracking, Voiding Delamination
- Assembly Errors
- Solder Failures (non wetting, grain size, leaching, coverage)
- Contamination – Solder non-wetting, Epoxy non-stick
- Plating Contamination
- RoHS Lead Free Solder Issues
- Cu Dissolution
- BGA, Tin Whiskers
- PCB Finishes
- ESD & EOS - Dielectric Breakdown
- Current Density & Fusing of Bond wires and wires
- Junction Temperature Issues

Physics of Failure Modeling

- Four main types of aging
- Engelmaier IPC Solder Joint Life Model, BGAs
- Junction Temperature Modeling
- Circuit trace and wire bond current density limit modeling
- Wear
- Creep
- *Miner' Fatigue Rule (Thermal, Mechanical, Combined)*
- *Advances in S-N Curve Modeling*
- *New Maximum Work Strength Modeling*
- Transistor FET & Beta Degradation

Physics of Failure Measurement Techniques

- *Fatigue Damage Spectrum (FDS)*
- *New Mesoscopic Noise Measurements*
- *Parametric Failure Rate Modeling*

Instructor Information

Dr. Alec Feinberg is the founder of **DfRSoft**. He has a Ph.D. in Physics and is the principal author of the books, Design for Reliability (DfR) and Thermodynamic Degradation Science: Physics of Failure, Accelerated Testing, Fatigue, and Reliability Applications. These books are written in an industrial environment, and are very practical. Alec has a logical approach to the DfR processes using a stage gate method since products are develop in these phases. Alec uses this method in his reliability training classes as well found on the DfRSoft website. Alec is also the principal developer for DfRSoftware which is the most thorough reliability tool currently available and is also used to accelerate learning in his training classes. Alec's industrial experience has allowed him to provide extensive reliability engineering services in diverse industries (AT&T Bell Labs, TASC, M/A-COM, Tyco Electronics, and Advanced Energy) for over 35 years on solar, thin film power electronics, defense, microelectronics, aerospace, wireless electronics, and automotive electrical systems. He has provided training classes in Design for Reliability & Quality, Shock and Vibration, HALT, Reliability Growth, and Electrostatic Discharge. Alec has presented numerous technical papers and won the 2003 RAMS Alan O. Plait best tutorial award for the topic, "Thermodynamic Reliability Engineering."

Cost: \$400 per person \$360 per person if you have 5 or more from same company

Date: Wednesday, May 23, 2018

Time: 8:30 am – 12:30 pm PDT

After registering, you will receive a confirmation email containing information about joining the webinar.

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