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Using Finite Element Analysis with Electronic Equipment: Thermal Cycling, Heat Transfer and Vibration Analysis by Steve Carlson

Join us for our next webinar! October 23, 2024 8:30 AM-12:00 PM Pacific time (California)
Cost $350 per person, Group discounts available! This course will be recorded and available for purchase to view at a time more convenient for you. Contact us for more details.

Register here and pass this on to your co-workers!

This 3.5-hour webinar, which costs $350, expands on David Steinberg's techniques and incorporates finite element analysis to determine electronic component junction temperatures and fatigue life due to random vibration and thermal cycling. This webinar is intended for beginners who have not yet had a course in finite element theory. The emphasis is on the engineering reasons to complete a valid finite element analysis. For completeness, it has been necessary to select specific software to illustrate the various stages. Most commercial solid modeling and finite element analysis systems are very similar, and the overlap in their capabilities is probably 90% or more. Solidworks has been selected due to its rapid learning curve and ability to perform most common finite element analysis for electronic hardware. Students will learn the stages of finite element analysis and work multiple examples with Solidworks Simulation and Cosmos/M Geostar. We will incorporate Professor Steinberg's methods with FEA techniques to perform heat transfer, random vibration, and thermal cycling analyses. **Questions are encouraged during the Webinar!**

Who should attend: R&D Electronic Engineers and Managers • Packaging Engineers • Quality & Reliability Engineers • Test Engineers • Manufacturing Engineers • Mechanical Engineers • Application & Sale Engineers

FINITE ELEMENT ANALYSIS WITH ELECTRONIC EQUIPMENT

- Incorporating Finite Element Analysis
- "How to" Thermal / Structural analysis flowcharts STAGES OF FINITE ELEMENT ANALYSIS
- Construction of parts in Solid Modeler
- Defeature solid model to improve meshing
- Combining multiple parts into an assembly
- Selecting Element Type
- Mesh the part or assembly
- Assigning material to each part
- Creating regions of the part to be loaded; Assigning levels and type
- Defining the model restraints
- Solving the linear system
- Post-process and evaluating the results
- Determine failure criterion
- Document, report, and file the study

SOLIDWORKS SIMULATION WITH ELECTRONIC EQUIPMENT

- Studies
    - o Drop Test – Effect of dropping the assembly on a rigid floor

- Modal Analysis – Resonant frequencies
- Dynamic Analysis – Harmonic, Random Vibration
- Fatigue – Number of cycles required for failure due to material S-N curve
- Modal Time History – Time based dynamic analysis
- Static – Constant acceleration
- Thermal – Steady-State and Transient

- Element Types
- Modeling Errors

CONSTRUCTING FINITE ELEMENT MODEL

- Split lines and bodies
- Mesh control
- Nodal singularity
- Restraints – Fixed vs. Simple Support

REAL WORLD EXAMPLES CIRCUIT CARD THERMAL ANALYIS

- Defeature system solid model using Solidworks.
- Apply boundary conditions and power dissipation in Solidworks Simulation
- Determine circuit card interface rail temperature with wedgelock contact resistance
- Construct circuit card using Cosmos/M Geostar layer by layer per Gerber data
- Apply component heat power / rail temperature
- Extracting board temperature and using spreadsheet to calculate junction temperature

CIRCUIT CARD COMPONENT FATIGUE LIFE DUE TO RANDOM VIBRATION

- Construct structural model chassis with wedge lock retained PCB
- Determine effective PCB flexural modulus of elasticity due to Copper / Dielectric layering
- Apply material properties and boundary conditions including random vibration curve
- Extract PCB deflection from FEA and use spreadsheet to determine Miner's Cumulative Damage Index using three band technique to calculate fatigue life

THERMAL EXPANSION ANALYSIS OF GLASS BODY DIODE

- Solid model of diode soldered to PCB
- Determined maximum solder shear stress over temperature
- Solder joint fatigue life determined for thermal cycling

Steve Carlson has over two decades of extensive experience in defense/aerospace industry dealing with design and analysis of electronic hardware with a strong understanding of thermal and structural analysis. He is currently a Principal engineer at Jet Propulsion Laboratory leading a group of analysts in the Reliability and Mission Assurance section. Steve learned the classical techniques for analyzing electronic hardware from Joel Sloan (author Design and Packaging of Electronic Equipment) and Dave Steinberg (author of multiple thermal and vibration analysis books) at Litton Guidance and Control Systems. Steve has expanded the classical techniques to include modern solid modeling and Finite Element Analysis to reduce analysis time, improve accuracy, and decrease product development time.

After registering, you will receive a confirmation email containing information about joining the webinar.
COST: $350 per person, $315 per person if you have five or more from the same company

View System Requirements