Cooling Techniques for Electronic Equipment Overview by Steve Carlson

Join us for a webinar on Wednesday, October 25, 2017 8:30-11:30 am Pacific time (California)
Cost $300 per person, group discounts available!

Register here and pass this on to your co-workers!
https://attendee.gotowebinar.com/register/5836057470072838401

Don't wait until your electronic equipment over-heats or fails because of poor cooling. Find out if your present systems are adequately cooled, how to avoid many common cooling problems and how to design efficient, reliable cooling systems for many different types of electronic cabinets. The purpose of this 3-hr webinar, which costs $300, is to show designers and engineers an overview of the quick methods for designing electronic equipment to withstand severe thermal environments without failing. Techniques are presented which will permit the evaluation and design of cost effective, compact cooling systems, without the aid of a large digital computer.

Learn simple design rules, and guidelines, which can improve the effective cooling of your sophisticated electronic components used in today's military, industrial and commercial electronic systems. Learn methods for determining thermal stresses in lead wires and solder joints due to a mismatch in thermal expansions.

This course is based upon the popular book Cooling Techniques for Electronic Equipment by Mr. Dave Steinberg. Questions are encouraged during the webinar, to make sure each participant understands the design techniques and application presented.
Who should attend: R & D Electronic Engineers & Mgrs, Packaging Engineers, Quality & Reliability Engineers, Test Engineers, Mfg Engineers, Mechanical Engineers, Application & Sales Engineers.

Steven Carlson has 19 years 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 the principal engineer at Carlson Mechanical Engineering and has provided mechanical analysis services to Northrop Grumman, Physical Optics Corporation, and multiple other electronic manufacturers for military and commercial applications. Steve holds a Masters in Mechanical Engineering and currently works at Jet Propulsion Laboratory (JPL) performing thermal and structural analyses on space based electronic hardware.

Electronics Cooling Background
- Heat Transfer within Electronic Systems
- Conduction
- Natural and Forced Convection
- Radiation
- Types of Thermal Analyses
- Steady-State and Transient
- Common Electrical Components and their Construction
- Types of Electronic Enclosures
- Material Properties and Unit Conversions

Practical Conduction Cooling Design Guidelines
- Calculate Temperature Rise
- Concentrated Heat Loading
- Uniform Heat Loading
- Determine Heat Flow
- Tracing a Heat Conduction Path from Heat Source To Sink
- One and Two Dimensional Resistor Networks
- Parallel and Series Heat Flow
- Printed Circuit Boards (PCB)
- Determine Component Junction Temperature: \( \theta_{cb} \) & \( \theta_{jc} \)
- Using Internal Ground and Voltage Planes to Spread Heat
Calculate Effective PCB Thermal Conductivity
Mounting High Power Components on Circuit Boards
Calculate Thermal Interface Impedance
Bolted Contact Resistance
Effects of Surface Finish, Hardness and Pressure on Interface Resistance
Thermal Resistance Across Different Board Edge Guides
Sample Problems to Promote Better Understanding

Mounting Various Types of Components on Circuit Boards
- Problems with Surface Mounting Components
- Leadless Chip Carriers, Transformers, Ball Grid Arrays, Large Multi-Chip Modules, and Large Fine Pitch Leaded Components
- Problems with Through Hole Mounting Components
- Pin Grid Arrays
- Small Axial Leaded Resistors
- Lead Wire Strain Relief
- Various Types Of Lead Wire Strain Relief To Prevent Solder Failures
- Avoiding Cracking of Chip Resistors and Capacitors
- Case Histories on Successes and Failures

Effective Natural Convection and Radiation Cooling
- Free Convection
- Required Spacing Between Circuit Boards for Good Cooling
- How Altitude Effects Natural Convection Cooling
- Finned Heat Transfer Surfaces
- Adding External Fins on a Box To Improve Cooling
- Making Effective Use Of Extruded Fin Heat Sinks
- Methods For Increasing Convection And Radiation Coefficients
- Combining Convection And Radiation Cooling
- Radiation Heat Transfer
- Sample Problems To Demonstrate Practical Applications

Methods for Improving Forced Convection Cooling
- Cooling Fans
- Air Flow Properties of Fans and Blowers (Fan Curve)
- Working with Sigma Delta Pressure Drop
- Fan Location
- Typical Problems with Improper Fan Installation
- How To Determine and Cure Short Circuit Cooling Air Flow Path
- Flow Losses
- Understanding Static, Velocity and Total Pressure
- Flow Losses Due to Entrance, Exit, Expansion and Turns
- Fan Selection
- Matching the Impedance Curves for Chassis and Fan
- Sample Problems to Illustrate Cost Effective Applications

Practical Design and Analysis Guidelines
- Hand-calculations confirm Finite Element Analysis results
- Coefficient of Thermal Expansion
- Thermal Expansion Equilibrium Equations, Lead Wires, Solder
- Slow Thermal Cycling Solder Creep Forces, Stresses, Fatigue Life
- Case Histories to Promote Improved Electronic Design

Cost:   $300 per person $270 per person if five or more attend from same company
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After registering, you will receive a confirmation email containing information about joining the webinar.