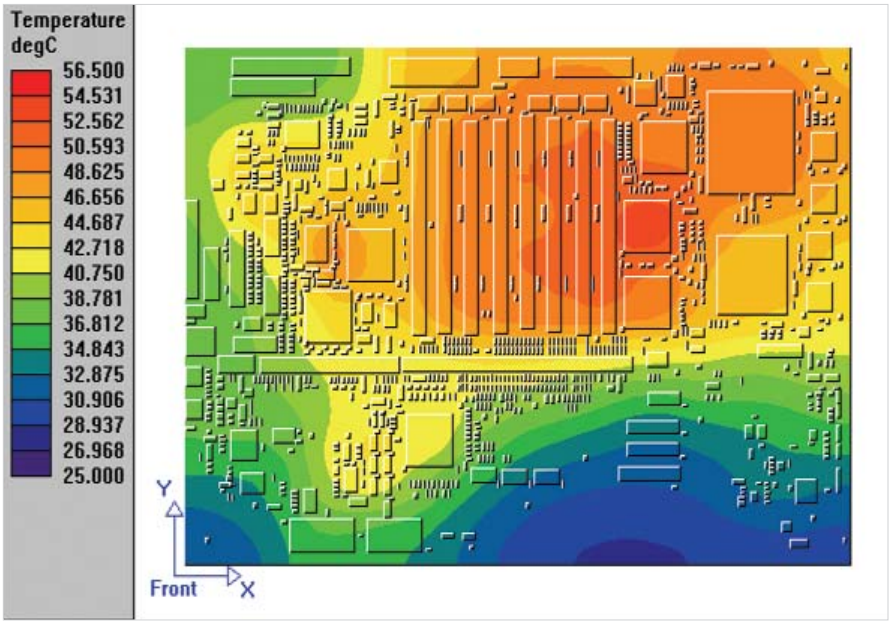
HyperLynx Thermal

Thermal Analysis for High-Speed PCB Design

System Design

DATASHEET



HyperLynx Thermal allows engineers and PCB designers to analyze board-level thermal problems on placed, partially routed, or fully routed PCB designs from all popular PCB layout environments. Temperature profiles, gradients, and excess temperature maps enable designers to resolve board and component overheating early in the design process.

Major product benefits

- Increases Mean Time Between Failure (MTBF) for products in the field, decreasing warranty cost
- Reduces design iterations and costly prototype respins
- Analyzes all major heat-transfer mechanisms, including convection, conduction, and radiation
- Allows engineers and PCB designers to identify component and PCB hot spots, perform solution-oriented "what-if" analysis on component placement, and stackup design, as well as mechanical cooling techniques
- Compatible with all major PCB layout tools

Overview

Every 10º C increase in component temperature beyond 100º C reduces its Mean Time Between Failure (MTBF) by as much as 50 percent. To resolve this problem during the PCB design process, HyperLynx® Thermal simulates board temperatures, component and junction temperatures, as well as component temperature constraint violations. The temperature gradient profile also allows the design team to avoid board warpage.

Solution-Oriented Analysis

HyperLynx Thermal can import and analyze single-sided, double-sided, and multilayer boards with irregular shapes, and reference-plane discontinuities. During simulation boards can be placed near the edge or interior of a cabinet, daughter cards can be incorporated, and components can be moved during "what-if" analysis.

To transfer heat from components and high-temperature areas, the PCB can be anchored by screws to heat sinks, cooled through chip fans or conduction pads, or wedge locks at the board edges. Effects of gravity, air pressure, and flow directions are modeled, and PCBs can reside in a sealed compartment—with or without a heat exchanger—or in an open system with forced convection.

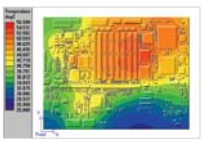
Fast, Accurate Simulation

HyperLynx Thermal incorporates full 3D modeling of complex flow and thermal fields based on heat conduction, convection, and radiation, with accuracy results that have been consistently validated by users and experimental wind tunnel and infrared image tests at +/-10 percent. Finite difference schemes with self-adaptive locally refined meshes are used in the computation to produce extremely fast, yet accurate results — simulating a board of 200 components in less than ten seconds on an average PC.

Thermal Analysis Profiles

Temperature Profile

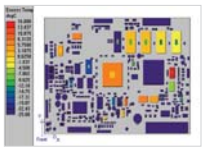
A quick snapshot of your PCB temperature profile – including consideration for conductive, radiative, and convective heat transfer - is helpful toward coming up with viable solutions for component overheating. If several components are hot because of



Mentor Graphics®

high-power requirements, for example, but the surrounding board is reasonably cool, a thicker reference plane may provide the solution. If the board surrounding the hot component also has a high temperature, other heat transfer solutions can be employed.

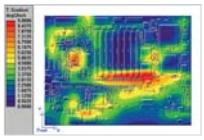
Component Temperature Constraint Violations



Thermal failure of components is tied to different materials, manufacturing processes, and of course, the operating environment. HyperLynx Thermal enables engineers and designers to quickly analyze component temperature constraint violations across the entire board.

Temperature Gradient

A severe temperature gradient can induce significant thermal-expansion stress, potentially resulting in board cracking or warping. HyperLynx Thermal alerts you to these potential troublespots, with a map of temperature gradients across the board.



Setup, Translation and Modeling

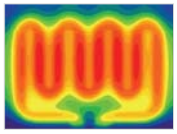
HyperLynx Thermal ships with 2,500 fully defined components, and new component models can be created in a matter of minutes from component datasheets. A direct export is available from Mentor Graphics® Expedition™, and an IDF (Independent Data Format) PCB interface enables import of Mentor Graphics Board Station® and PADS® PCB layout files, as well as Cadence Allegro, OrCAD Layout, Cadstar, Visula, Protel, and PCAD.

Solutions for Multiple Industries

Throughout a decade of development, the analytical capabilities of HyperLynx Thermal have been optimizedto meet the requirements of multiple applications and industries.

Automotive

In many automotive applications, high currents pass through thick traces on the board and generate significant heat.The figure to the left, shows HyperLynx Thermal's analysis of heat conduction from a hot trace.

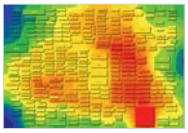


Avionics and Space

The figure below shows a typical board used in satellite applications. Thermal radiation is analyzed, along with thermal screws and card guides at the upper and lower edges to conduct heat to the sink.

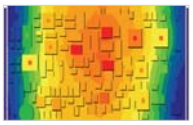
Computers and Instrumentation

A PC motherboard is shown below. These boards are often fairly large, component dense, and typically incorporate CPUs with high power dissipation. Chip fans, heat sinks, or local impingement jets can be modeled, as well as other convective cooling methods.



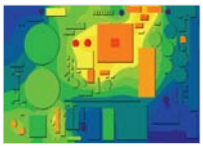
Telecom and Industrial Controls

The next figure shows a board in a cardcage with natural convective cooling within a cabinet, as well as heat sinks on several components.



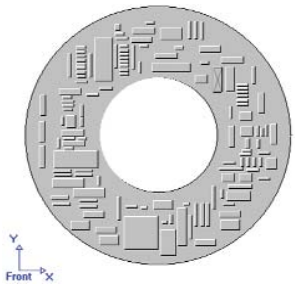
Power Supplies

Power supplies typically incorporate tall components that generate significant power and restrict air flow. The figure below shows a horizontal power supply operating with natural convection. Though the transformer has highpower, its temperature remain low due to the large surface area and natural convection. The hottest components shown result from moderate power and medium size.



System Requirements

- Windows XP and 2000
- NIC, Parallel port, or USB port to supply HostID to license management software.



To learn more about thermal design or the rest of the HyperLynx product family, go to www.mentor.com/hyperlynx to download the thermal or high-speed design tutorials and online demos — or call to schedule a product demonstration.

Corporate Headquarters
Mentor Graphics Corporation
8005 SW Boeckman Road
Wilsonville, OR 97070-7777
Phone: 503.685.7000
Fax: 503.685.1204

Sales and Product Information
Phone: 800.547.3000

Silicon Valley
Mentor Graphics Corporation
1001 Ridder Park Drive
San Jose, California 95131 USA
Phone: 408.436.1500
Fax: 408.436.1501

North American Support Center
Phone: 800.547.4303

Europe
Mentor Graphics Deutschland GmbH
Arnulfstrasse 201
80634 Munich
Germany
Phone: +49.89.57096.0
Fax: +49.89.57096.400

Pacific Rim
Mentor Graphics (Taiwan)
Room 1001, 10F
International Trade Building
No. 333, Section 1, Keelung Road
Taipei, Taiwan, ROC
Phone: 886.2.87252000
Fax: 886.2.27576027

Japan
Mentor Graphics Japan Co., Ltd.
Gotenyama Garden
7-35, Kita-Shinagawa 4-chome
Shinagawa-Ku, Tokyo 140-0001
Japan
Phone: 81.3.5488.3033
Fax: 81.3.5488.3004

Printed on Recycled Paper

07-2007 1025970-w