

Why thermal
simulation is
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Ever Increasing Complexity



PCB Design Considerations





Why is thermal design critical?

- **Performance:** Will the product work correctly?
- **Reliability:** Will the product fail prematurely?
- **Safety:** Is the device too hot to touch? Risk of fire?









Thermal challenges in the electronics industry...

of engineers' top design priority is reliability

45%

say they need to spend more time on thermal management

33%

27%

wait until after a design has been completed before they consider testing for thermal issues



Overheating Electronics Are a Major Cause of Reliability Issues

99% engineers had a product derailed by late stage complications

identified thermal issues as common cause of project delays

20%

E20k

cost of a late stage design failure



When do engineers test the thermal management of their designs?





The cost of redesigns



66

Tools that enable design checking should be deployed at the earliest stage: each remake can cost thousands, but even if the cost of remaking is minimised to a few hundred pounds the biggest issue is the time lost.

Rod Piwowarski, CEO Lascar Electronics



Early Thermal Simulation

facebook

66

Given how the electronics industry is changing, we now have to start modelling simulations at least three to four years in advance.

Saket Karaiqikar, Thermal Design Engineer, Facebook

SigmaET

Lower Cost and Higher Reliability

facebook.

66

Everybody wants things at a lower cost with higher reliability. This puts more burden upon design engineers to find good solutions. Being able to find those solutions early on is going to be key in the future. And that's where simulation tools come in.

Saket Karaiqikar, Thermal Design Engineer, Facebook





What is Thermal Simulation







What is thermal simulation of electronics?



Thermal simulation allows you to create a 'digital twin' of a real product or design and uses Computational Fluid Dynamics to predict:

- Temperature
- Airflow





Heat Transfer Mechanisms

Thermal simulation considers:

- Conduction
- Convection
- Radiation







Additional analysis





Simulation driven design







How can Thermal Simulation Help?

How can thermal simulation help you make better engineering decisions?



- Visual representation of the temperature and airflow to quickly highlight issues
- Identify overheating components before a prototype is created
- Experiment with solutions without having to prototype





Design questions thermal simulation can answer:



- Can I place two powerful components close together?
- Which package type should I use?
- Is there enough copper pour to dissipate heat?
- Will a component operate within its thermal limits if I move the component?
- Is a heat sink required?
- Can I run a processor at full power?
- Do I need to add additional thermal vias?
- What airflow is required over the board to dissipate the heat?
- Does the mechanical engineer need to modify the enclosure?
- Is the layer stack up suitable?



What do Engineers want from a Thermal Simulation Tool?

What do engineers want from simulation?







40% of electronics engineers

consider thermal simulation to be either too complex or too time consuming



not being completely satisfied with their simulation package, 60% haven't switched provider in over 3 years.

0/

of thermal engineers



6SigmaET The Nuts and Bolts

Simulation Across the Electronics Industry





Who has switched to 6SigmaET?





A Finmeccanica Company





BOSCH





6SigmaET is Fast

An independent side-by-side comparison conducted by Rohde and Schwarz found 6SigmaET was faster at preparing the model, pre-processing and solving than a comparable thermal simulation software htmeusage(hours)





Powerful Solver

Handling complexity of modern electronics Up to 750 Million Grid Cells

Solve 100M Model in an Hour

Ten of Thousands of Objects

Complex CAD and PCB Designs





6SigmaET is detailed...







Detailed PCB Modelling		
Board Layout	Layer stack up	Vias
Traces	Pads	PCB Holes
Component Location	Keep Outs	Reference Designators



Component Modelling



Simplified Block

2R Resistor Model

Compact Delphi Model

Top Outer

Bottom Oute



Detailed Model



Intuitive Model Creation

6SigmaET is automated...











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6SigmaET is accurate...

6SigmaET is validated against a wide range of analytical solutions and published data. It has also been shown to perform well in numerous studies published by customers.



Thales: Components on a JEDEC test board

UTA: Open Compute Servers

Experimental CFD



6SigmaET is connected...







Questions & Answers