

DIGITAL INDUSTRIES SOFTWARE

Simcenter FLOEFD T3STER Automatic Calibration module

Increase accuracy of electronics cooling studies

Benefits

- Achieve high accuracy prediction of junction temperature for package thermal models (>99.5% accuracy is possible in certain cases)
- Overcome prohibitive time constraints associated with traditional manual calibration
- Explore package dimensions and material property changes needed for measurement based calibration easily
- Leverage calibrated highest accuracy transient thermal models in CFD studies to better evaluate design thermal reliability and validate cost reduction decisions

Summary

The automatic calibration module for Simcenter FLOEFD, CAD embedded CFD software helps increase accuracy by calibrating a thermal model to thermal transient test data quickly and easily.

Automatic thermal model calibration

Enhanced thermal analysis accuracy is critical to meet increasingly demanding design requirements in many modern electronics products. Calibrating simulation to a measurement is of proven value to achieve highest fidelity component thermal modeling accuracy, however manual calibration adjustments of models can be prohibitively time consuming. As part of Siemens Xcelerator portfolio, Simcenter test and simulation tools provide unique automatic calibration technology.

Simcenter Micred T3STER hardware is an advanced thermal transient test solution for thermal characterization of IC packages, power semiconductors, LEDs and electronic systems. The equipment uses an electrical test method to deliver



recognized highly accurate, repeatable junction temperature transient measurement. During a typical test of an electronic device or IC package, a heating or cooling transient response to a power step is precisely measured. This is post processed to generate a Structure Function, which represents the heat flow path from device junction to ambient as a profile of thermal resistance vs thermal heat capacitance. By automatically calibrating a simulation based Structure Function in Simcenter FLOEFD to match an imported measurement generated Structure Function, engineers can now achieve a highly accurate thermal model and use it confidently for transient analysis.

Prerequisite

Simcenter Micred T3STER SI, T3STER or Power Tester hardware equipment measurement data.

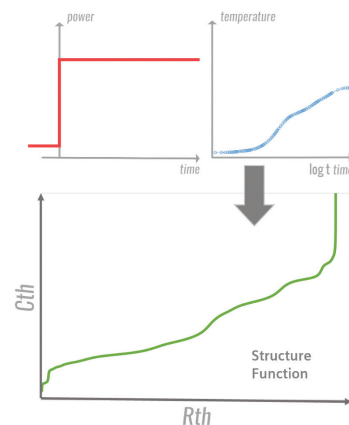
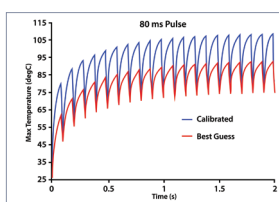
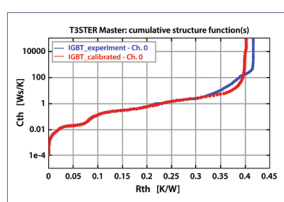
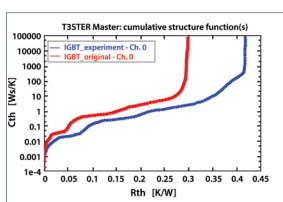
Simcenter FLOEFD T3STER Automatic Calibration Module

The Simcenter FLOEFD automatic calibration module enables users to first import a measurement based structure function from a Simcenter Micred T3STER hardware thermal transient test study and compare it to simulation based structure function. The engineering user can then explore package model internal dimensions and material properties changes through automation within the calibration capabilities of the parametric study

tool. This automatic procedure ensures that the simulation model transient thermal behavior matches test data. The result is a highly accurate calibrated detailed 3D model for transient analysis.

An accurate, calibrated thermal model for transient analysis has high value for application uses such as:

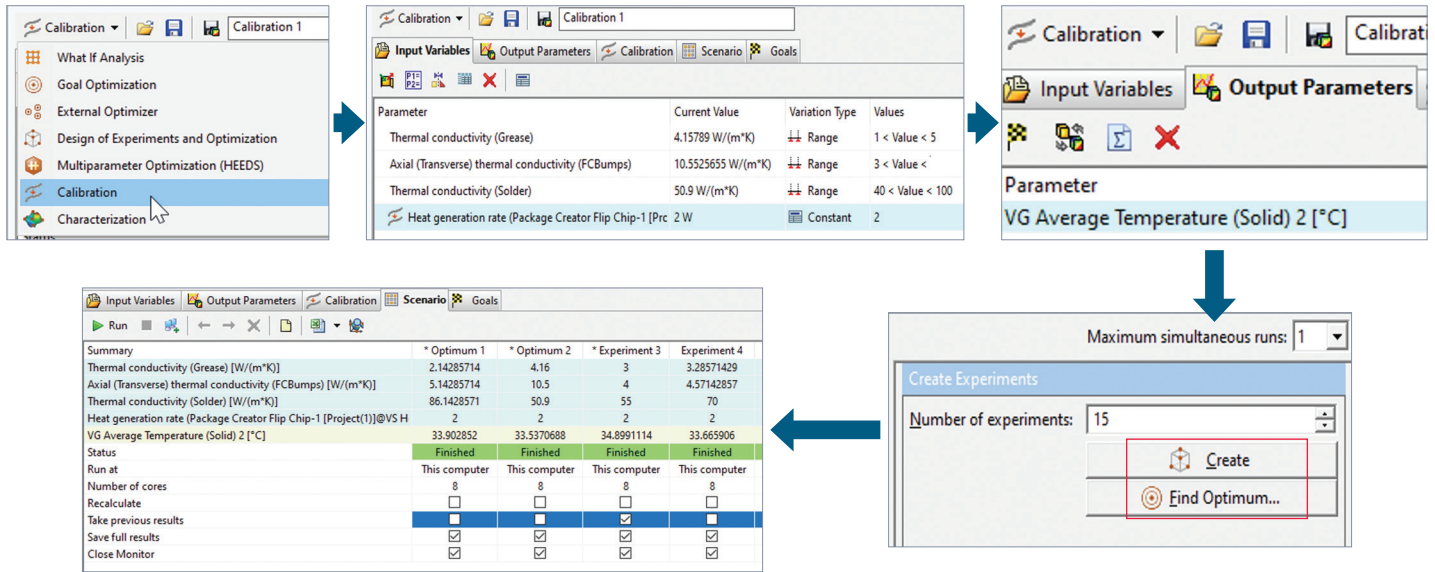
- power electronics mission profile based thermal analysis for thermal reliability insights e.g power semiconductor junction temperature prediction within a vehicle inverter for a given EV drive cycle
- digital electronics e.g modeling power mode change thermal response or throttling control influences
- supply chain support whereby semiconductor OEMs provide highest accuracy test calibrated detailed thermal models to their electronics clients for market differentiation value
- a highest fidelity 3D detailed thermal model is also beneficial basis to generate any reduced order fast, solving models for electrothermal circuit simulation or system simulation. (for more details on boundary condition independent reduced order models see the Simcenter FLOEFD BCI-ROM and Package Creator Module)



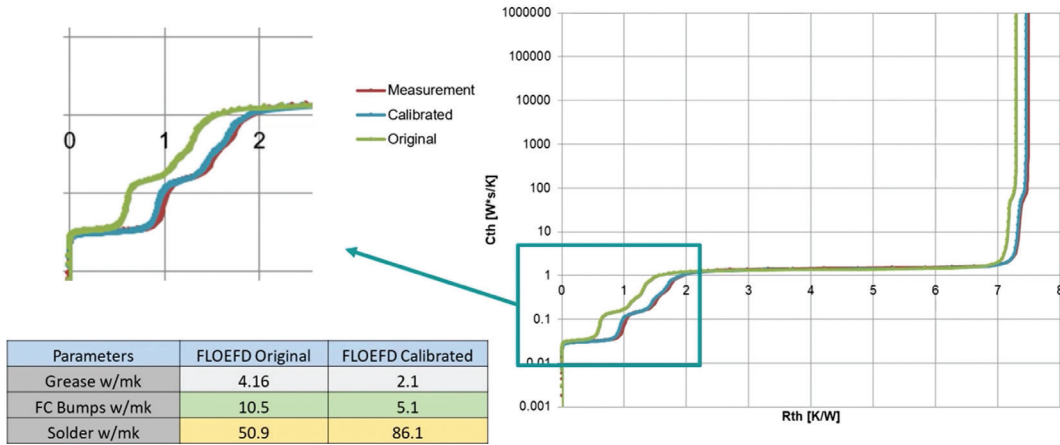
Thermal transient test, structure function generation and comparing uncalibrated vs calibrated thermal models.



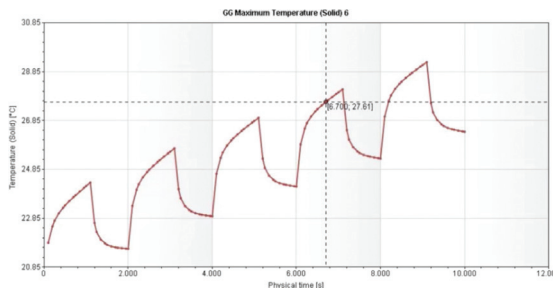
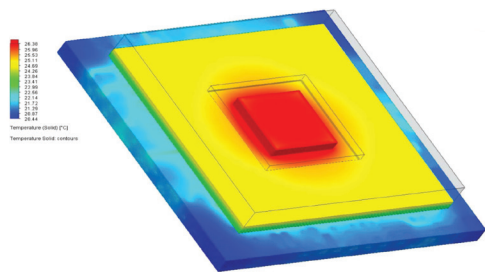
Process of automatic calibration



Structure function



Structure function calibration close up.



Accurate transient response modeling using an automatically calibrated ic package thermal model.

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