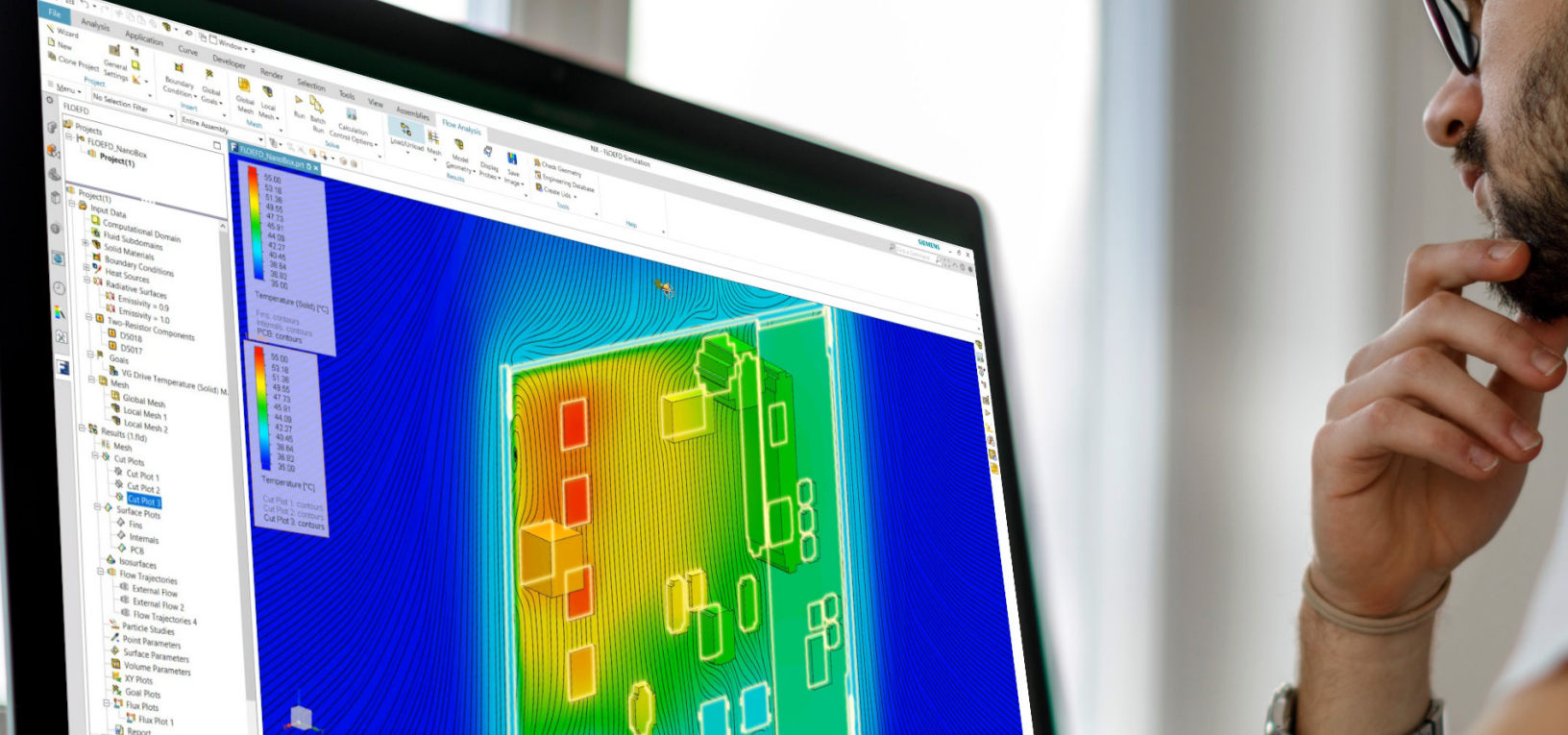




DIGITAL INDUSTRIES SOFTWARE

Simcenter FLOEFD Electronics Cooling Center Module

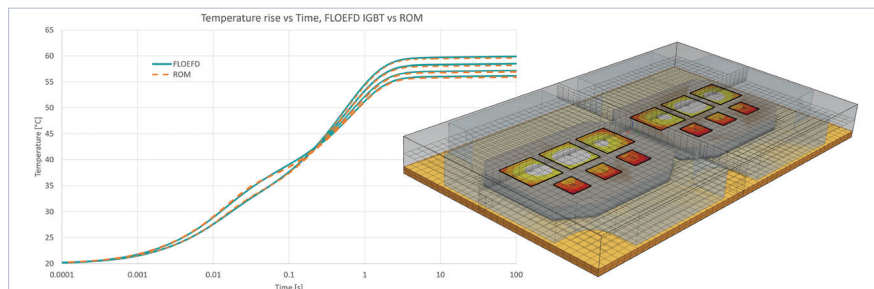
Combining the best electronics related capabilities of Simcenter FLOEFD and Simcenter Flotherm for accurate thermal simulation of electronics inside CAD

Benefits

- Frontload powerful thermal design simulation and design space exploration in CAD to prevent re-spins and eliminate costly physical prototyping
- Access best-in-class functionality both Simcenter FLOEFD and select technology from Simcenter Flotherm to make thermal analysis accurate, fast and easier to integrate with electronic and mechanical design workflows
- Validate electronics cooling system performance to ensure reliability and long product life

Summary

Part of the Siemens Xcelerator business platform, Simcenter™ FLOEFD™ is a simulation software tool for frontloading computational fluid dynamics (CFD) earlier in product development that is fully embedded in computer-aided design (CAD) software. You can simulate fluid flow and heat transfer directly using 3D CAD geometry without the need for data translations to a separate analysis environment. Depending on your needs, there are several electronics cooling specific modules which may suit your needs.

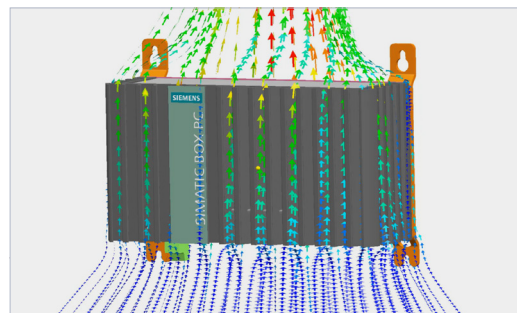
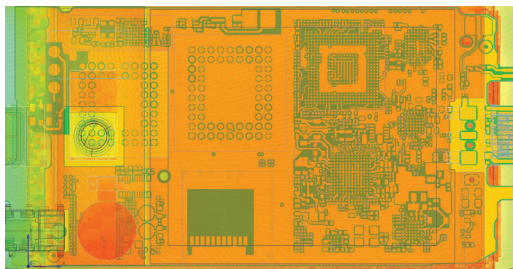


3D thermal simulation of a power electronics component compared with a BCI-ROM simulation.

SIEMENS

[siemens.com/simcenter](https://www.siemens.com/simcenter)

The Simcenter FLOEFD Electronics Cooling Center module combines several key technologies from Simcenter Flotherm™ software with Simcenter FLOEFD inside your preferred CAD environment including NX™ software, Solid Edge® software, Creo and CATIA V5. It features powerful functionalities to help you quickly and accurately predict thermal behavior of electronic devices, validate electronics cooling system performance to achieve long product life and easily explore methods for cooling in complex electronic assemblies.



The Simcenter FLOEFD Electronics Cooling Center is a compilation of several modules and functionalities namely:

Simcenter FLOEFD Electronics Cooling Module

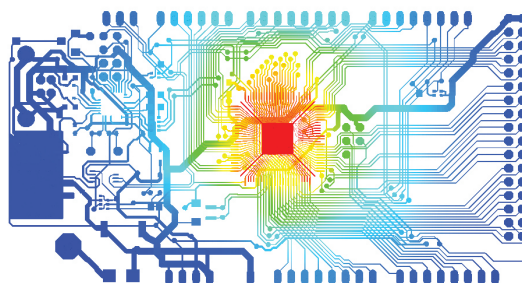
This module offers:

- Joule heating for calculating steady-state direct electric current in electro-conductive solids. The calculations of electric potential and current can be performed only in conductive solids; for example, metals and metal-

containing composite materials. Electrical resistivity of the material may be isotropic, anisotropic or temperature dependent.

- Compact models for facilitating simulation of electronics equipment. This module offers two-resistor compact model that is test-based on an approved Joint Electron Device Engineering Council (JEDEC) standard; built-in library of two-resistor models of standard JEDEC package outlines; Heat pipe compact models.
- PCB generator for obtaining the bi-axial thermal conductivity values. Thermal conductivities can be automatically derived from the PCB structure and the properties of the specified conductor and dielectric materials can be accessed.
- Robust materials library: In addition to the basic materials, the following databases are also included: 1,000+ fans from different manufacturers; solids materials such as alloys, ceramics, metals, polymers, laminates, glasses and minerals and semi-conductors; integrated circuit (IC) packages; single- and multi-stage thermoelectric coolers (TEC); interface materials (contact thermal resistance); and two-resistor components.

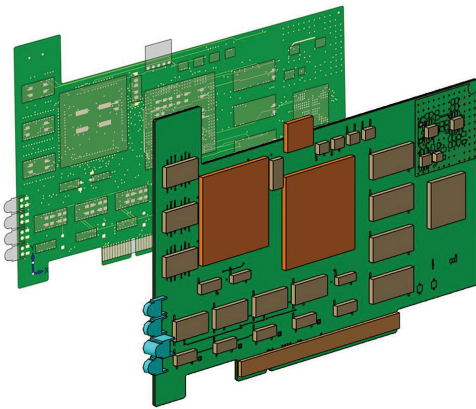
For more detailed information please refer to the Simcenter FLOEFD Electronics Cooling Module flyer.



Simulation of an electronics device.

Simcenter FLOEFD EDA Bridge Module

The powerful Simcenter FLOEFD EDA Bridge lets users import detailed PCBs with material and integrated circuit (IC) thermal properties into Simcenter FLOEFD for thermal analysis either on their own, or as part of a larger system-level assembly.



From EDA data to 3D CAD imported PCB.

The imported PCBs can be represented as fully detailed 3D geometry with copper traces, a PCB component with bi-axial thermal conductivity values or as a Smart PCB. Using the Smart PCB, the copper and dielectric within a fully routed board are modeled using a network assembly which is very computationally efficient for faster solution time. In addition, it allows the import of PDML files.

The following PCB import file formats are supported: IDF, CC and CCE (native file format for Siemens Digital Industries Software's Xpedition™ software and PADS™ software), ODB++ (neutral file format for PCB manufacturing), ProStep (*.idx, *.idz, *.xml) as well as IPC2581B (neutral file format of the IPC Digital Product Model Exchange consortium).

For additional information, please refer to the Simcenter FLOEFD EDA Bridge Module flyer.

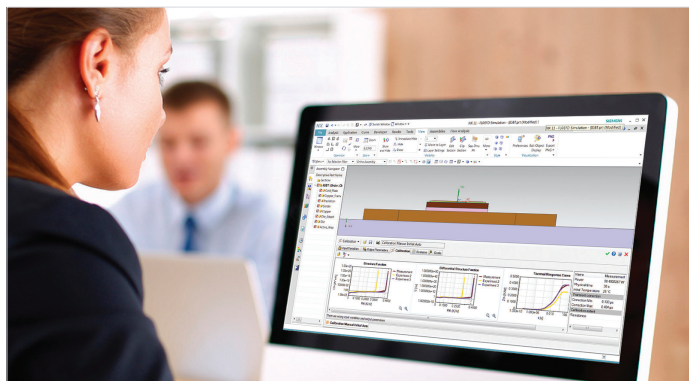
Simcenter FLOEFD T3STER Automatic Calibration Module

This module helps you achieve highest fidelity modeling of IC packages in your simulation through automatic calibration using thermal test data.

Semiconductor package characteristics data used in simulation can differ from reality due to the lack of knowledge about the internal structure. Simcenter Micro™ T3STER™ hardware measures transient thermal response quickly and accurately to an applied power step. Processing of this junction temperature data allows the generation of a structure function, representing the heat flow path from device junction to ambient as a profile of thermal resistance versus thermal capacitance.

Using this module, users import test data and then calibrate their thermal model to match the structure function closely. The calibration mode of the parametric study searches for package dimensions and material properties to fit the measurement so your model represents the thermal behavior of the package structure and material properties to provide highest fidelity.

For additional information, please refer to the Simcenter FLOEFD T3STER Automatic Calibration Module flyer.



Automatically calibrated package thermal model.

Simcenter FLOEFD BCI-ROM and Package Creator Module

This module allows users to generate a Boundary Condition Independent Reduced Order Thermal Model (BCI-ROM) that offers fast, accurate modeling in any thermal environment. The reduced order model is extracted from a conduction only analysis and is particularly useful for transient analysis. The user specifies the range of heat transfer coefficients for extraction. A BCI-ROM preserves the close accuracy in space and time to the 3D thermal model while solving orders of magnitude faster. BCI-ROM exports are in three primary formats:

- **Matrices format** (for standalone solution)
- **VHDL-AMS format** (for circuit simulation tools electrothermal analysis, for example, PartQuest Explore or Xpedition AMS)
- **FMU format** for 1D system simulation tools, for example, Simcenter Amesim™ software or Simcenter Flomaster™ software

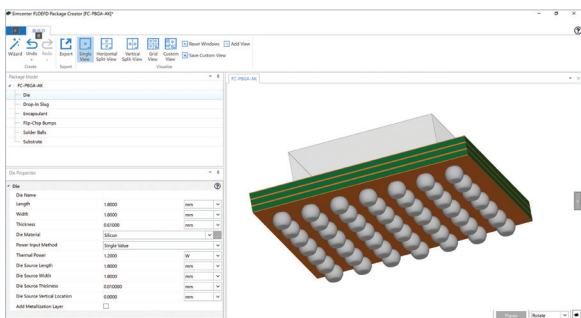
Additionally, Simcenter FLOEFD can export a thermal netlist in a SPICE format valid for a set range of boundary conditions.

The Package Creator application allows you to create clean 3D CAD based detailed thermal model geometry quickly in minutes from a library of the most common IC package families. To create a package, you can specify various components such as the encapsulant, die, die-attach, leadframe, die-attach pad and bond wires for a more accurate thermal model.

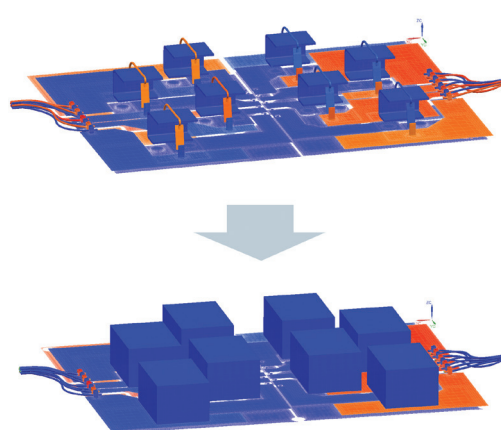
For additional information, please refer to the Simcenter FLOEFD BCI-ROM and Package Creator Module flyer.

Electrical element

This thermo-electric compact model allows you to add a component into a direct current (DC) electro-thermal calculation by the given component's electrical resistance. The corresponding Joule heat is calculated and applied to the body as a heat source. There are two types of electrical elements, resistors and wires: the resistor element uses the total electrical resistance provided and the wire element automatically calculates the resistance based on the wire's material properties, length and cross section area. Optionally you may also specify the thermal resistance of the wire's insulator.



Thermal simulation of a power electronics package.



Simulations, using accurate thermo-electrical compact models.

Siemens Digital
Industries Software
[siemens.com/software](https://www.siemens.com/software)

Americas
1 800 498 5351

Europe
00 800 70002222

Asia-Pacific
001 800 03061910

For additional numbers,
click [here](#).