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Simcenter FLOEFD BCI-ROM and Package Creator Module

Faster thermal design inside CAD with boundary condition independent reduced order models (BCI-ROM) and create thermal models of electronic packages effortlessly with Package Creator.

Benefits

- Up to 40,000 times faster than solving full 3D detailed models without loss of accuracy
- Available for all thermal environments - user defines range of heat transfer coefficients
- Embedded inside Siemens NX™, Solid Edge®, Creo® and CATIA V5 user interfaces
- Conduct transient simulations over extended period of time ie optimizing automotive drive cycle
- Enables the supply chain hide sensitive IP contained within the detailed model
- Builds upon Simcenter FLOEFD Calibration capability ensuring that the detailed model is highly accurate by calibration against Simcenter T3STER™ or POWERTESTER™ Hardware measurement data

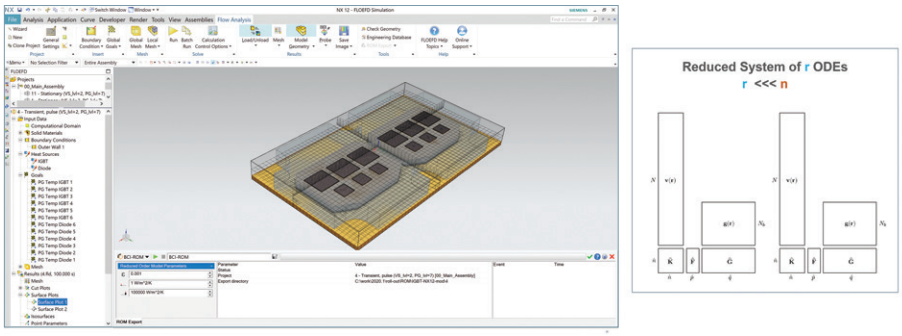
Boundary Condition Independent Reduced Order Model (BCI-ROM)

Transient simulations can present a significant challenge in electronics thermal design. Modern electronics design requires consideration of multiple transient power loads, various power control strategies, and a wide range of expected operating conditions for the device.

Accurately predicting temperature is key to understanding reliability of electronics devices in the field during use.

Simcenter FLOEFD is part of Xcelerator, the comprehensive and integrated portfolio of software and services from Siemens Digital Industries Software. It is able to extract Boundary Condition Independent Reduced Order Model, or BCI-ROMs. They maintain predictive accuracy in all situations, can be solved orders of magnitude faster, providing a huge increase in productivity.

This method provides an alternative to extracting thermal resistor and thermal capacitor based dynamic compact thermal models, which have limited partitioning of the surface area and are typically only possible for single heat source packages. Simcenter FLOEFD's BCI-ROM technology allows linear conduction problems with any number of heat sources to be solved with the same accuracy as the full 3D conduction model up to 40,000 times faster.

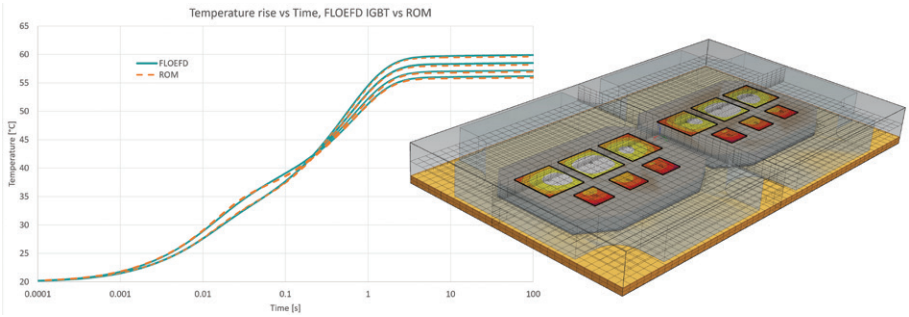


Simple workflow supports BCI-ROM export as a matrix, SPICE sub-circuit or VHDL-AMS model.

Simcenter FLOEFD BCI-ROM and Package Creator Module

The accuracy is mathematically guaranteed by the FANTASTIC method. The required accuracy is set by the user as the 'acceptable relative error' when the BCI-ROM is extracted. The heat transfer coefficient range is also set by the user.

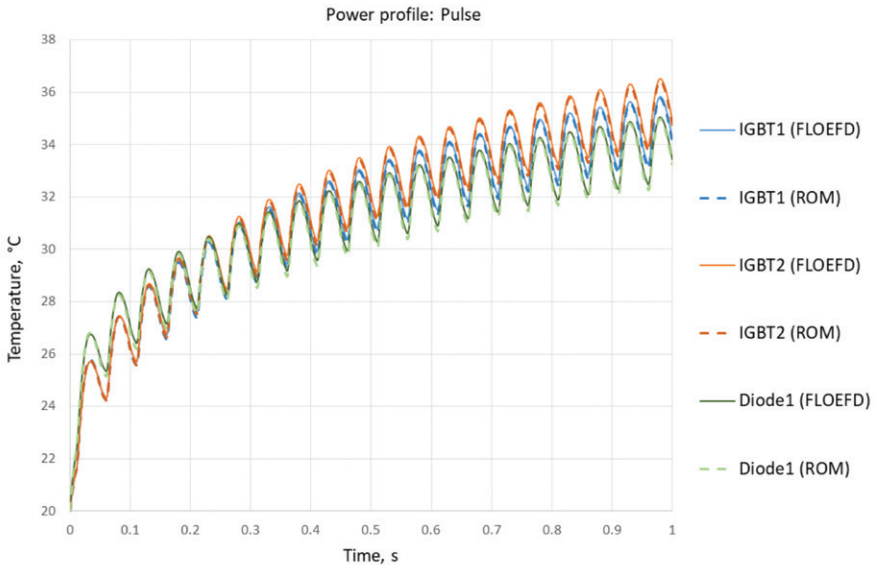
The Simcenter FLOEFD BCI-ROM technology provides a workflow into the wider electronics simulation environment. By exporting the ROM as a matrix, it can be solved in MathWorks MATLAB or in GNU's Octave, or steady-state in Microsoft Excel. It also supports the SPICE sub-circuit for electro-thermal simulators such as Mentor's SystemVision® Cloud.



Spatial temperature response of the BCI-ROM is identical to that of the detailed mode.

There are many applications for the technology including:

- **Power Electronics:** Simulating temperature excursions experienced in the inverter between the motor drive and the battery is an important factor for assessing their field reliability. To model EV power and cooling system, speed versus time across a standard drive cycle can be converted into inverter power dissipation versus time using Simcenter Flomaster™ software. The power versus time data can then be used as input into a BCI-ROM of the inverter unit; thus, enabling temperature versus time to be predicted accurately across the whole drive cycle. Rainflow counting of the number and magnitude of the temperature swings can also be used to calculate the resulting fatigue damage within the inverter assembly and its lifetime.
- **Digital Electronics:** Modern digital electronics have complex active power management strategies. With the help of this module, the strategies can be tested against a wide range of use cases and environmental conditions. Each use case may have a unique set of component powers and specific power map for each die. Scenarios can even consider combinations of use cases. For example in the case of mobile phones – one minute they're used for a phone call, next for streaming a video, or navigation while the phone is being charged in a car. These use cases put different thermal demands on different parts of the system. Control logic can be optimized to ensure that the cooling solution provides the best possible user experience, minimizing the need for performance derating by reducing clock frequency, while maintaining component junction, component case, and touch temperatures within allowable limits. And importantly, hours of real time can be simulated in a matter of minutes.



BCI-ROM response to complex powering profiles is identical to the detailed model.

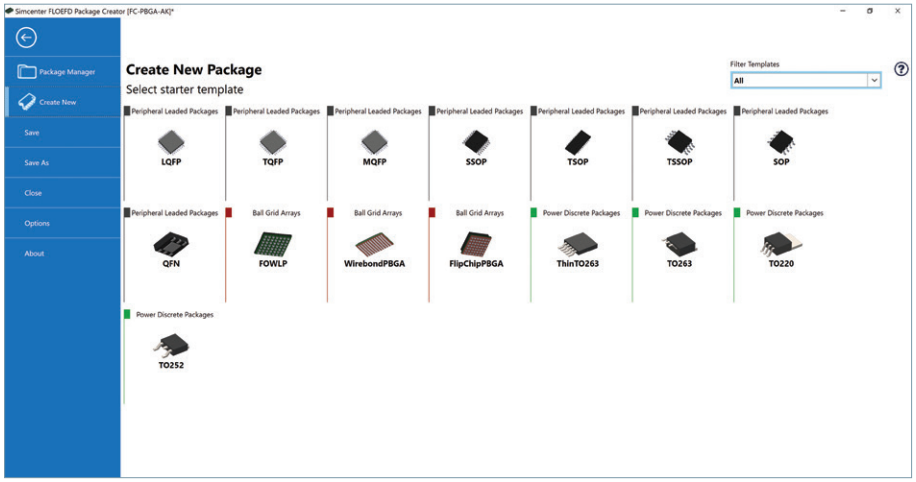
Package Creator

Simcenter FLOEFD Package Creator can help you create accurate detailed thermal models of electronic packages in minutes enabling you to complete projects faster, and without re-spins.

Benefits

- Create thermal models of electronic packages effortlessly
- Accurately predict junction temperature as a lead indicator of thermal reliability.
- Wizard-based with defaults to speed model creation.
- Achieve greater than 99% accuracy in temperature prediction in time and space upon calibrating Package Creator models using Simcenter T3STER™ and Simcenter POWERTESTER™

It supports 15 of the most common chip package families. The models can be imported directly into Simcenter FLOEFD. The models require no clean-up before use. Simply plug and play! Semiconductor companies and packaging houses can use Package Creator to create models for their customers, while system integrators and other end user companies can use Package Creator to create thermal models of packages where these are not available through the supply chain.



Selection of 15 most common chip package templates.

Package Families Supported

Peripheral Packages:

- LQFP, TQFP, MQFP, SSOP, TSOP, TSSOP, SOP, QFN

Ball Grid Arrays:

- FOWLP, Wirebond PBGA, Flip Chip PBGA

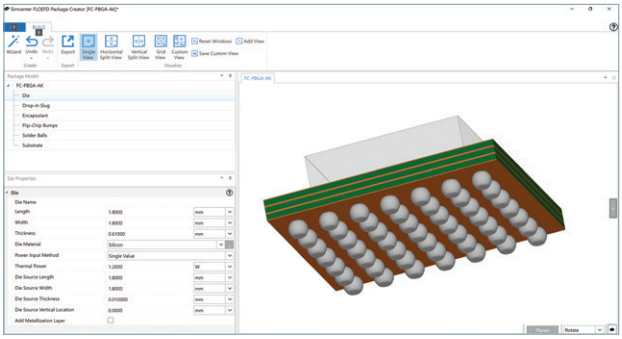
Power Discrete Packages:

- Thin TO263, TO263, TO220, TO252

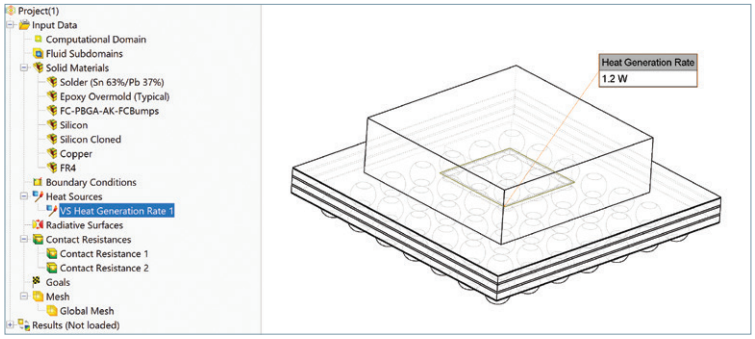
Wizard-based Workflow

Package Creator's wizard-based workflow helps you create a package – simply choose the package style, enter a name, the thermal power and optionally a die size if this is known. Default values are automatically provided for all other parameters, but you can change them.

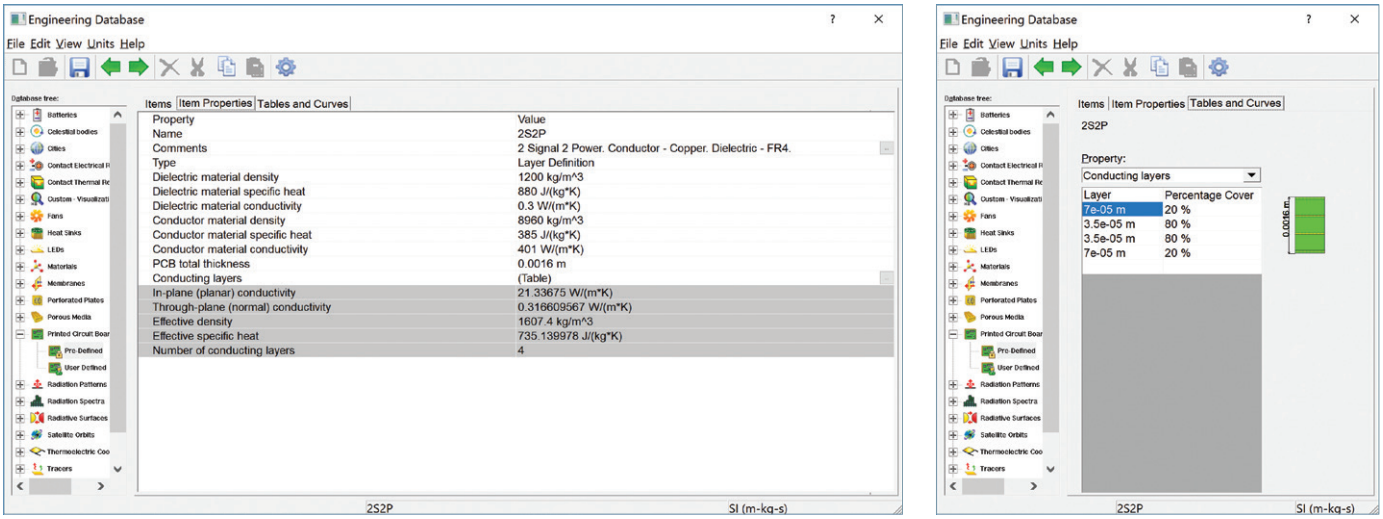
The wizard gives access to the various geometric features that make up the construction of the chosen package family, such as die, bond wires, die attach, etc. Some features, can be modelled in different levels of detail. For example, the die can be a single power, or a power map specified as a table or imported from a file.



Detailed package definitions are possible.



Packages import with detailed project definitions into Simcenter FLOEFD.



PCB Generator's bi-axial thermal conductivity definition in the Engineering Database.

Detailed Model Thermal Calibration

Responses of the actual part in different environments can be measured with Simcenter T3STER and Simcenter POWERTESTER. Detailed thermal models can be calibrated against the measurement data, tuning model parameters to match provides the response of the actual part, to provide greater than 99% model accuracy in both space and time.

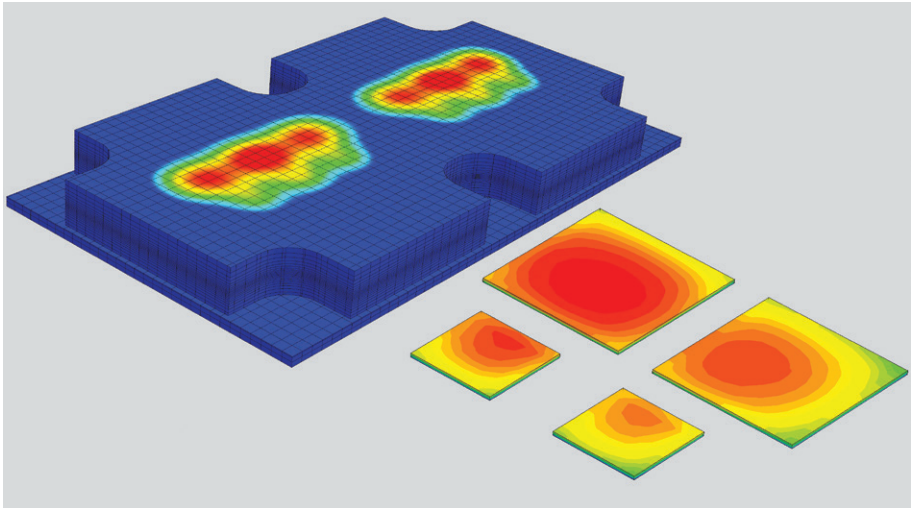
Material Library

The module also includes its own material library which can be augmented. Materials can be cloned and modified, and new materials added. Materials can have isotropic, biaxial or orthotropic thermal conductivities, with all options supporting thermal conductivity of a function of temperature defined via a table providing full flexibility.

Create faster and better electronics packages inside CAD with Simcenter FLOEFD.

PCB Generator

PCB generator is used 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.



Detailed thermal simulation of an IGBT.

Siemens Digital Industries Software
siemens.com/software

Americas +1 314 264 8499
Europe +44 (0) 1276 413200
Asia-Pacific +852 2230 3333

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