

3D and compact thermal modeling in power electronics: an overview

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Thermal management is a key point of power converters development because it affects their performance defining heat flow and temperature cycling. Even if cooling technologies for electronics have been a research topic since the birth of power electronics, in the last decade the number of publications related to this field has grown significantly. This is because thermal management, with the power density increasing and the high reliability required by many applications, cannot be the same of old systems.

Then, here it will be presented an overview of cooling techniques for power electronics and the numerical modeling related to thermal management problems.

It will be shown different numerical analysis based on multiphysics Finite Element Analysis and compact thermal models, such as the Foster and Cauer networks, which can be useful for SPICE-like electro-thermal simulations.

The aim is to show how multiphysics simulations can be used for the cooling system design or for reliability studies.