DESCRIPTION
THERMAL MODEL FOR
PKB4216HDPI

Contents

General

The model is an estimation of the thermal behavior of PKB4216HDPI, which is a through hole design. The mechanical structure, PCB stack-up, components and materials are similar to other products in the same family, which means that this thermal model might be applicable for several products within the PKB-D family.

The model is intended for steady-state thermal simulations.

Model Description

The model is a readymade Flotherm 11.1 model. The model consists of three major components:
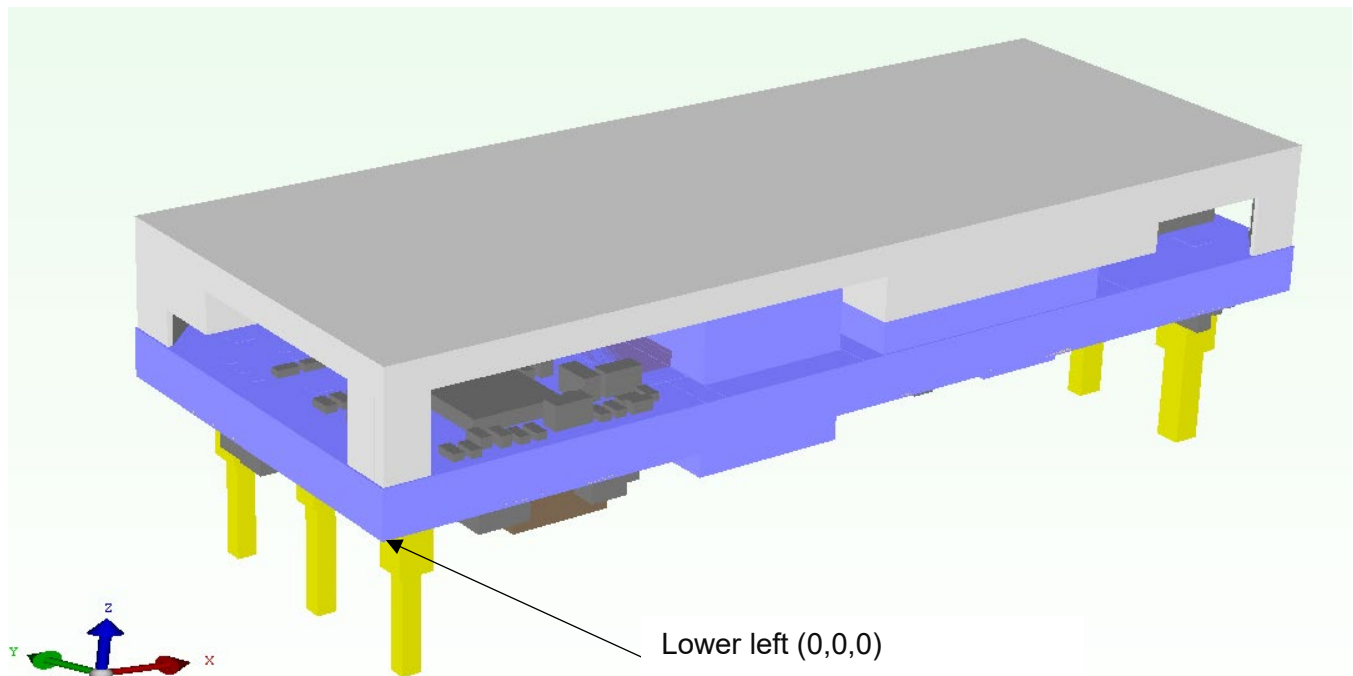
3D CAD Geometry

Lower left (0,0,0)

Figure 1

In the geometry most components are maintained per the original design but have been simplified in FloMCAD to cuboids. The PCB has been modeled as a bulk, with inserts of low conducting areas. In order to capture through hole and buried vias, the via sets are processed as electrical vias in FloEDA. Blind vias are treated as patches.

Origin has been placed so that [0,0,0] is in the lower left corner of the PCB.

Unit in file: [mm]

Domains of power loss distribution

There are several sources for power loss. The power loss for each of them, at certain combinations of module voltage and current, are given in *Appendix 1 - Power Loss Distribution*.
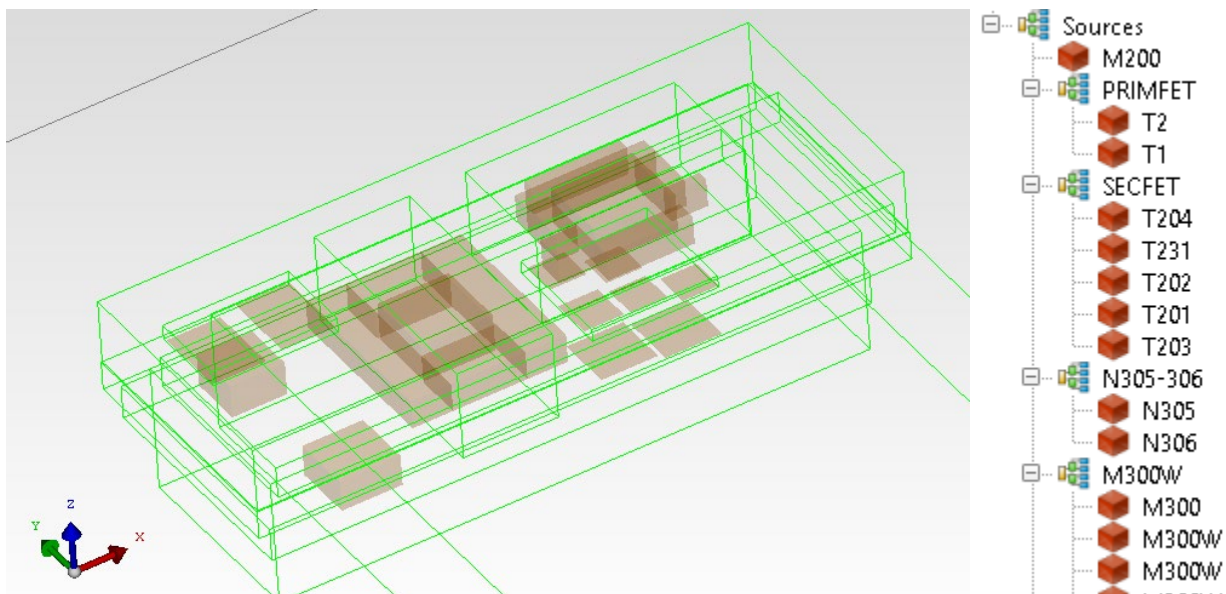

Figure 2 Domains of power losses

Domains of material data

There are several material domains. The heat conductivity for each of them is given either as isotropic, or anisotropic values in x-,y-, and z-direction (x,y,z) in the figures following.
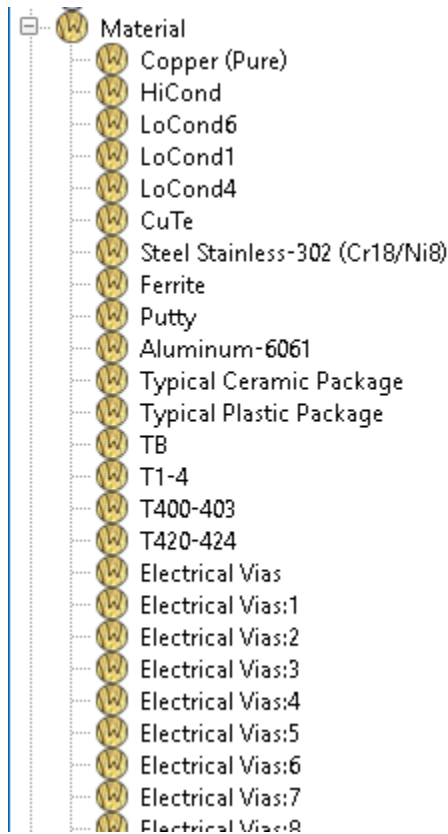

Figure 3: Materials, generic example

Note. The given heat conductivity is only intended to model the temperature distribution of the module in this application. The values should not be treated as physical true or transferable to other applications.

Model Calibration

The model has been calibrated to give temperatures as similar as possible for V_{in}=53[V], I_{out}=5[A], compared to thermal verification document *6/102 65-BMR 674 11 Uen, Rev A*. AirSpeed=1[m/s] (neg to pos)

The result of the calibration can be seen in Figure 4. As a reference the calibration set-up is provided as an assembly "Verification assembly", see Figure 5. This assembly should be deleted when model is imported into a project.
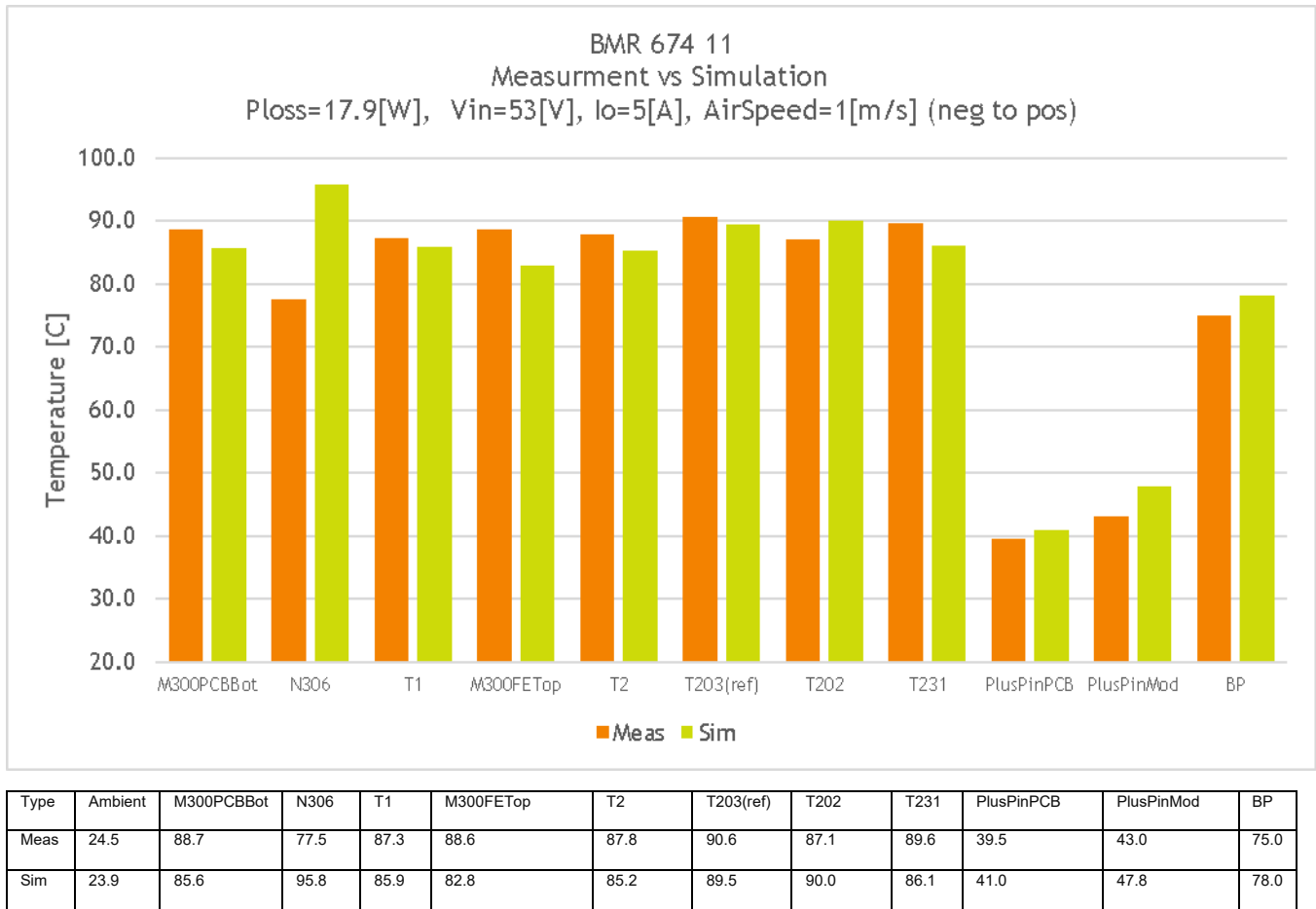
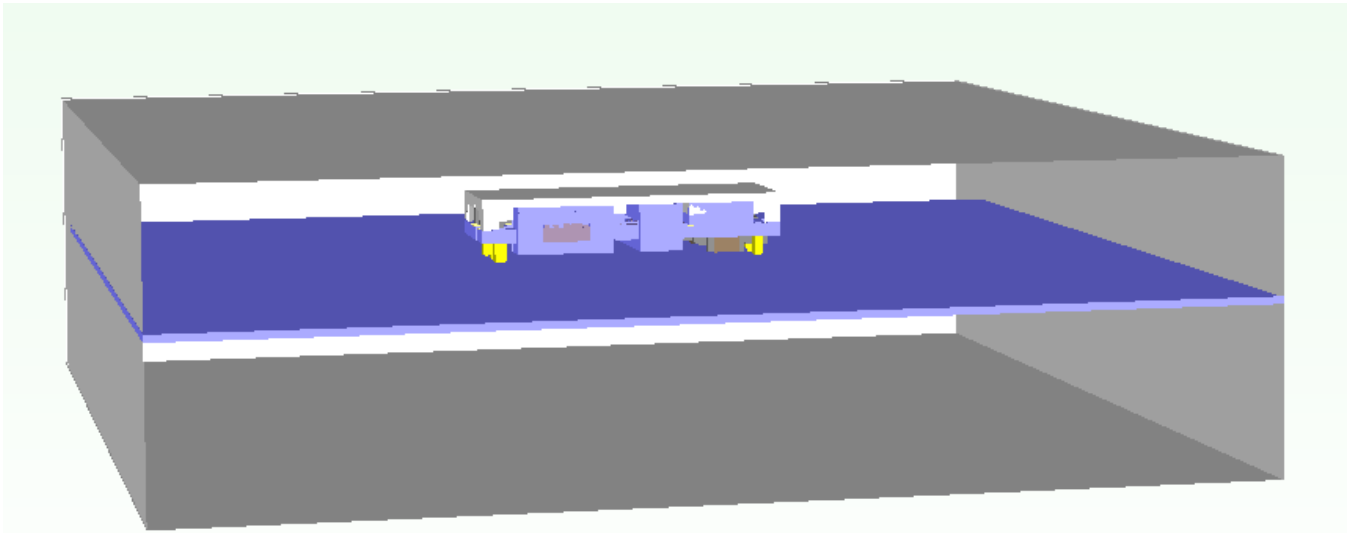| Type	Ambient	M300PCBBot	N306	T1	M300FETop	T2	T203(ref)	T202	T231	PlusPinPCB	PlusPinMod	BP
Meas	24.5	88.7	77.5	87.3	88.6	87.8	90.6	87.1	89.6	39.5	43.0	75.0
Sim	23.9	85.6	95.8	85.9	82.8	85.2	89.5	90.0	86.1	41.0	47.8	78.0

Figure 4: Model calibration result

Figure 5 Thermal Verification Test Set-Up

Model Usage

Import the *.pdml file into the desired project. Delete the assembly "Thermal Verification Test Set-Up".

Assign power losses per table in *Appendix 1 - Power Loss Distribution* to the sources in section *Domains of power loss distribution*. Default settings are for V_{in}=53[V], I_{out}=5[A], T≈100[C]

If the model is rotated, make sure that the orientation of the orthotropic materials properties are preserved (also rotated).

Do not change the order of power sources and geometry objects, as this can change the power and material settings.

The module temperatures can be monitored in predefined monitor points, which corresponds to the measured points in the thermal verification. These temperatures are not intended for pass/fail criteria.

Additional Information

Model has been constructed with SI units.

Reference
PKB4216HDPI.pdml

Disclaimer
The model and model documentation described herein are provided for the sole purpose of facilitating thermal modeling of a structure where the referenced product is included. It should not and cannot be

interpreted neither as a detailed description of the product itself, nor as a statement of the product's performance.

The model has been constructed on a best effort basis, but we cannot accept liability for any discrepancy between model predictions and actual values.

Revision history

A   2023-02-28   New document

Appendix 1 - Power Loss Distribution

Power loss distribution example for BMR 674 11.

V_{in}=53[V], I_{out}=5[A], T≈100[C]

Source	Number of domains	Per domain [W]	Total [W]
M200	1	0.25	0.25
PRIMFET	2	2	4
SECFET	4	1.5	6
T231	1	1	1
N305-306	2	0.3	0.6
M300	1	0.8	0.8
M300W	4	(*)	3.2
M200W	7	(*)	0.75
M301	1	0.5	0.5
M1	1	0.8	0.8
Total [W]			**17.9**

(*) Defined as Source/Volume. Adjust source so that the total adds up.