DESCRIPTION
THERMAL MODEL FOR
PKU4213D

FLEX POWER MODULES

Contents

General

The model is based on and valid for PKU4213D, which is a Through Hole Pin, Baseplate design with thermal material interface. The mechanical structure, PCB stack-up, components and materials are similar to other products in the same family, which means that this thermal model is applicable for several products within the family.

The model is intended for steady-state thermal simulations.

Model Description

The model is a readymade Flotherm 11.1 model. The geometry was created by importing a CAD model in STEP format through the MCAD bridge. The PCB was imported through FloEDA with resolution 20, and 256 conductor bands. The model consists of the four major components:

1. 3D geometry
2. Domains of power loss
3. Domains of material properties
4. Predefined monitor points

3D CAD Geometry

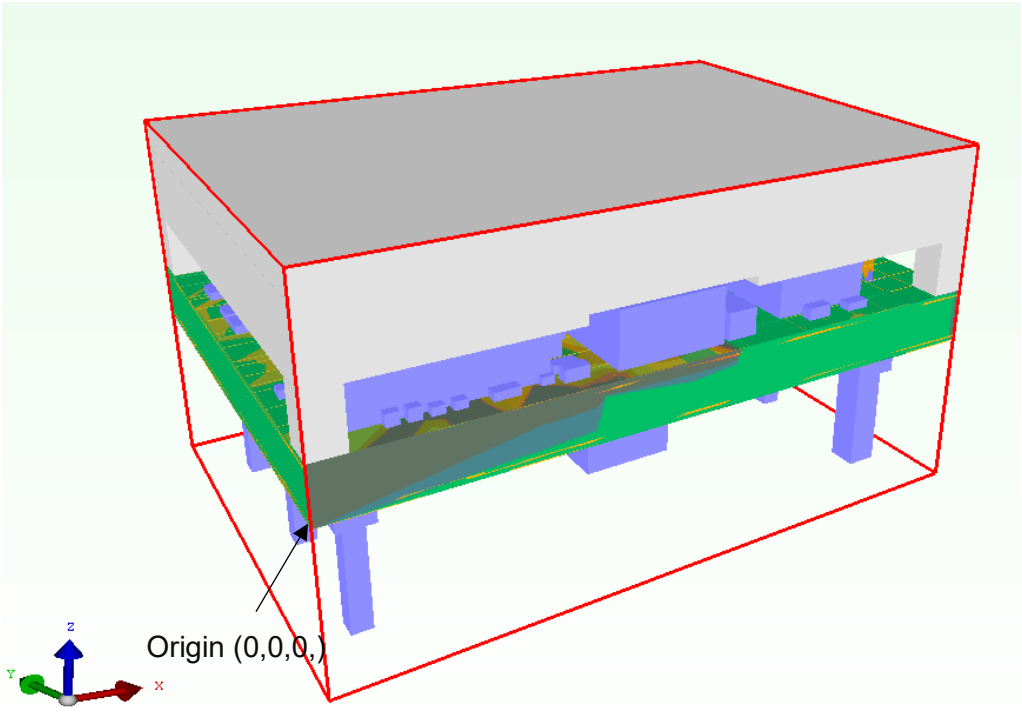


Figure 1 Model origin in lower left corner of PCB and axis orientation.

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 module total powers, are given in *Appendix 1 - Power Loss Distribution.*

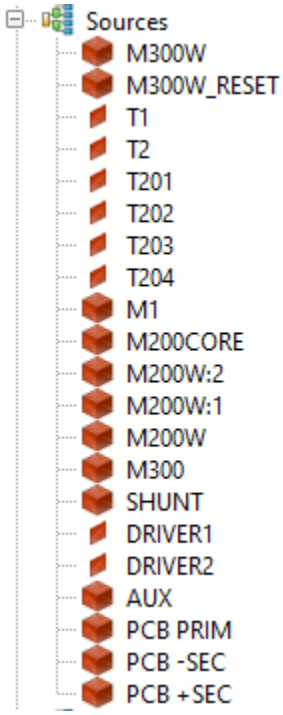


Figure 2: Heat Sources to be found as sources. Note: the negative source is to compensate for cut-out in the PCB.

Domains of material data

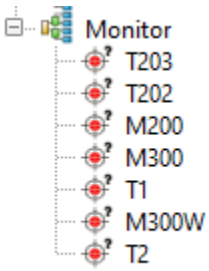
There are several material domains. The heat conductivity for each of them is given either as isotropic or orthotropic values in x-,y-, and z-direction (x,y,z).

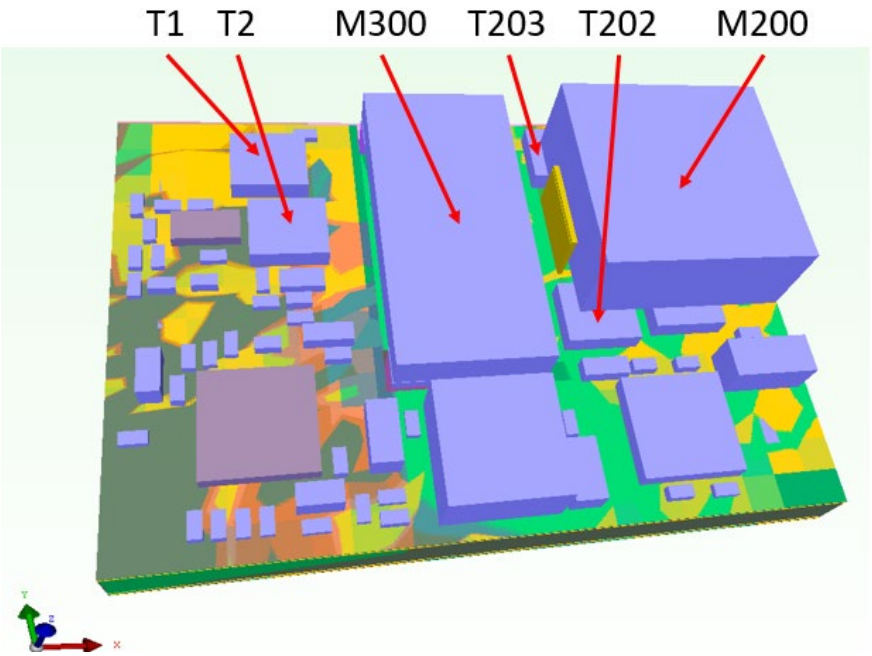
Figure 3. Domains of material data. (Not showing the large number of patches from FloEDA)

Note. The given heat conductivities are only intended to model the heat flux and temperature distribution of this module application. The values should not be treated as physically true or transferable to other applications.

Monitor points

The model comes with predefined monitor points, which corresponds to the location in document 3/102 65-BMR 675 04 Rev A:





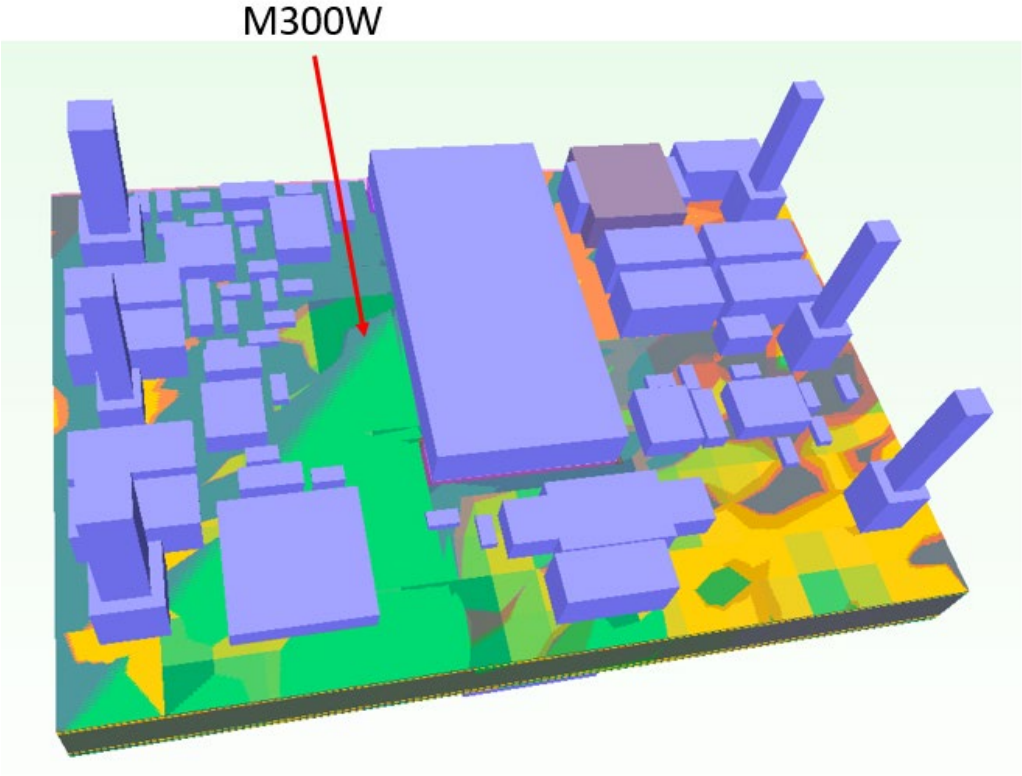


Figure 4. Thermocouple location.

Model Calibration

The model has been calibrated to give temperatures as similar as possible compared to thermal verification document 3/102 65-BMR 675 04 Rev A, for V_{in}=53[V], V_{out}=12.0[V], I_{out}=17[A], I_{in}=4.2[A], measured in cold wall. Baseplate and pin temperatures were set to 94.61[C] and 96.29[C] respectively

Flotherm simulation temperatures are within ±3.9 [degC] compared to measured values.

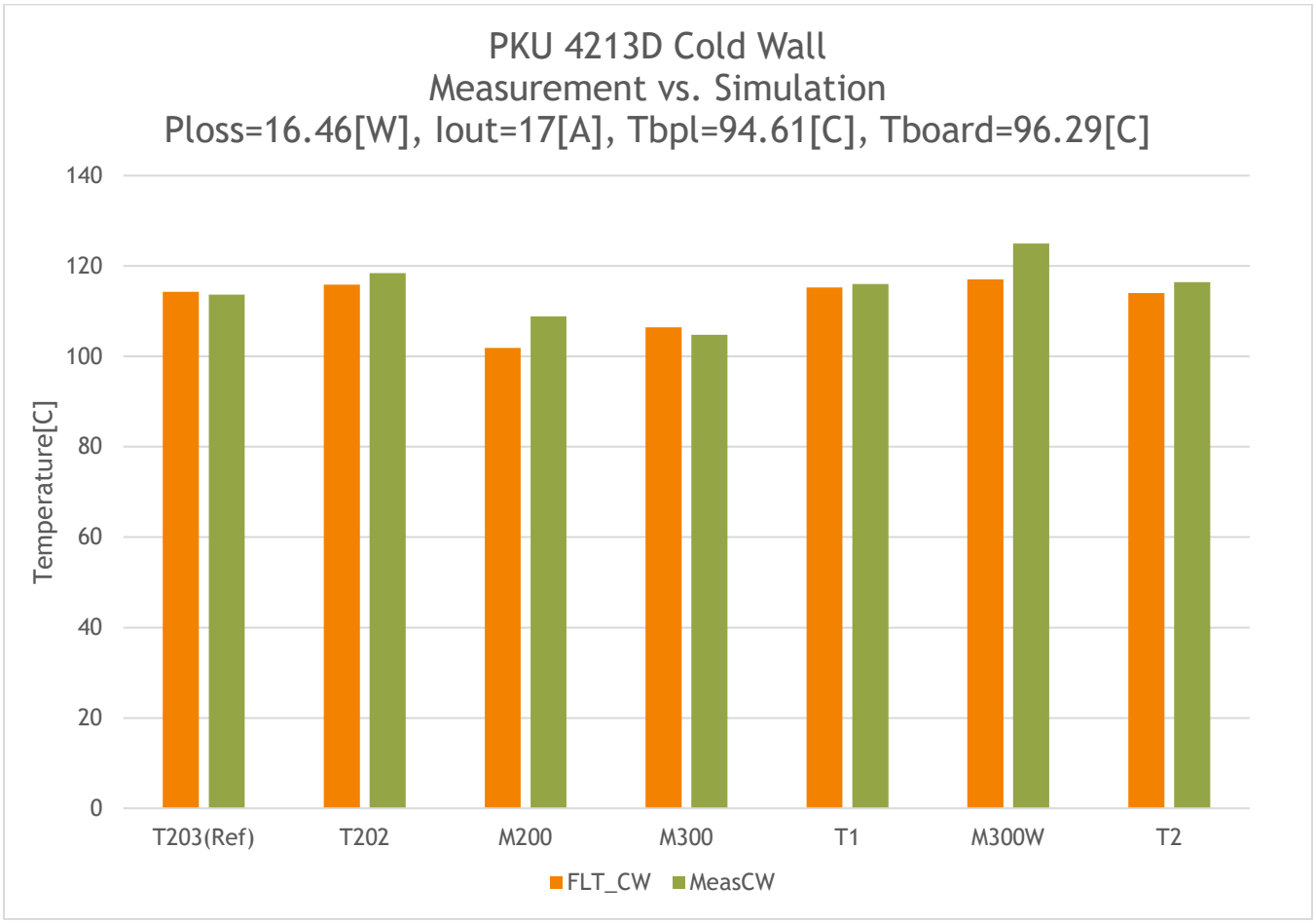


Figure 5: Model calibration result. MeasCW=Measured values in cold wall. FLT_CW=This model, Flotherm.

Model Usage

Import the *.pdml file into the desired project.

Adjust the dissipated power by altering the thermal sources per Figure 2, according to Appendix 1 - Power Loss Distribution. Default settings are for Vout=12V, 205[W] output power.

If the model is rotated, make sure that the orientation of the orthotropic materials properties is 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.

Additional Information

Model has been constructed with SI units.

Reference

Thermal report 3/102 65-BMR 675 04 Rev A

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	2020-06-11	New Document

Appendix 1 - Power Loss Distribution

Power loss distribution example for PKU 4213D/BMR 675 04.

V_{in}= 53.0[V] V_{out}= 12.0[V] I_{in}= 4.2[A] I_{out}= 17A]

Domain	Number of domains	Domain volume [mm^3]	Per domain [W]	Per volume [mW/mm^3]	Total [W]
PRIMFET	2		1.1		2.2
SECFET	4		0.95		3.8
M300W	2	264.5		7.561	2
M1	1		0.69		0.69
M200W	3	19.1		94.2	1.8
M300CORE	1		1.3		1.3
SHUNT	1		0.27		0.27
DRIVER	2		0.25		0.5
AUX	1		1.5		1.0
PCB	3	1620		1.543	2.5
M200CORE	1		0.4		0.4
Total [W]					**16.46**