DESCRIPTION
THERMAL MODEL FOR
PKJ4716A

FLEX POWER MODULES

Contents

General

The model is based on and valid PKJ4716A, which is a Through Hole Pin 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 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 12.2 model. It was created by importing a CAD model in STEP format through the MCAD bridge. Components that are not contributing to the heat transfer, have been removed from the geometry. The model consists of the four major components:

3D CAD Geometry

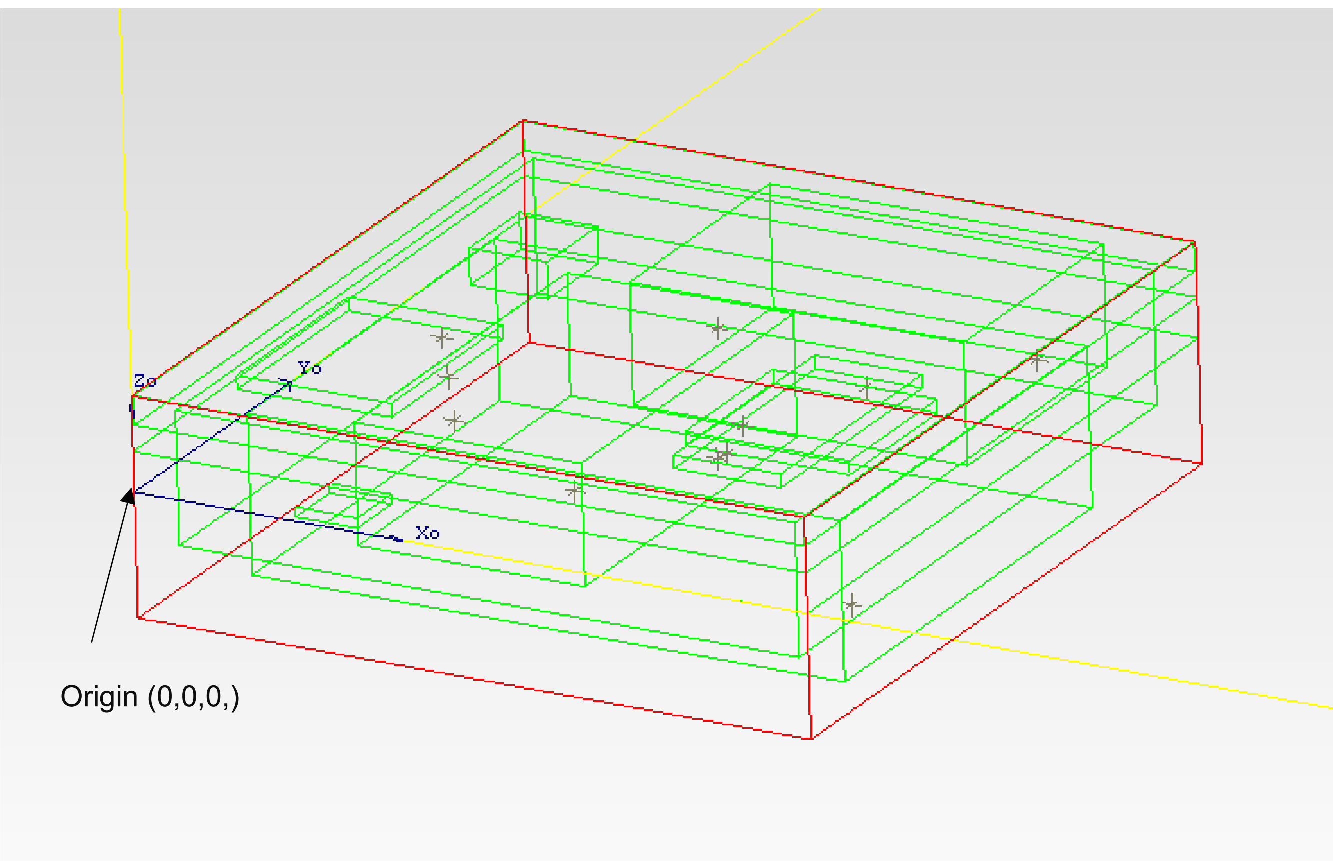

Figure 1 Model origin in lower left corner of PCB and axis orientation.

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*

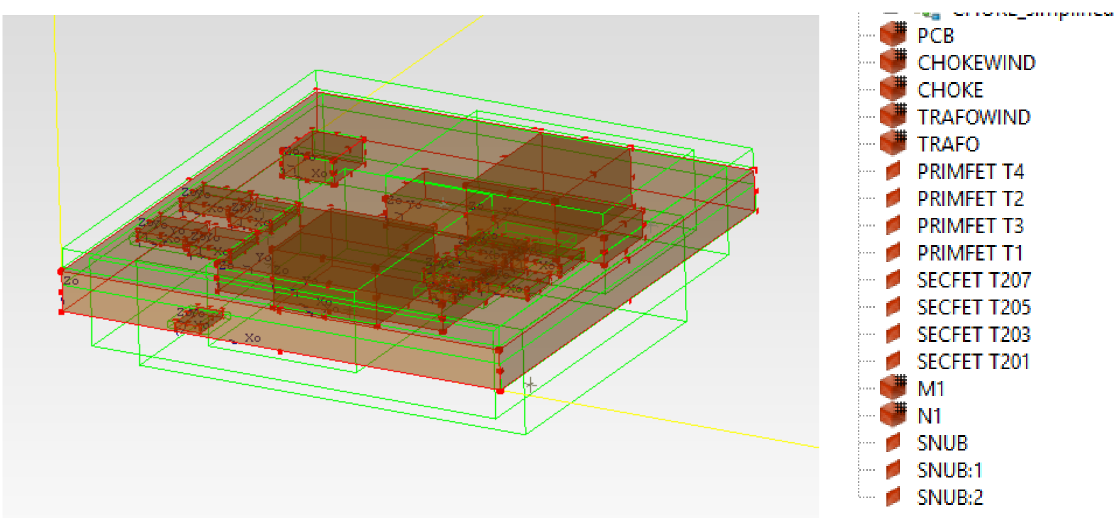

Figure 2: Heat Sources

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) per the following list.

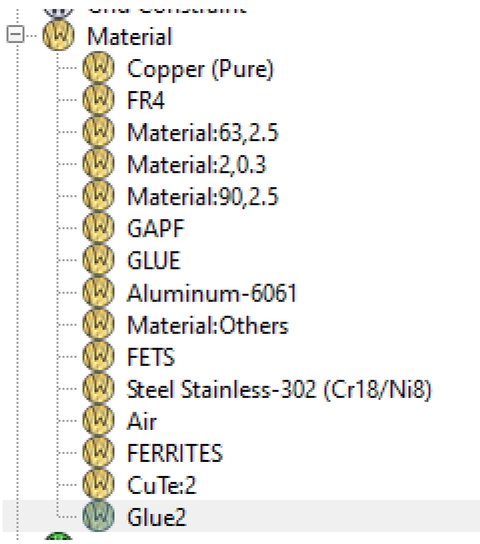

Figure 3. Domains of material data

Note. The given heat conductivities are only intended to model the temperature distribution of the module in this 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 2/102 65-BMR 681 01 Rev A:

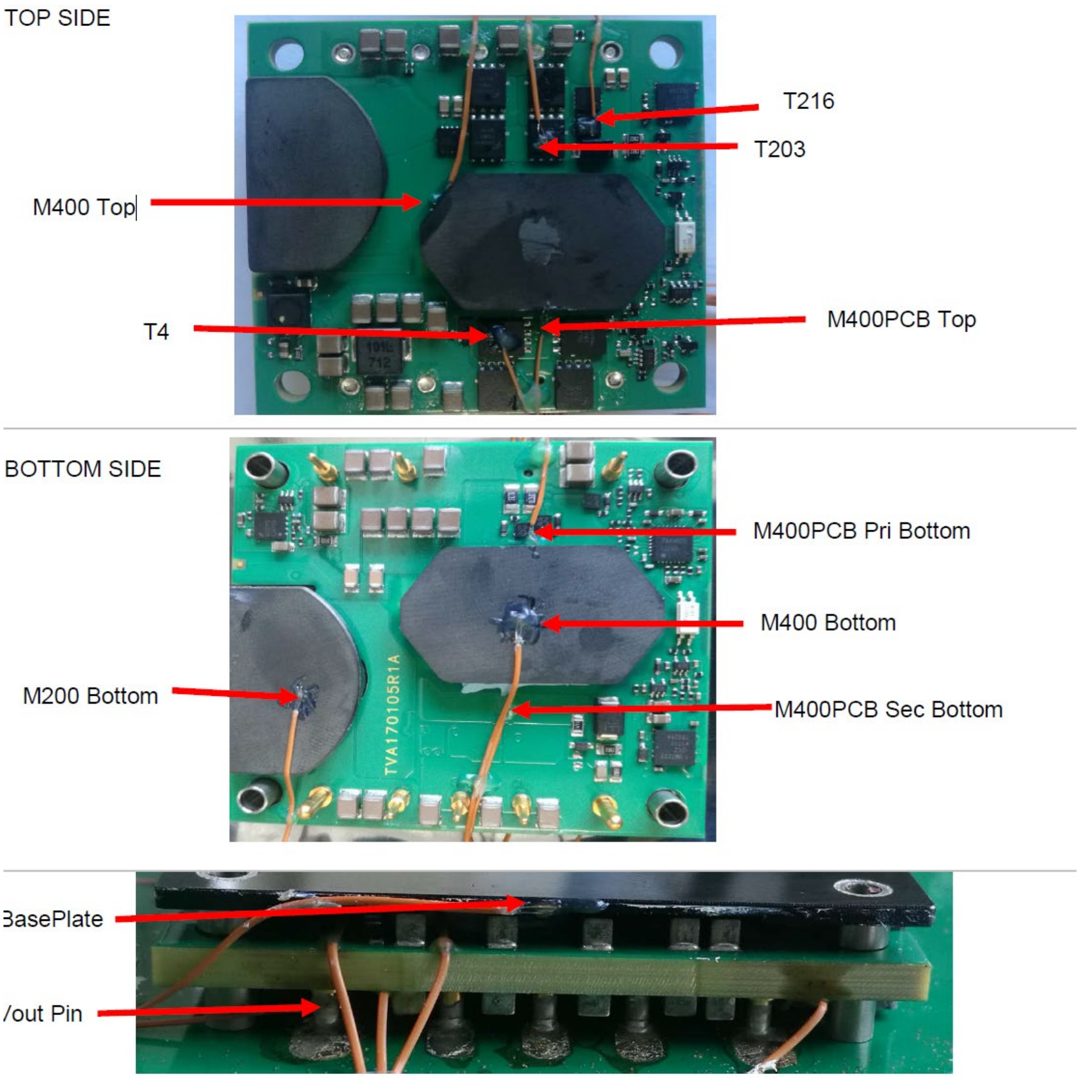

Figure 4. Thermocouple location.

Model Calibration

The model has been calibrated to give temperatures as similar as possible for V_{in}=48[V], V_{out}=28.3[V], I_{out}=25.48[A], I_{in}=15.71[A], compared to thermal verification document 2/102 65-BMR 681 01 Rev A. The referenced verification data is from a Cold Wall test; thus, no heat transfer to air was calculated.

Simulation temperatures are within ±2 [degC] compared to measured values.

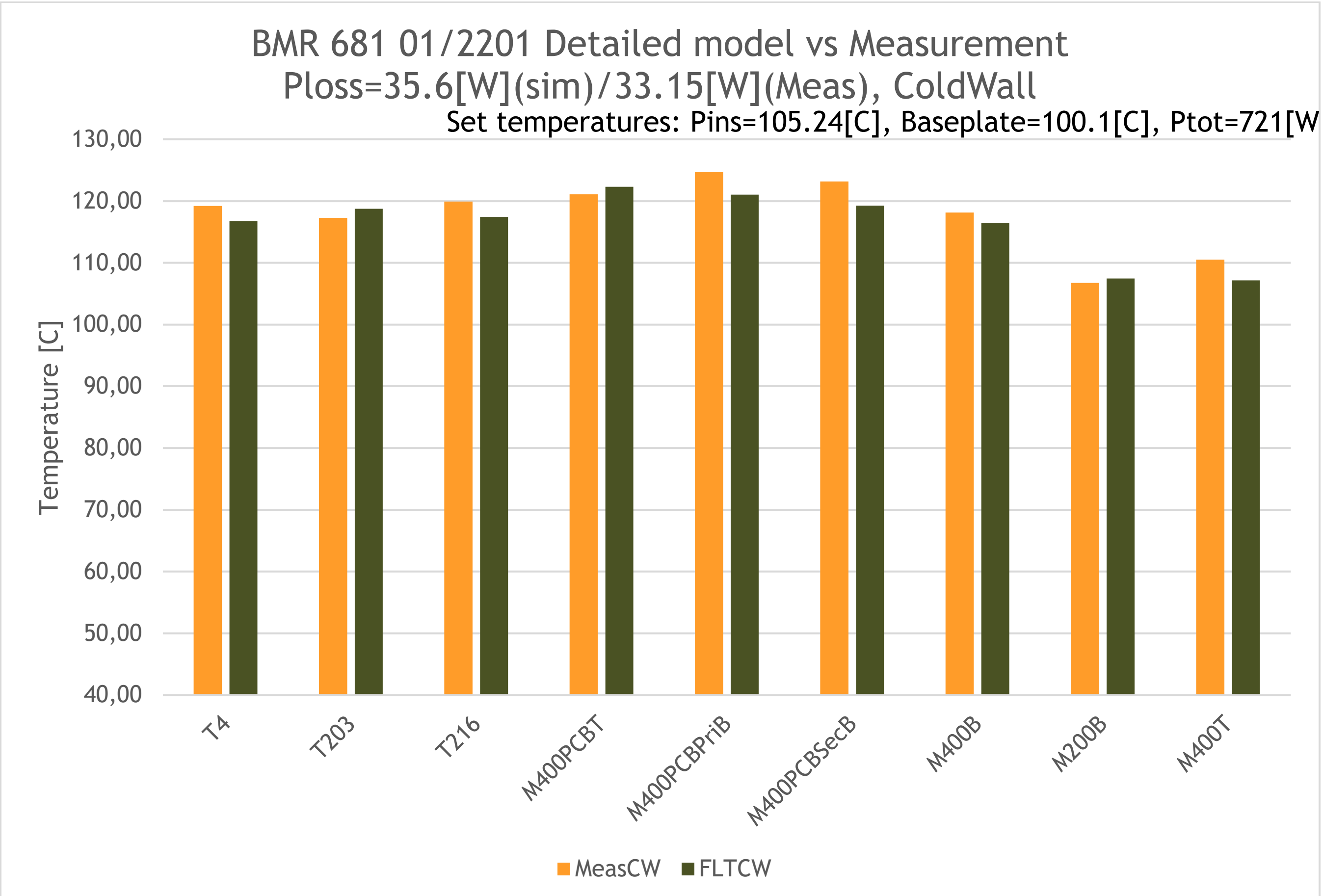

Figure 5: Model calibration result.

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 700[W].

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 2/102 65-BMR681 01 Rev A

Product number and r-state history

Flex product number IPM 101 53, R1A 2019-11-07

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	2019-10-24	New Document for Flotherm 12.2

Appendix 1 - Power Loss Distribution

Power loss distribution examples for BMR 681 01/2201.

V_{in}= 53V T≈100[C]

Domain	Number of domains	Power loss per domain (W) @total power			Subtotal power loss [W] @total power		
		300[W]	500[W]	700[W]	300[W]	500[W]	700[W]
PRIMFET	4	0.83	1.3	2	3.32	5.2	8
SECFET	4	0.7	1.4	2.3	2.8	5.6	9.2
TRAFOWIND	1	0.81	2.2	4.2	0.81	2.2	4.2
TRAFO	1	1.32	1.32	1.32	1.32	1.32	1.32
CHOKEWIND	1	0.73	1.96	3.8	0.73	1.96	3.8
CHOKE	1	0.15	0.15	0.15	0.15	0.15	0.15
PCB	1	1.15	3	5.8	1.15	3	5.8
SNUB	3	0.14	0.4	0.75	0.42	1.2	2.25
AUX	1	0.23	0.23	0.23	0.23	0.23	0.23
M1	1	0.07	0.18	0.4	0.07	0.18	0.4
N1	1	0.25	0.25	0.25	0.25	0.25	0.25
Total [W]					**11.25**	**21.29**	**35.6**