DESCRIPTION
THERMAL MODEL FOR
BMR684 SERIES

FLEX POWER MODULES

Contents

General

The model is an estimation of the thermal behavior of BMR684, 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 is applicable for several products within the BMR684 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

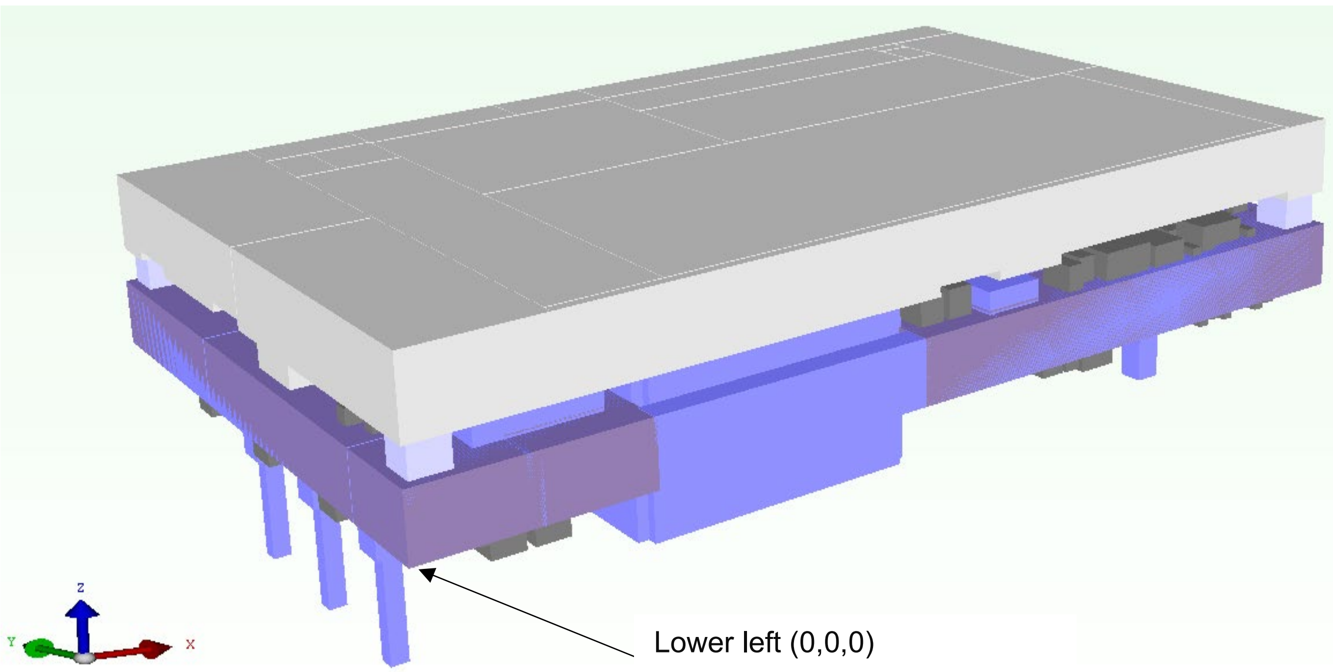


Figure 1

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 vias, the via sets are processed as electrical vias in FloEDA.

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.*

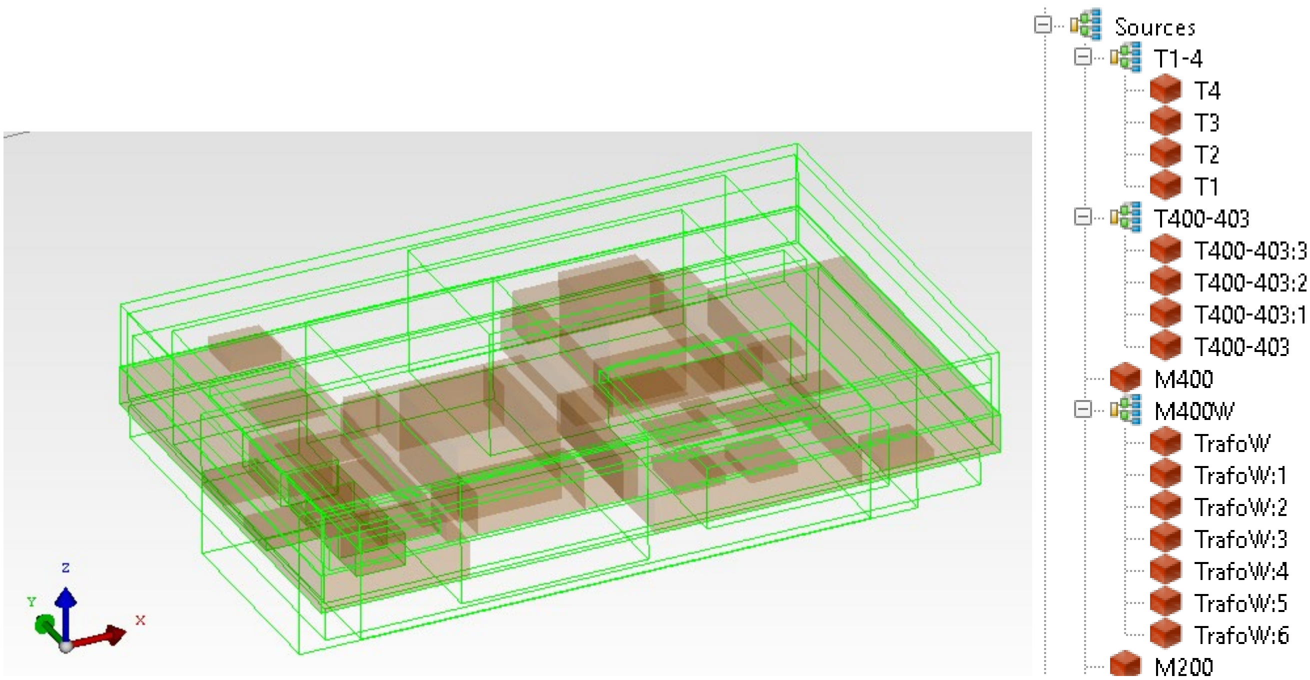


Figure 2 Domains of power losses

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.

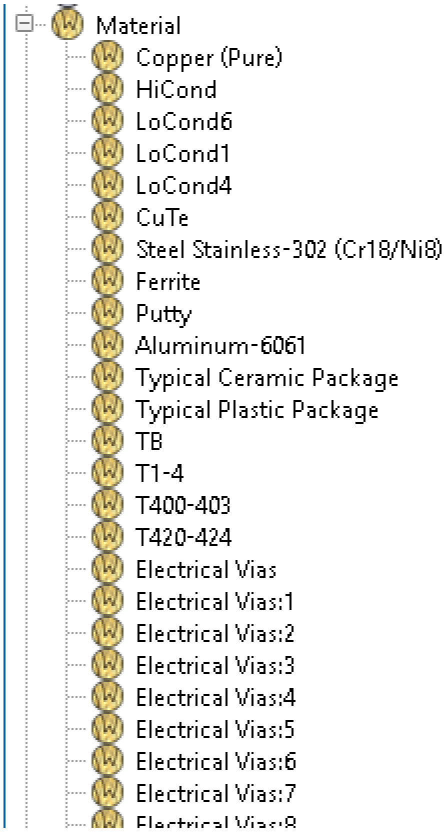


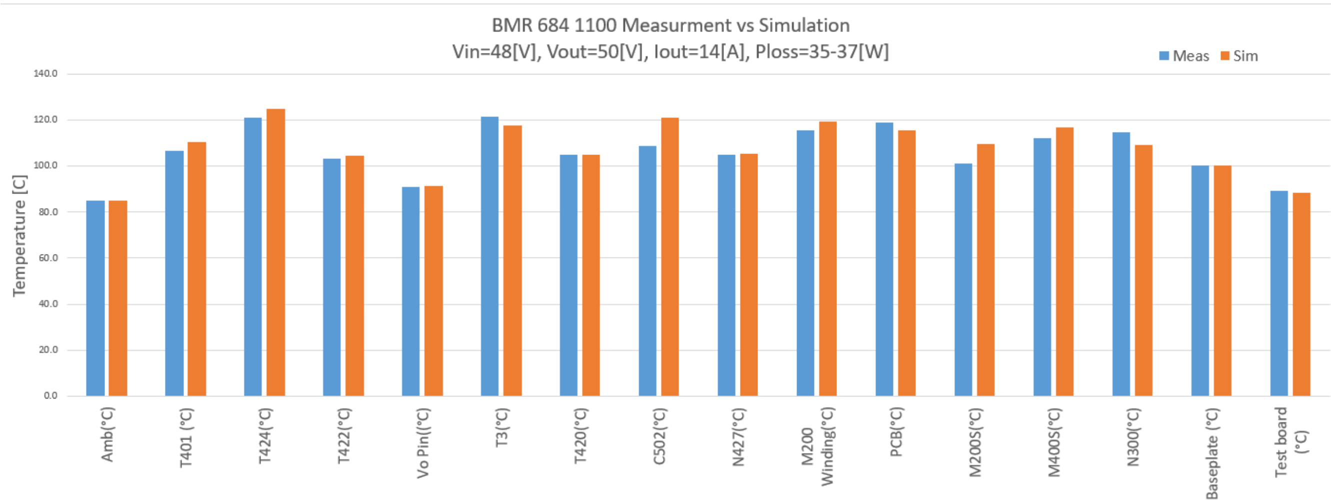
Figure 3: Materials

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}=48[V], V_{out}=50[V], I_{out}=14[A], compared to thermal verification document *1/102 65-BMR 6841100 A*. According to the measurement settings, the temperature of baseplate, BPL, was set to 100[C]. Total Ploss=35-37[W].

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.



Meas	85.1	106.4	121.0	103.2	91.0	121.3	104.9	108.9	105.0	115.6	118.8	101.2	112.1	114.5	100.0	89.4
Sim	84.9	110.2	124.6	104.6	91.3	117.6	104.8	120.9	105.4	119.2	115.3	109.4	116.7	109.1	100.2	88.2

Figure 4: Model calibration result

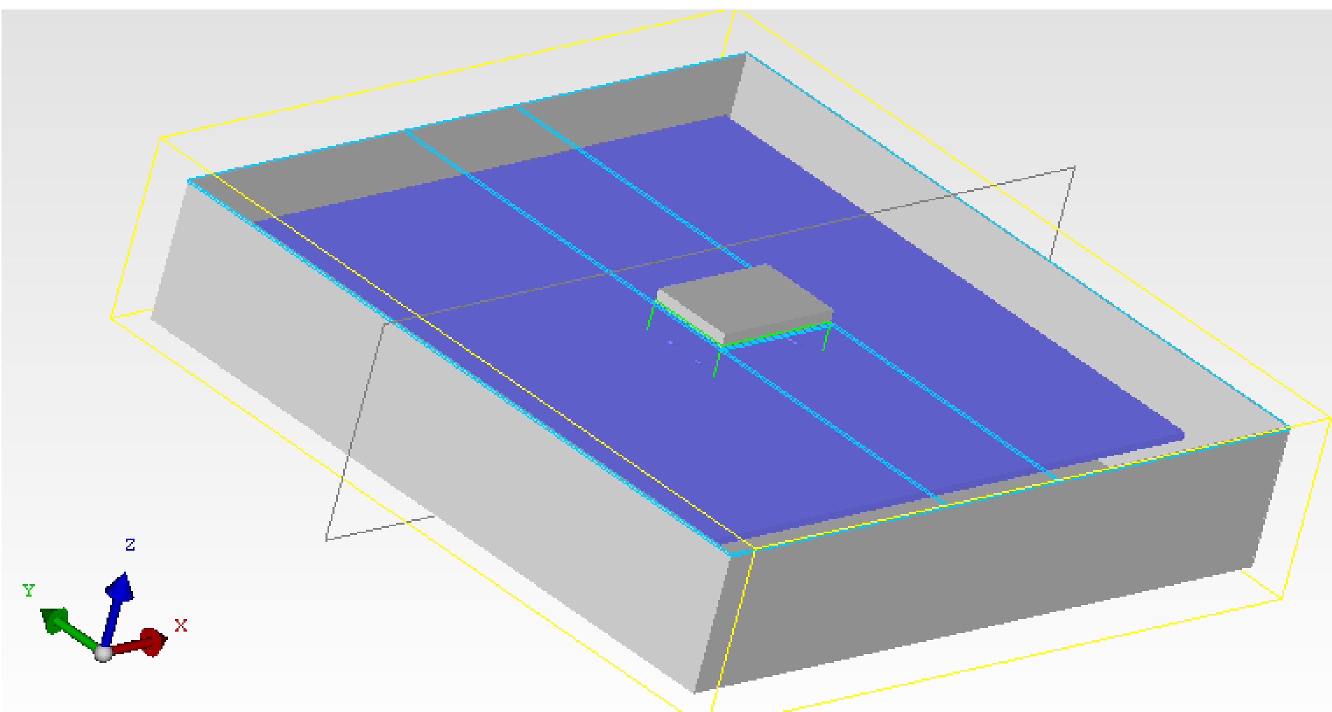


Figure 5 Thermal Verification Test Set-Up

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}=48[V], V_{out}=50[V], I_{out}=14[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

Thermal report *1/102 65-BMR 684 1100 A*

Data file BMR684.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	2023-01-25	New document

Appendix 1 - Power Loss Distribution

Power loss distribution example for BMR684

V_{in}=48[V], V_{out}=50[V], I_{out}=14[A], T≈100[C]

Source	Number of domains	Per domain [W]	Total [W]
T1-4	4	1.75	7
T400-403	4	2.5	10
M400	1	2.5	2.5
M400W	7	(*)	3.6
M200	1	0.2	0.2
M200W	4	(*)	3.5
M1	1	0.5	0.5
T420-424	4	1	4
C4-5,502-503	4	0.1	0.4
N427	1	0.7	0.7
PCB	3	(*)	1.6
N421	1	0.3	0.3
N300-301,409,419	4	0.2	0.8
Total [W]			**35.1**

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