DESCRIPTION
THERMAL MODEL FOR
BMR 482

FLEX INC.

Contents

General

The model is an estimation for the thermal behavior of BMR 482. This thermal model of the product is calibrated against one of the thermal verification tests.

The model is intended for steady-state thermal simulations.

Model Description

The model is a readymade Flotherm 11.1 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

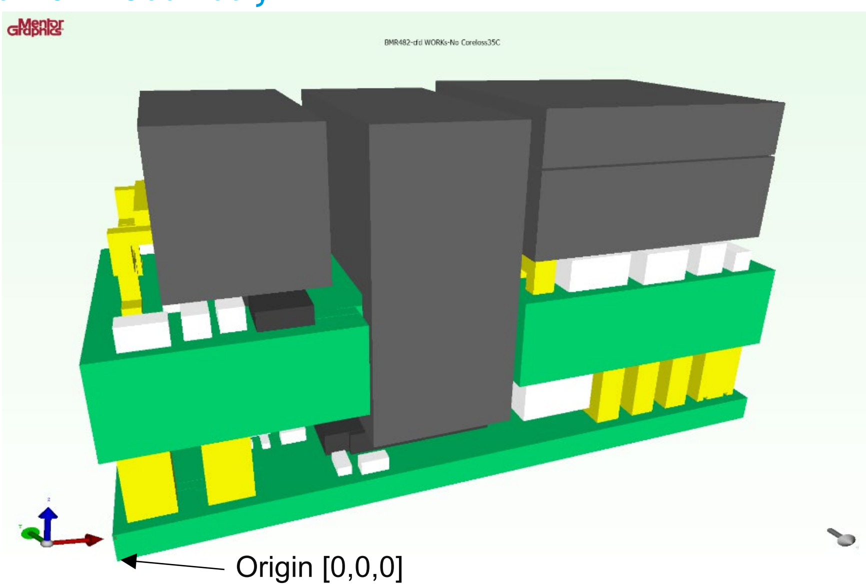


Figure 1. 3D geometry of the model

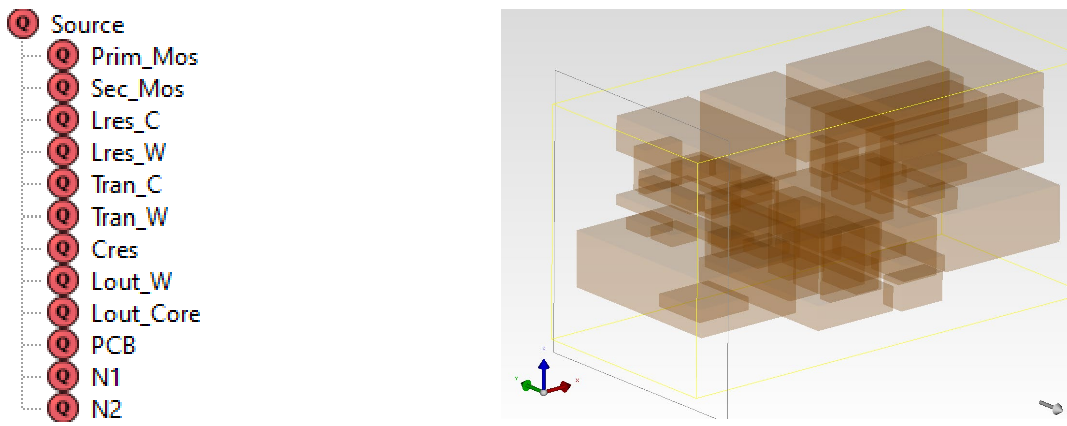
3D geometry is created by importing a CAD model in STEP format through the MCAD bridge. Components that are not contributing to the heat transfer have been removed from the geometry. The PCBs have been simplified to a bulk geometry where the copper layers and vias have been taken into consideration by assigning anisotropic material properties to the PCBs domains.

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



(a) (b)

Figure 2: Power loss setting: (a) list of heat sources, and (b) heat sources distribution in the model

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.

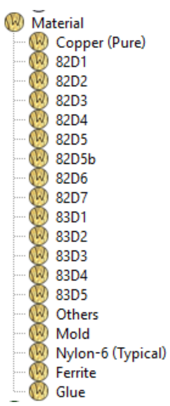


Figure 3. Domains of material data

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. These monitor points are shown here

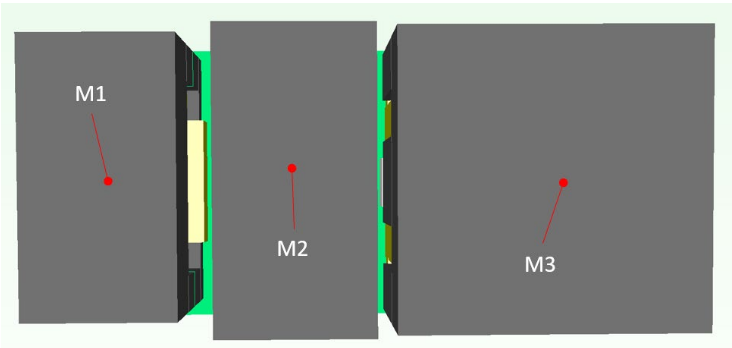


Figure 4. Monitor points in the model, top view is selected.

Model Calibration

The model has been calibrated to give temperatures as similar as the results of the wind tunnel test in a case of 54V input, 0.8V/100A output. The windspeeds are 2m/s and 4m/s and the ambient temperature is 25°C.

Flotherm simulation temperatures are within ± 8°C compared to the measured data (see Figure 5).

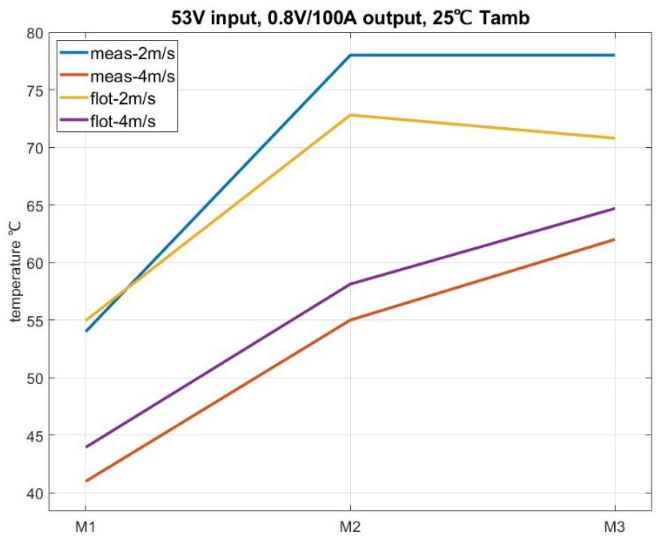


Figure 5: Model calibration result: meas – measured values, flot – Flotherm simulation results.

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 input voltage 54V input, 0.8V/100A output.

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

19010-BMR482.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	2022-12-30	New Document

Appendix 1 - Power Loss Distribution

Power loss distribution examples for BMR 482.

Condition: 54V input, 0.8V output, Output current:100A (default setting).

Domain	Number of domains/ boundaries	Domain volume [mm^3]	per domain [W]	per volume [mW/mm^3]	Subtotal power loss [W]
Prim_Mos	4		0.670		2.680
Sec_Mos	4		0.627		2.508
Lres_W	4	28.1		42	1.180
Trans_C	5	716.7		0.293	0.210
Trans_W	5	371.5		8.550	3.176
Cres	6		0.062		0.372
Lout_W	4	86.6		14	1.213
Lout_Core	4	600		0.400	0.264
PCB	2		0.316		0.632
N1	1		0.088		0.088
N2	1		0.300		0.300
Lres_C	4	257.1		0.420	0.108
				Total (W)	**12.73**

Power loss distribution examples for BMR 482.

Condition: 54V input, 0.8V output, Output current:70A.

Domain	Number of domains/ boundaries	Domain volume [mm^3]	per domain [W]	per volume [mW/mm^3]	Subtotal power loss [W]
Prim_Mos	4		0.366		1.463
Sec_Mos	4		0.321		1.282
Lres_W	4	28.1		23.56	0.662
.Trans_C	5	716.7		0.293	0.210
Trans_W	5	371.5		4.886	1.815
Cres	6		0.038		0.226
Lout_W	4	86.6		7.690	0.666
Lout_Core	4	600		0.400	0.264
PCB	2		0.156		0.312
N1	1		0.088		0.088
N2	1		0.270		0.270
Lres_C	4	257.1		0.424	0.109
				Total (W)	**7.37**

Power loss distribution examples for BMR 482.

Condition: 54V input, 0.8V output, Output current:35A.

Domain	Number of domains/ boundaries	Domain volume [mm^3]	per domain [W]	per volume [mW/mm^3]	Subtotal power loss [W]
Prim_Mos	4		0.147		0.587
Sec_Mos	4		0.101		0.403
Lres_W	4	28.1		12.06	0.339
.Trans_C	5	716.7		0.280	0.201
Trans_W	5	371.5		1.989	0.739
Cres	6		0.039		0.236
Lout_W	4	86.6		0.762	0.066
Lout_Core	4	600		0.400	0.264
PCB	2		0.040		0.079
N1	1		0.086		0.086
N2	1		0.250		0.250
Lres_C	4	257.1		0.424	0.109
				Total (W)	**3.36**