THERMAL MODEL

BMR314

FLEX INC.

Contents

General

The model is an estimation of the thermal behavior of BMR314. The model is intended for steady-state thermal simulations.

Model Description

The model is a readymade Flotherm 2024 model supplied in *.pack format. The model consists of three major components:

3D CAD Geometry

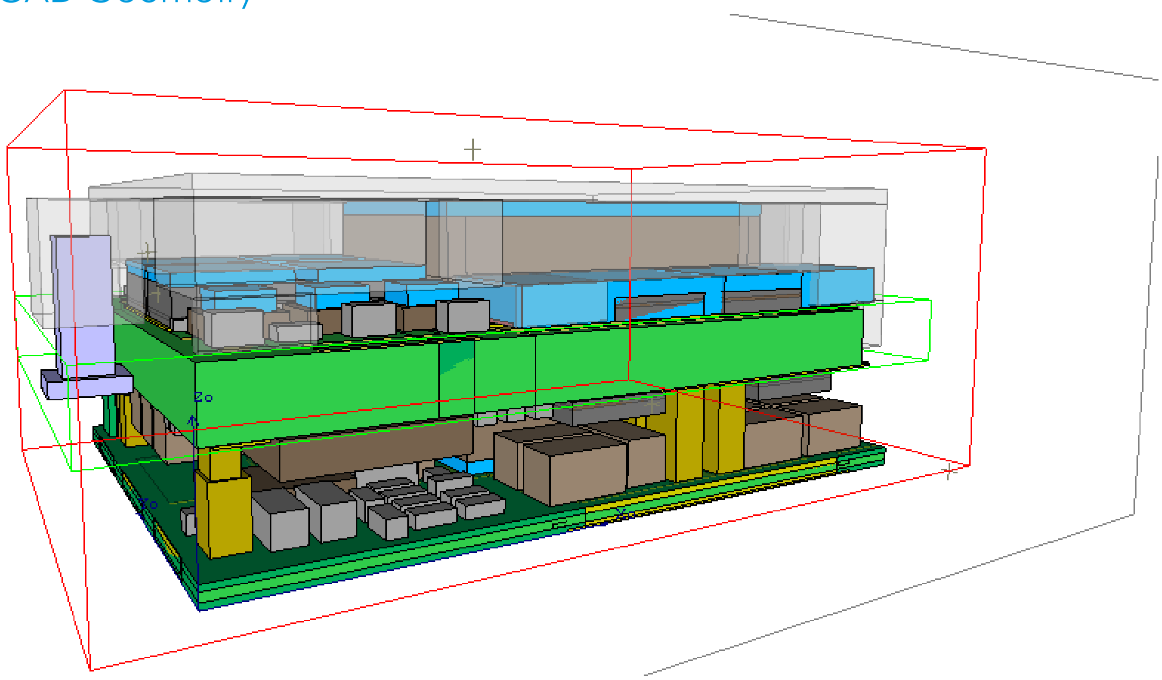

Figure 1

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 they have been grouped to larger domains, with an equivalent thermal conductivity attached.

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

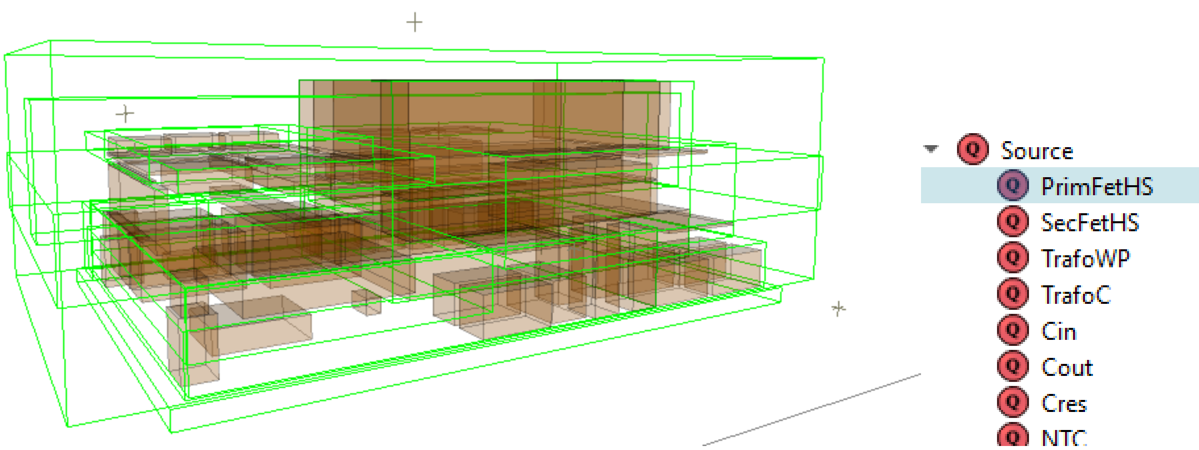

Figure 2 Examples of domains of power losses

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.

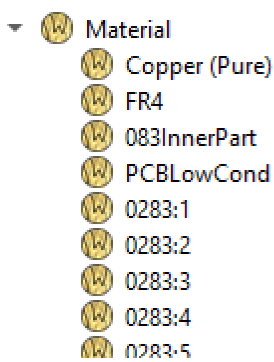

Figure 3: Examples of materials

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}=54[V], V_{out}=13[V], I_{out}=60[A], compared to thermal verification document *3/102 65-BMR314 rev PA1*.

The result of the calibration can be seen in Figure 4.

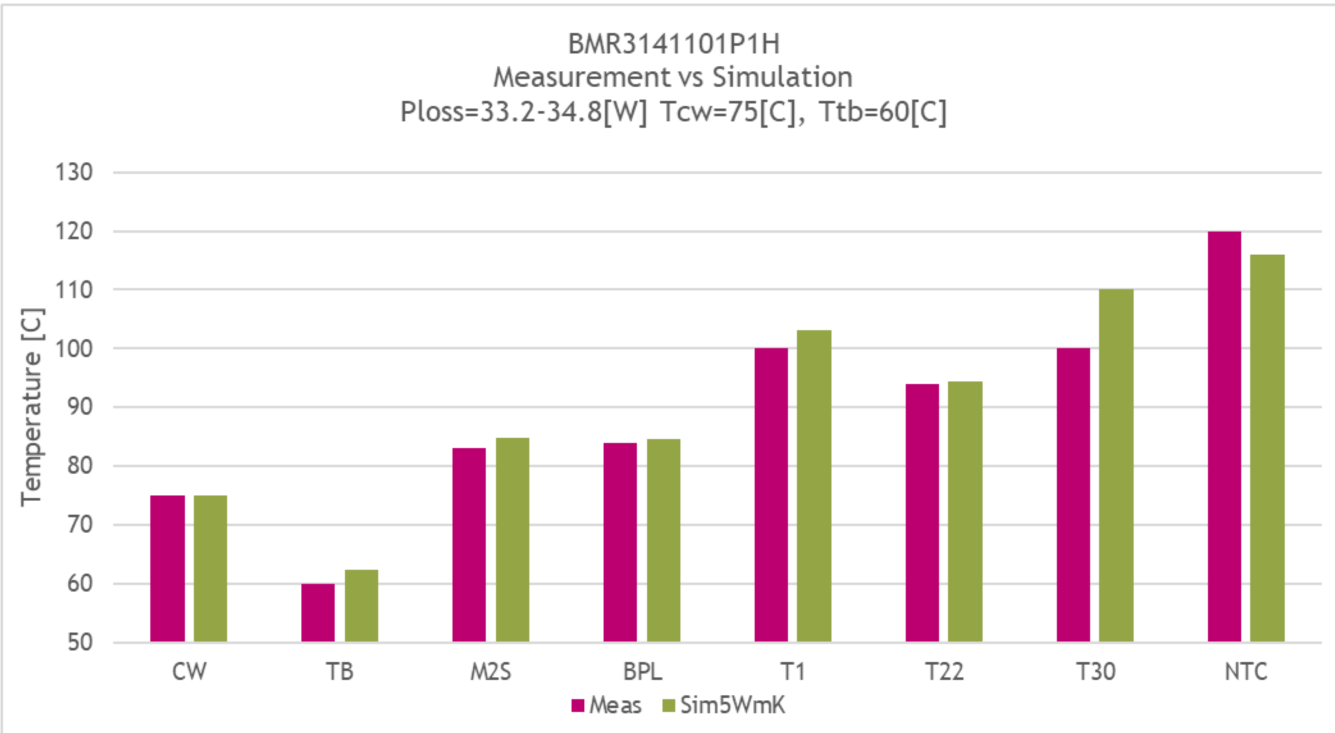

Figure 4: Model calibration result.

Model Usage

Load the *.pack file and export the BMR3141011P1H part (omitting the verification set-up assembly, see Figure 5) in desired format. Import this into the target project. Adjust the dissipated power by altering the thermal sources per Figure 2, according to Appendix 1 - Power Loss Distribution. Default settings are for V_{in}=54[V], V_{out}=13[V], I_{out}=60[A] T≈100[C]

The *.pack file includes assembly used for constructing the model, consisting of a cold wall, gap pad and a test board, see Figure 5. Connected to this assembly are two thermals, CW and TB and a Gap Pad. These are provided for reference only and should be omitted when using the model.

The localized grids and grid constraints are not necessary parts of the model. Choose grid settings per best practice in FloTHERM.

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.

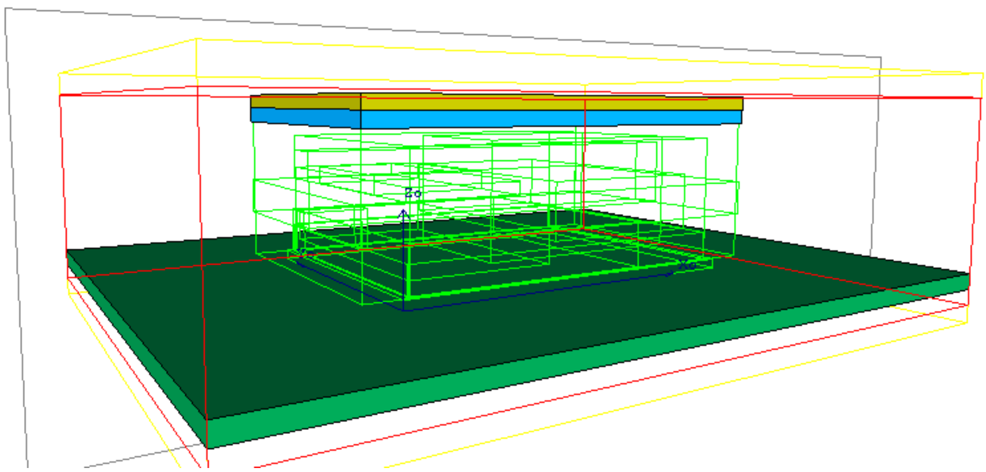

Figure 5: Verification set-up assembly used to create the model. It is only supplied as reference and should be omitted when exporting the actual product model.

Additional Information

Model has been constructed with SI units.

Reference

Thermal report 3/10265-BMR314 PA1
BMR3141011P1H_A.pack
Copy of bmr314_plosses.xlsx

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

Revision	Revision information	Date	Responsible
A	New document	2024-09-09	KARLADRU

Appendix 1- Power loss distribution

Power loss distribution example for BMR 314.

V_{in}=54[V], V_{out}=13[V], I_{out}=60[A] T≈100[C]

Source	Number of domains	Per domain [W]	Per volume [mW/mm³]	Total [W]
PrimFetHS	2	1.456		2.91
SecFetHS	4	0.913		3.65
TrafoWP	(*)		515	5.90
TrafoC	(*)		1.83	1.31
Cin	3	0.064		0.19
Cout	14	0.012		0.17
Cres	3	0.071		0.21
TrafoWS	(*)		52.3	8.12
OutputPinsToSecFets	(*)		42.8	1.59
PrimFetLS	2	1.362		2.72
InputPinToPrimFet	(*)		27.67	0.37
N1	1	0.062		0.06
SecFetLS	4	0.886		3.54
PrimDriv	2	0.133		0.27
SecDriv	4	0.259		1.04
Aux	5	0.548		2.74
Total [W]				**34.8**

(*)Defined as source/volume