



THERMAL MODEL

BMR4922311/011



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General

The model is an estimation of the thermal behavior of BMR4922311/011, which is through-hole pin design. The model is intended for steady-state thermal simulations.

Model Description

The model is a readymade Flotherm 2024 model provided as PDML-file. User can export relevant parts to be used in an application project. The model consists of three major components:

3D CAD Geometry

In the geometry most components are maintained per the original design, but some have been simplified in FloMCAD to cuboids and some simplified to 2-Resistor Models. For the accuracy of the simulation, the PCB imported traces and vias by importing EDA files. The glue has a great influence on heat dissipation, so the laying of glue is reasonably simplified according to the actual situation.

Unit in file: [mm]

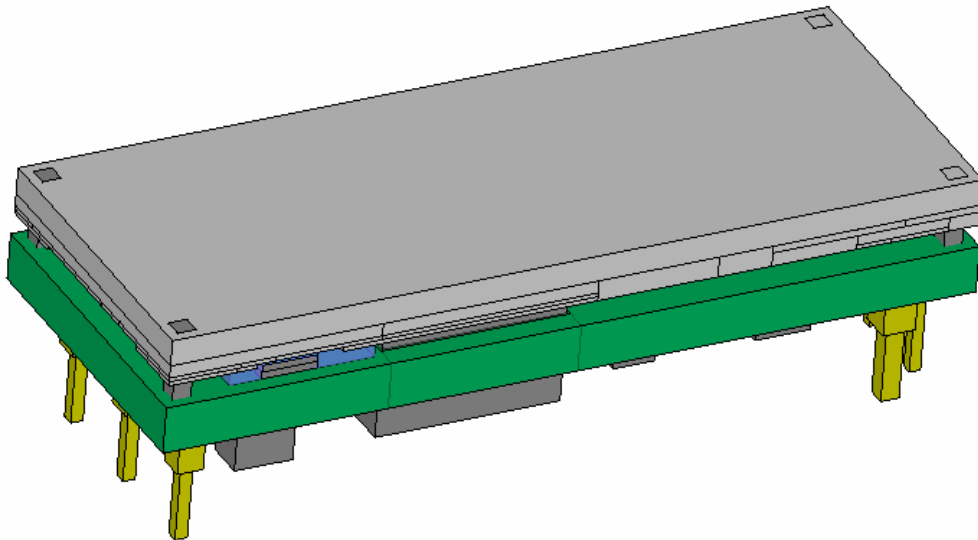


Figure 1

Domains of power loss distribution

There are several sources for power loss, partly assigned by Sources, partly assigned by Cuboids, and partly by 2-Resistor Models. The power loss for each of them are given in [Appendix 1 - Power Loss Distribution](#)

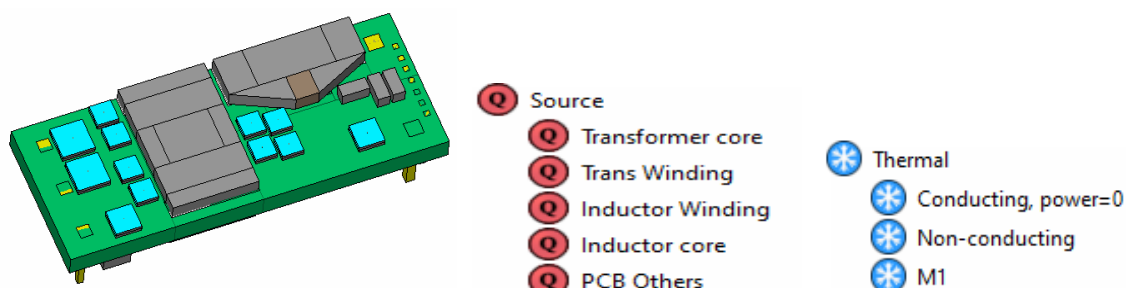


Figure 2 Domains of power losses

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.

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.

Material
Copper (Pure)
FR4
Aluminum-6061
M0 Lr 0: 385,385,385 W/mK
M0 Lr 4: 96.9,96.9,193 W/mK
M0 Lr 6: 96.9,96.9,193 W/mK
M0 Lr 8: 96.9,96.9,193 W/mK
M0 Lr 10: 96.9,96.9,193 W/mK
M0 Lr 12: 96.9,96.9,193 W/mK
M0 Lr 14: 96.9,96.9,193 W/mK
M0 Lr 18: 96.9,96.9,193 W/mK
M0 Lr 20: 96.9,96.9,193 W/mK
M0 Lr 22: 96.9,96.9,193 W/mK
M0 Lr 26: 385,385,385 W/mK
dielectric_12

Figure 3: Materials

Model Calibration

The model has been calibrated to give temperatures as similar as possible for $V_{in}=53[V]$, $V_{out}=12[V]$, $P_{out}=504[W]$, compared to thermal verification document 1-10265-BMR Thermal Test Report from Input to Output. Total Ploss=26.8[W].

The result of the calibration is show in the figure below:

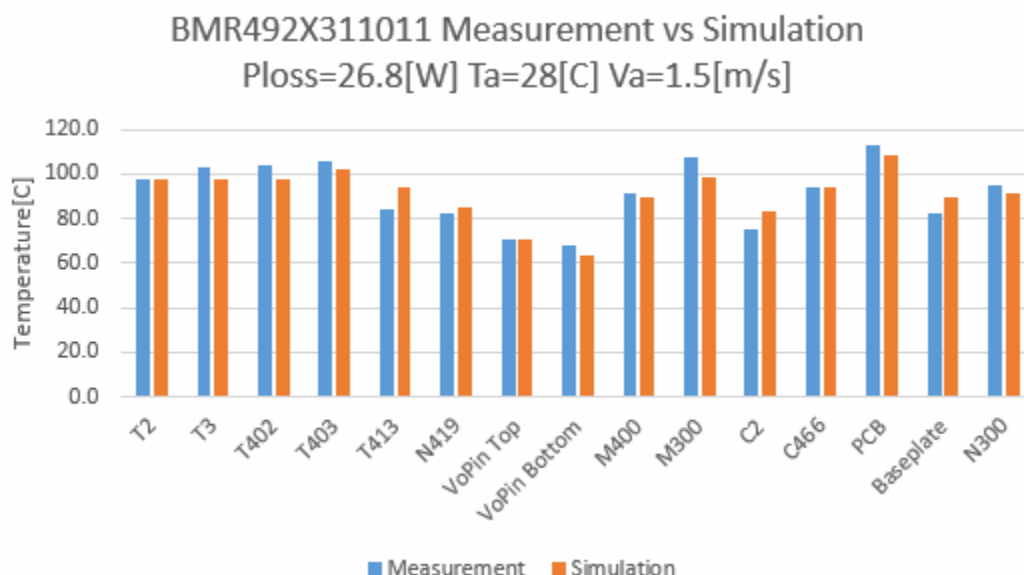


Figure 4: Result of calibration

Model Usage

Import the *.pdml file into the desired project.

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 $V_{in}=53[V]$, $V_{out}=12[V]$, $P_{out}=504[W]$, $T_{\approx}100[C]$

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.



Additional Information

Model has been constructed with SI units.

Reference

Wind tunnel report 1-10265-BMR4920311-011 Thermal Test Report from Neg to Posi.pdf
Flotherm model *BMR492X311_53Vi_12Vo_504W.pdml*

Product number and r-state history

BMR4922311011R1A

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
A	New document	2025-05-13

Appendix 1 - Power Loss Distribution

Power loss example for BMR4922311011R1A for $V_{in}=53[V]$, $V_{out}=12[V]$, $P_{out}=504[W]$, $T \approx 100[C]$

Domain	Number of domains	BMR4922311011R1A	
		per domain [W]	Subtotal power loss [W]
Prim-Mos	4	1.5775	6.31
Sec-Mos	8	0.571	4.568
Trans-F	1	2.76	2.76
Choke-F	1	0.321	0.321
Trans-W	1	4.928	4.928
Choke-W	1	4.108	4.108
Snubb	2	0.16	0.32
Prim-Driv	2	0.185	0.37
Sec-Driv	2	0.114	0.228
Aux-Supp	1	0.383	0.383
In-Ind	1	0.27	0.27
PCB	1	2.265	2.265
Total PD			26.831