DESCRIPTION
THERMAL MODEL FOR
BMR467 SERIES

FLEX POWER MODULES

Contents

General

The model is based on and valid for internal no BMR 467 0010, which is a Through Hole Pin, Open Frame 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 11.1 model. The geometry was created by importing a CAD model in STEP format through the MCAD bridge. The PCB has been simplified into a number of domains with orthotropic properties through FEM simulations. The model consists of the four major components:

1. 3D geometry
2. Domains of power loss
3. Domains of material properties
4. Predefined monitor points

3D CAD Geometry

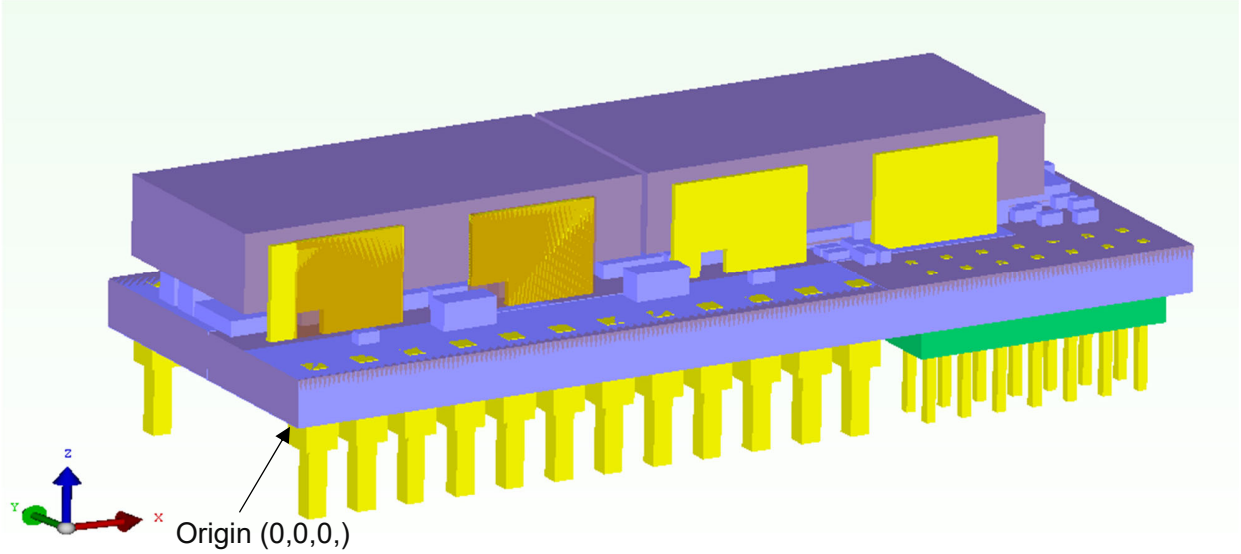


Figure 1 Model origin in lower left corner of PCB and axis orientation.

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.*

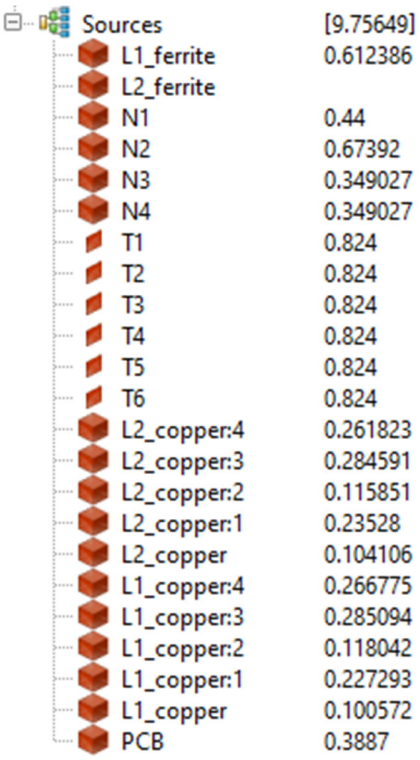


Figure 2: Heat Sources to be found as sources.

Domains of material data

There are several material domains. The heat conductivity for each of them is given either as isotropic or orthotropic values in x-,y-, and z-direction (x,y,z).

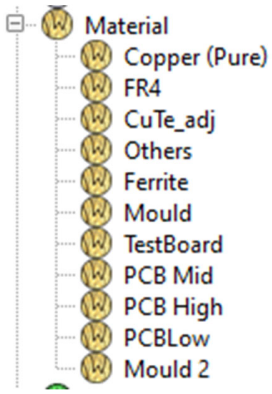
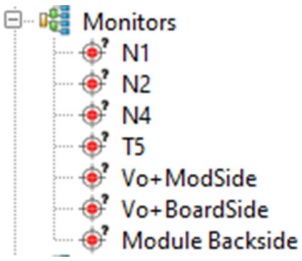


Figure 3. Domains of material data.

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 1/102 65-BMR 467 0010 Rev A:



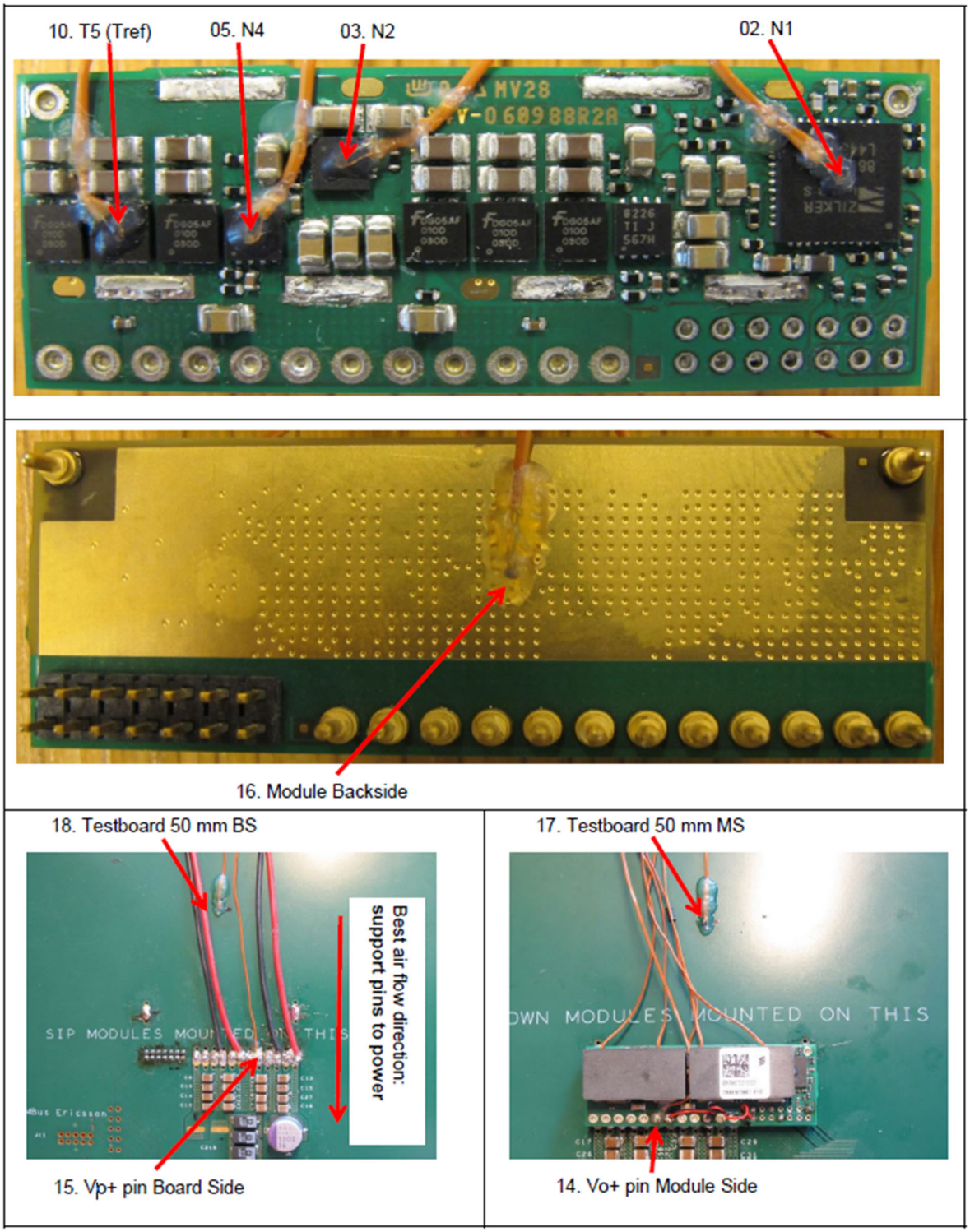


Figure 4. Thermocouple location.

Model Calibration

The model has been calibrated to give temperatures as similar as possible compared to thermal verification document 1/102 65-BMR 467 0010 Rev A, for V_{in}=12.0[V], V_{out}=1.0[V], I_{out}=90[A], I_{in}=8.4[A], at 2[m/s]. Air direction is in negative y-direction.

Flotherm simulation temperatures are within ±1.1 [degC] compared to measured values.

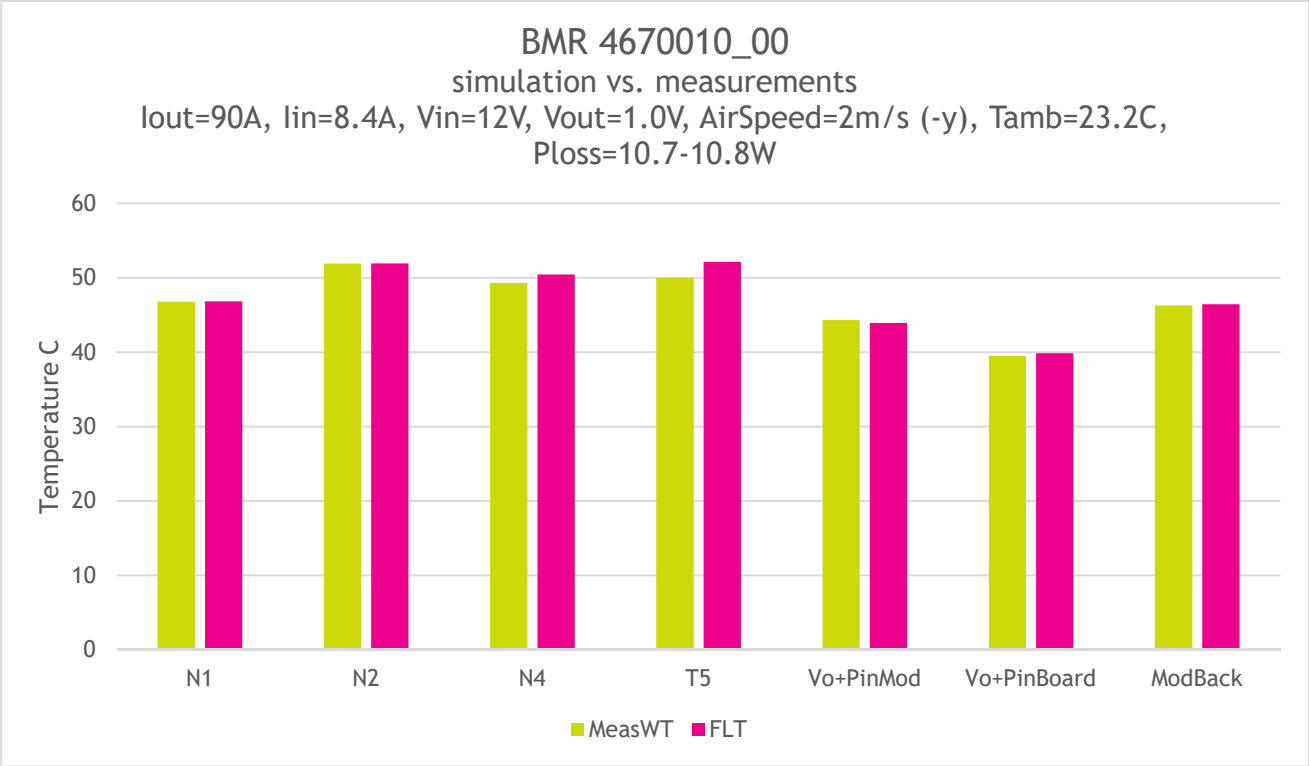


Figure 5: Model calibration result. MeasWT=Measured values in wind tunnel. FLT=This model, Flotherm.

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 Vout=1V, 90[W] output power.

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 1/102 65-BMR 467 0010 Rev A

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	2020-06-03	New Document

Appendix 1 - Power Loss Distribution

Power loss distribution example for BMR 467 0010.

V_{in}= 12.0[V] V_{out}= 1.0[V] I_{in}= 8.4[A] I_{out}= 90A]

Domain	Number of domains	Domain volume [mm^3]	Per domain [W]	Per volume [mW/mm^3]	Total [W]
T1-6	6		0.824		4.944
N1	1		0.44		0.44
N2	1		0.674		0.674
N3-4	2		0.349		0.698
Lx_ferrite	2		0.612		1.224
Lx_copper	10	238.2		8.395	2.0
PCB	1		0.389		0.389
Cx	6		0.05		0.3
Total [W]					**10.67**