

ST POWERSTUDIO

Dynamic electro-thermal simulator for STPower devices



Predicting performance of SLLIMM™ and ACEPACK™ devices to ensure the best fit for your application mission profile

ST PowerStudio is a powerful and flexible simulation software for SLLIMM™ intelligent power modules and ACEPACK™ power modules, supporting developers select the proper device fitting the application mission profile, saving design time and resources.

The tool features a one-click comprehensive power and thermal analysis, providing a very accurate estimation of power loss, junction and case temperatures, and even explores non-testable parameters and helps in sizing a suitable heatsink.

KEY FEATURES

- Comprehensive power and thermal analysis
- User-friendly interface
- Static and dynamic mission profile
- Multi thermal set-up
- Simulation with or without heatsink
- Internal self-heating model
- Output data, tables and charts, for each power device
- Quick link to the device documentation
- Output PDF report
- Online forum
- Portable software
- Multilanguage (English, Chinese, and Japanese)

KEY BENEFITS

- Selection of proper device fitting the application mission profile
- Easier, faster and cheaper solution design
- Deep analysis of power loss and device temperatures
- Exploration of non-testable parameters
- Very accurate temperature-dependent output results
- Complex and long mission profile simulation
- Heatsink size estimation
- Internet connection not required for simulation

Overview

ST PowerStudio (STSW-POWERSTUDIO) is based on a very precise built-in electrical and thermal model for each device and thanks to an iterative calculation, taking into account the self-heating effects, it provides a very accurate estimation of the power loss as well as junction and case temperatures.

The software simulates mission profiles with a static load (single set of input conditions) or a dynamic load, changing the input conditions over time and performing very long simulation profiles.

Several thermal set-up input conditions can be simulated, such as:

- devices without heatsink, estimating the case and the junction temperatures;
- fixed case temperature (with heatsink), estimating the junction temperature and the heatsink thermal resistance;
- fixed heatsink thermal resistance, estimating the case and junction temperatures;
- fixed heatsink thermal impedance, estimating the case and junction temperatures and considering the thermal inertia of the system.

Simulation results are shown on tables and on dedicated scope views, in function of time, load current and switching frequency. An output report is provided with the summary of all the information and results for an easy comparison or archiving.

Support and online forum

In addition to dedicated documentation including a detailed user manual and other resources, ST facilitates connectivity with developers using ST PowerStudio through the ST Community with an on-line forum for additional support.

Visit <https://community.st.com/community/st-powerstudio>

User interface

The screenshot displays the ST PowerStudio software interface. On the left, the 'Product Selection' panel shows a 3-phase 2-level topology design with a circuit diagram. The 'Mission Profile' is set to 'Static Load'. The 'Input Data' table is as follows:

Input Data	Limits	Steady State
t _{sim} : Simulation time (s)	0.001 + 15	0.200
I _{ph} : RMS Phase Current (A)	0.01 + 15	9.000
P _{out} : Output Power (W)	0.1 + 20000	1217.11
V _{dc} : DC Link Voltage (V)	20 + 450	300.00
f _{sw} : Switching Frequency (kHz)	1 + 40	12.0
f _{sim} : Output Frequency (Hz)	0.1 + 500	50.00
PF: Power Factor	0.1 + 1	0.50
Mi: Modulation Index	0.01 + 1	0.85
T _{amb} : Ambient Temperature (°C)	25 + 100	50
T _{case} : Case Temperature (°C)	25 + 125	100.0

The 'Output Data' table on the right provides the following summary:

	T1	D1
Conduction Loss (avg) (W)	4.46	1.60
Switching Loss (avg) (W)	3.11	0.26
Total Loss (avg) (W)	7.56	1.86
Junction Temp. (Max) (°C)	125.58	108.42
Junction Temp. (avg) (°C)	114.86	104.31
T1-D1 Total Loss (avg) (W)	9.43	
System Total Loss (avg) (W)	56.56	
Case Temp. (Max) (°C)	100.00	
Heatsink-TIM Rth (°C/W)	0.88	

Two charts are shown: 'Graph 1: Junction Temperature vs. Time' and 'Graph 2: T1-D1 Power Loss vs. time'. Graph 1 shows temperature oscillations between approximately 100°C and 125°C. Graph 2 shows power loss oscillations between 0W and 25W.



© STMicroelectronics - April 2020 - Printed in United Kingdom - All rights reserved
 ST and ST logo are registered and/or unregistered trademarks of STMicroelectronics International NV or its affiliates in the EU and/or elsewhere. In particular, ST and ST logo are Registered in the US Patent and Trademark Office.
 For additional information about ST trademarks, please refer to www.st.com/trademarks.
 All other product or service names are the property of their respective owners.

