

Data from: Additively manufactured lightweight hybrid multi-tier liquid cooler for 10 kV SiC MOSFET power module

Dataset DOI: <https://doi.org/10.5061/dryad.2rbnzs84t>

Description of the data and file structure

This dataset includes the CAD models and thermal testing data of a multi-tier liquid cooler for a 10 kV SiC MOSFET power module. This dataset includes data for two prototypes, i.e., i) a fully metallic Al-AlSi₁₀Mg multi-tier liquid cooler with a CNC-milled aluminum 6061-T6 manifold and a 3D-printed (DMLS) AlSi₁₀Mg heat sink core, and ii) a hybrid nylon-AlSi₁₀Mg multi-tier liquid cooler with a 3D-printed (SLS) carbon-filled nylon 12 (PA12) manifold and a 3D-printed (DMLS) AlSi₁₀Mg heat sink core.

Files and variables

File: *ned-011_MultiTierColdPlate.zip*

Description:

This file contains five folders, including "Cooler Design Files," "10kV Module 150W Al-AlSi₁₀Mg Heat Sink," "10kV Module 150W Nylon-AlSi₁₀Mg Heat Sink," "IR Videos," and "Pictures."

Cooler Design Files:

This folder includes three subfolders, i.e., "eDrawings_CAD," "SolidWorks_CAD," and "STEP." The "eDrawings_CAD" includes the .EPRT and .EASM files of the manifold, heat sink core, and the assembly. The "SolidWorks_CAD" subfolder includes the SolidWorks version of the same files. The "STEP" folder includes the .STEP version of the manifold and the heat sink core.

10kV Module 150W Al-AlSi₁₀Mg Heat Sink:

This folder includes 11 LabVIEW measurement files (.lvm) for thermal testing data of an Al-AlSi₁₀Mg multi-tier liquid cooler at a power load of 150 W and flow rates of 100, 150, 200, 250, 300, 350, 400, 450, 500, 550, and 600 mL/min. The Al-AlSi₁₀Mg is a fully metallic heat sink with a CNC-milled aluminum manifold and a 3D-printed (DMLS) AlSi₁₀Mg heat sink core.

10kV Module 150W Nylon-AlSi₁₀Mg Heat Sink:

This folder includes 11 LabVIEW measurement files (.lvm) for thermal testing data of a nylon-AlSi₁₀Mg multi-tier liquid cooler at a power load of 150 W and flow rates of 100, 150, 200, 250, 300, 350, 400, 450, 500, 550, and 600 mL/min. The nylon-AlSi₁₀Mg is a hybrid heat sink with a 3d-printed nylon manifold and a 3D-printed (DMLS) AlSi₁₀Mg heat sink core.

IR Videos:

This folder includes four representative IR videos (.seq) captured using a FLIR A655sc IR camera, namely,

- Al-AlSi₁₀Mg_150W_150mLpm: Al-AlSi₁₀Mg metallic liquid cooler, power load of 150 W, water flow rate of 150 mL/min
- Al-AlSi₁₀Mg_150W_550mLpm: Al-AlSi₁₀Mg metallic liquid cooler, power load of 150 W, water flow rate of 550 mL/min
- Nylon-AlSi₁₀Mg_150W_150mLpm: nylon-AlSi₁₀Mg hybrid liquid cooler, power load of 150 W, water flow rate of 150 mL/min
- Nylon-AlSi₁₀Mg_150W_550mLpm: nylon-AlSi₁₀Mg hybrid liquid cooler, power load of 150 W, water flow rate of 550 mL/min

Pictures:

This folder includes photographs of the Al-AlSi₁₀Mg metallic liquid cooler and nylon-AlSi₁₀Mg hybrid liquid cooler, and two representative IR images.

Accessibility

The IR videos (.seq) can be opened using FLIR Thermo Studio (Starter is free: <https://www.flir.com/instruments/thermal-studio-plan-selection/>) or flirpy (<https://github.com/LJMUAstroecology/flirpy>)

The LabView measurement files (.lvm) can be opened using Notepad or pandas (<https://pandas.pydata.org/>)

The SolidWorks CAD files can be opened using SolidWorks or AutoDesk Viewer (free: <https://viewer.autodesk.com/>)

The .STEP CAD files can be opened using FreeCAD (<https://www.freecad.org/>) or online STEP viewers such as <https://mantle3d.com/free-online-step-and-stl-cad-file-viewer-no-downloads-needed/> and <https://imagnetostl.com/view-stp-online>

The eDrawing files can be opened using eDrawings Pro or eDrawings Viewer (Viewer is free: <https://www.edrawingsviewer.com/download-edrawings>)