ELECTRONIC PACKAGE 3D PRINTED HEAT SINKS

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Objective

This project develops cost-effective 3D printed heat sinks capable of rapid production and broad adaptability that can maintain the Thermal Test Chip (TTC) below 85°C under steady-state operation.

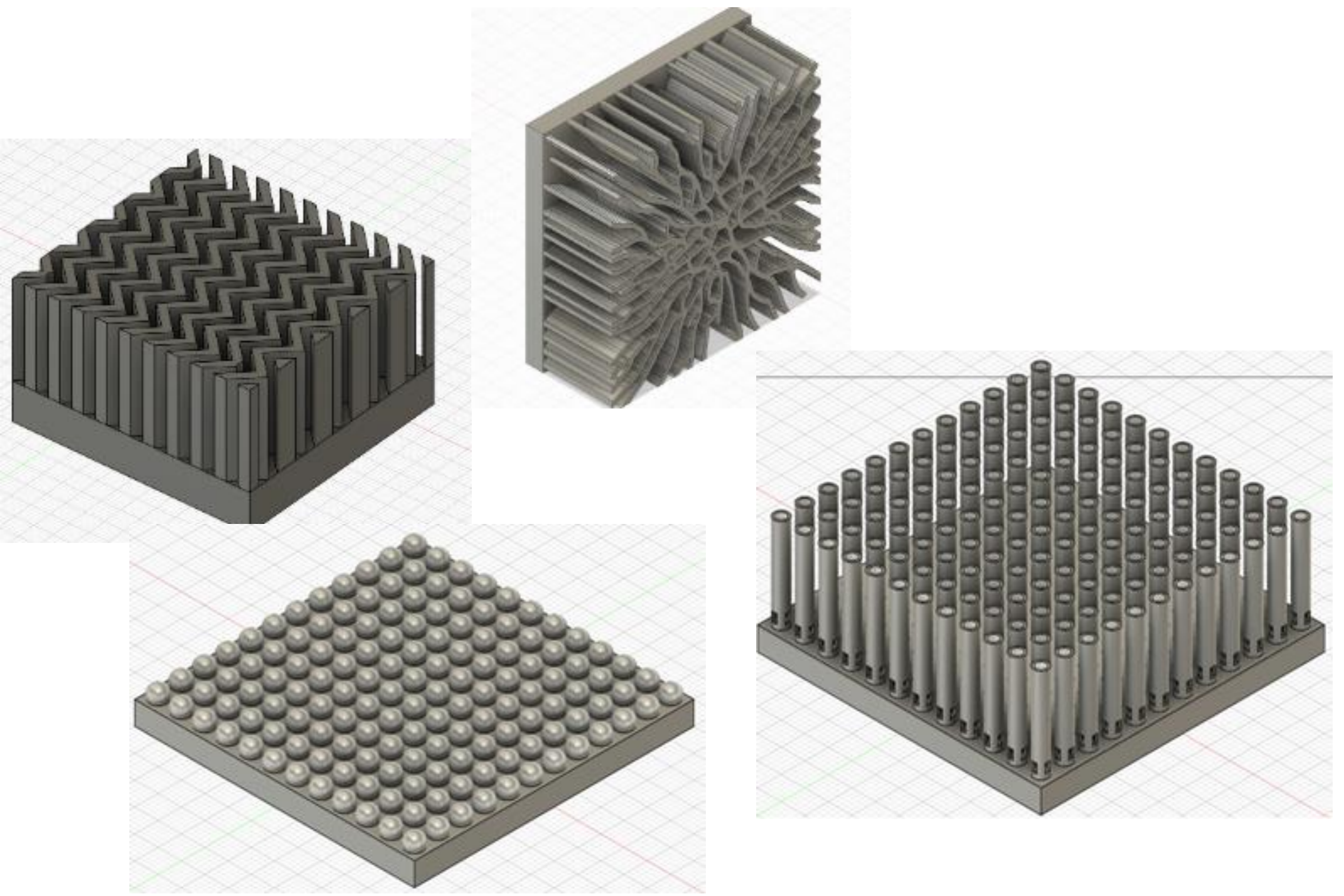
Methodology

Using Fusion 360, heat sink models and geometries are developed. The created models are then tested in thermal management software ANSYS. The heat sink designs that perform best in simulations are produced using 3D printers and then tested in the lab with a Thermal Test Chip (TTC). Data from the lab tests is then used to determine the most efficient heat sink, and through an iterative process, the most efficient designs are refined to produce new and improved heat sink designs.

TEA Thermal Engineering Associates

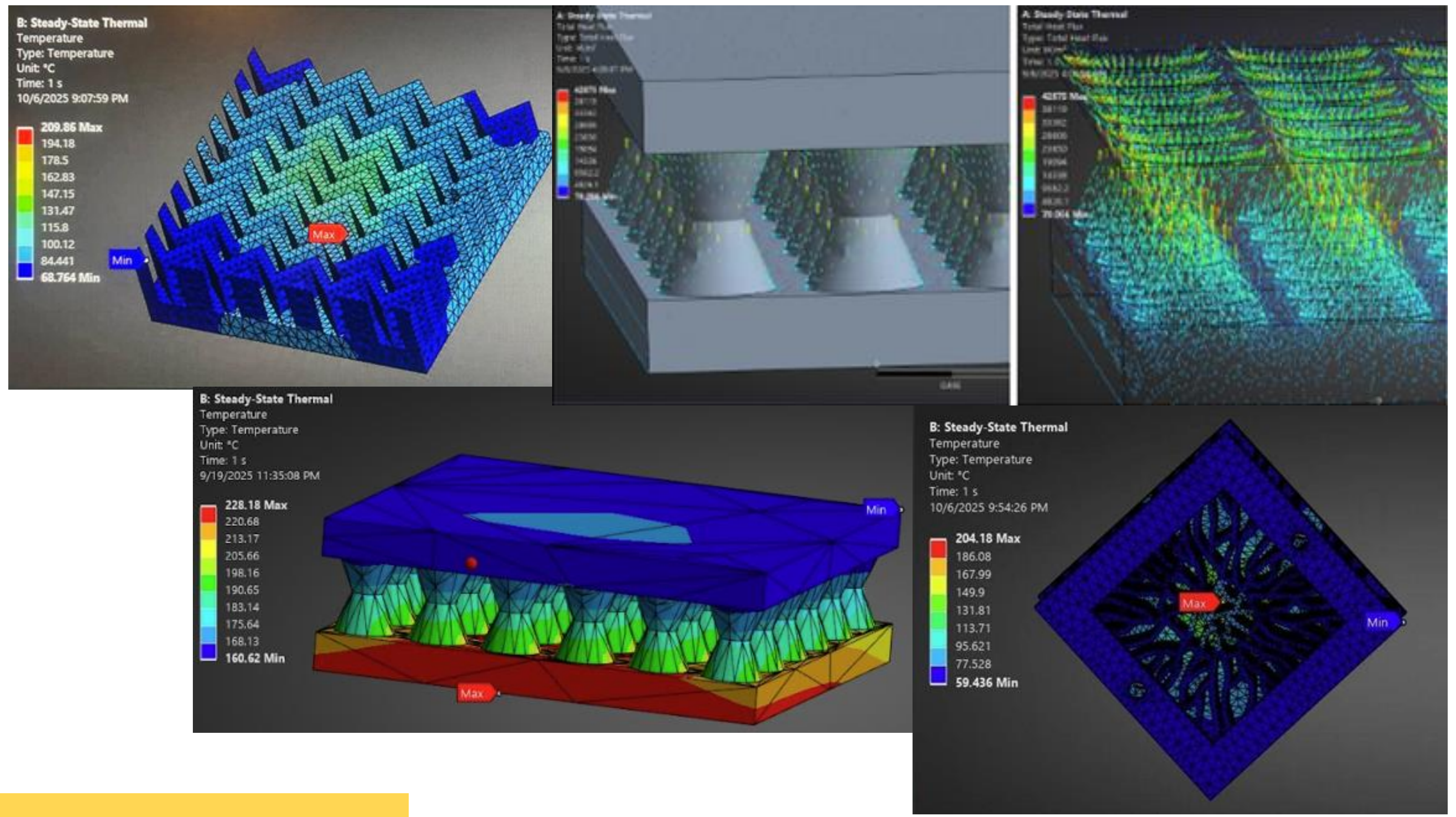
Heat Sink Concepts

Heat sink models and concepts were initially created in Fusion 360.



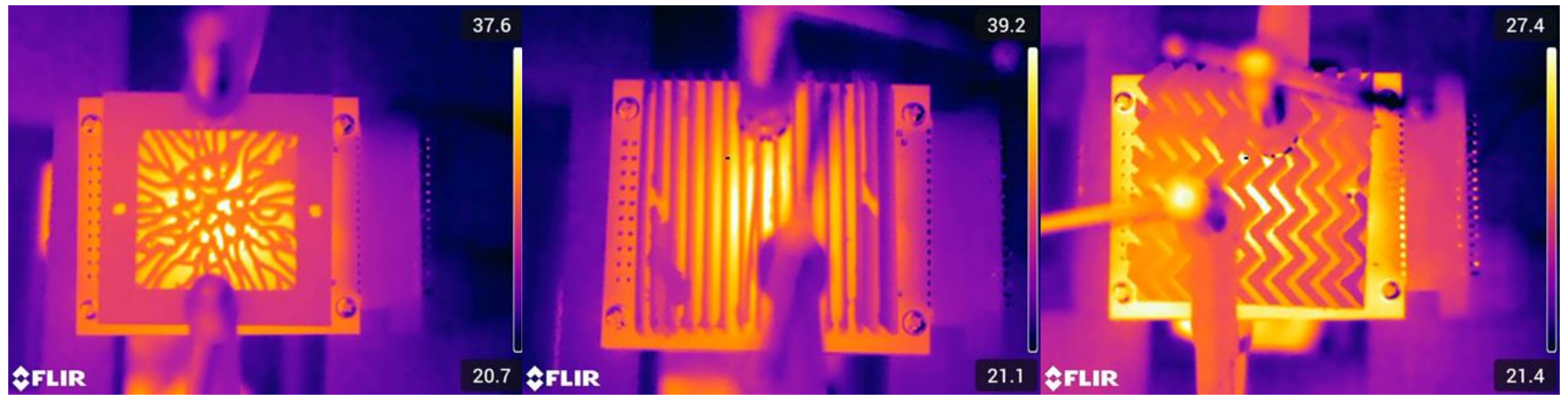
Thermal Modeling

Using ANSYS thermal modeling software, the most efficient heat sinks were identified through simulation. The identified heat sinks were then 3D printed.



Bench Testing

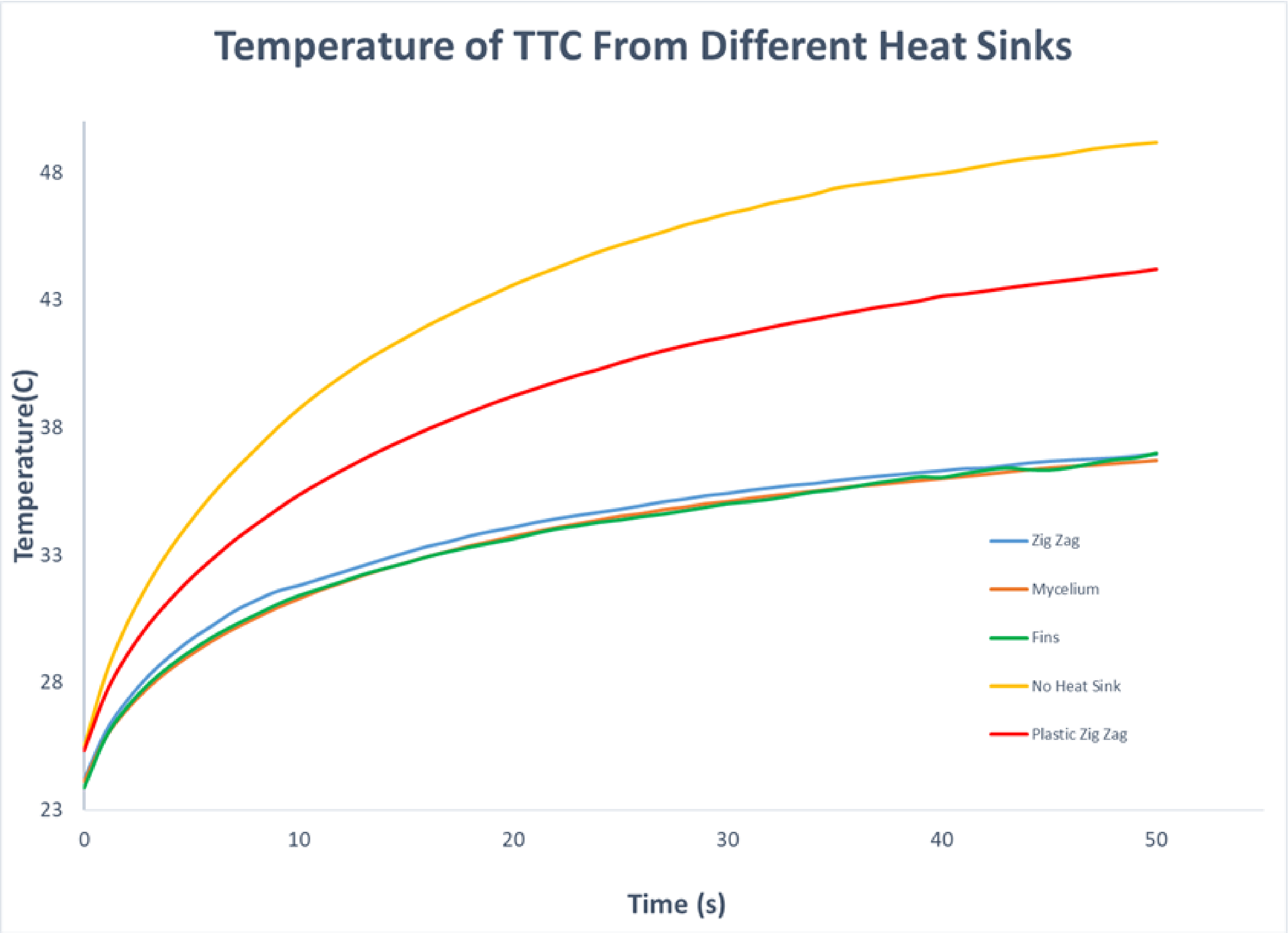
After the best potential heat sink candidates were printed, they were brought to the MTW Lab and bench tested using the Thermal Test Chip (TTC).



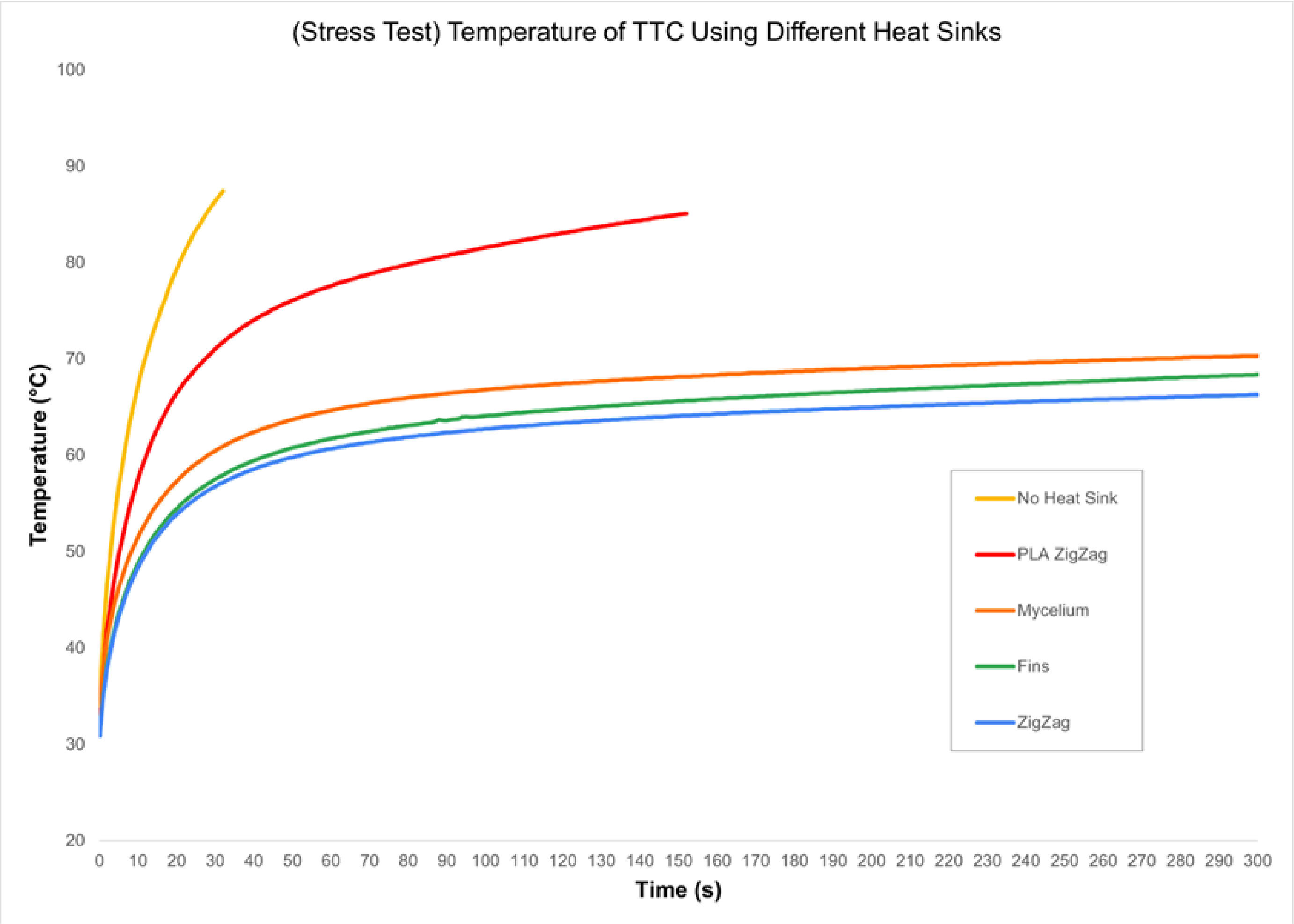
Results

The bench test results show that using TPU in the designed geometries results in more efficient heat dissipation. When compared to controls with no heat sink or a heat sink made from PLA, the TPU heat sinks performed better, maintaining the Thermal Test Chip (TTC) at a lower temperature and below the desired limit of 85°C. The heat sink that performed the best in a five-minute stress test was the ZigZag design, with an average temperature of 66.3°C. The runner-up was the Mycelium design, with an average temperature of 68.4°C.

Initial Testing Results



Stress Testing Results



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