

# Analysis of Heat Generation and Dissipation of a Raspberry Pi Pico in a Vacuum

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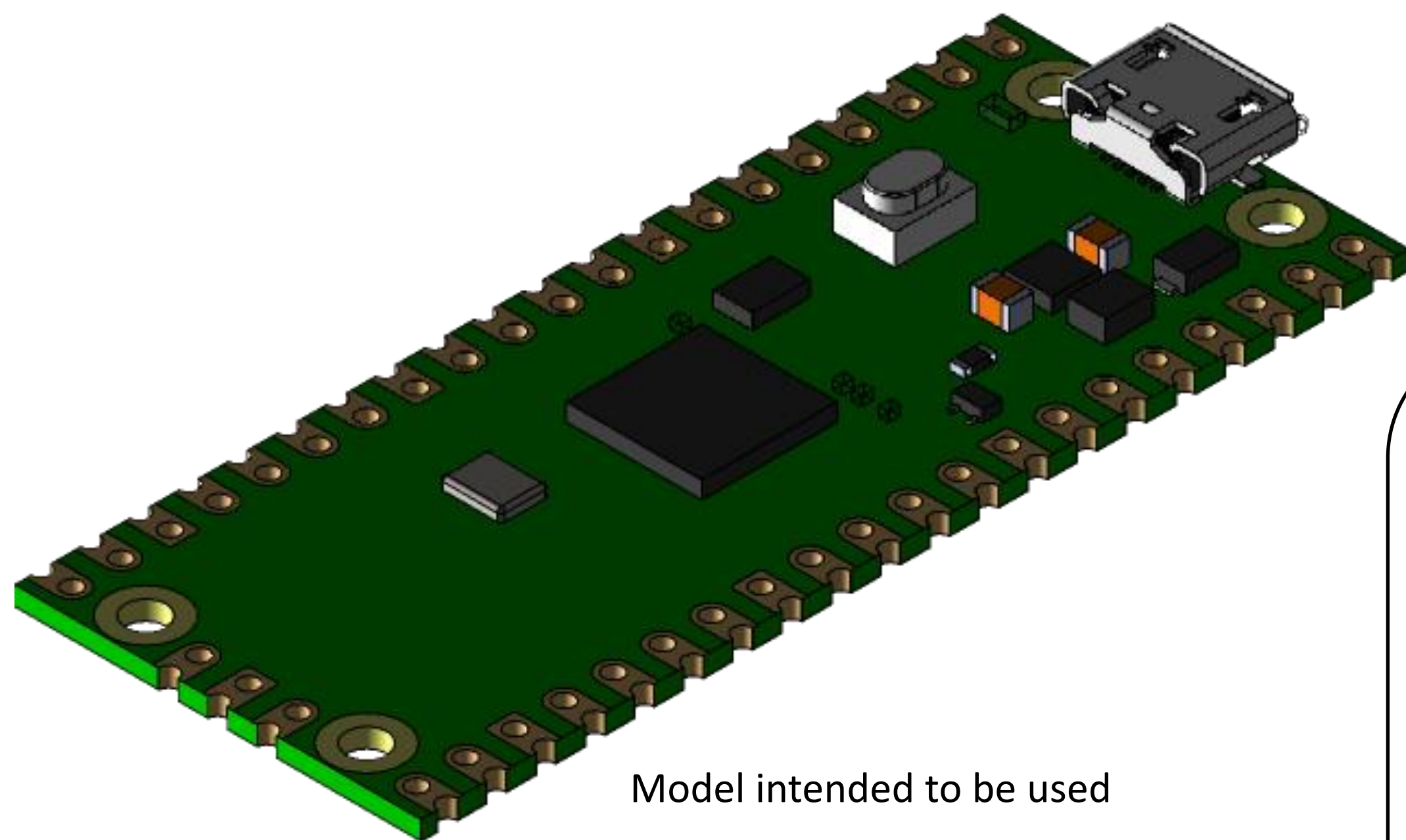
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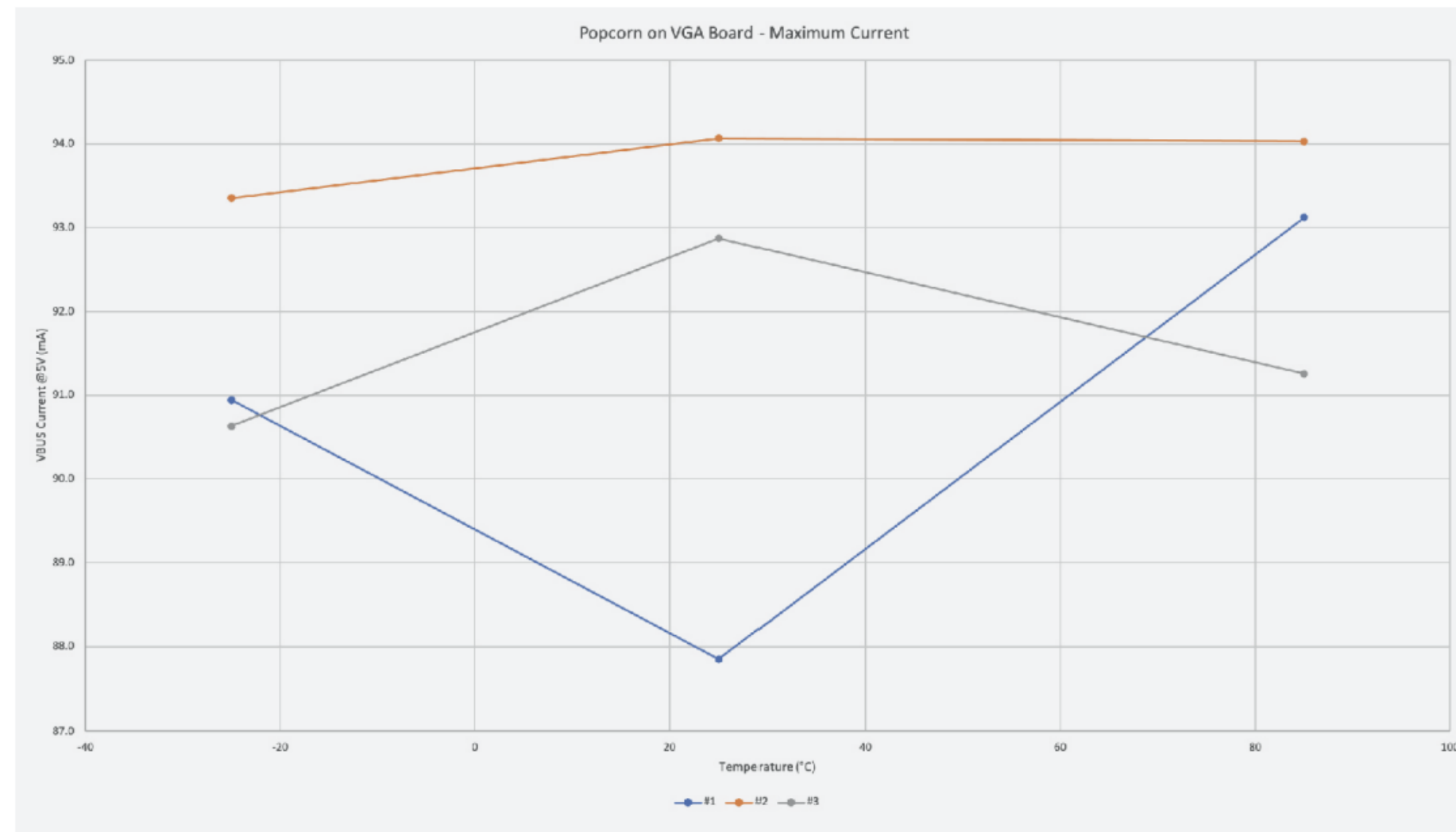


## Research Question:

Initially, the goal of the project was to look into the heat levels of a common controller used in CubeSat designs and see whether heat dissipation solutions were needed, and how those would be implemented. Below is the model imported into Ansys.



Graphic of maximum current in a Raspberry Pi Pico in Popcorn Mode from the Datasheet



Pico board	Average VBUS current @5V (mA)			Maximum VBUS current @5V (mA)		
	Temperature (°C)			Temperature (°C)		
	-25	25	85	-25	25	85
#1	90.3	89.3	90.7	94.6	94.5	95.6
#2	91.2	87.1	90.6	95.4	91.0	95.5
#3	90.8	90.2	91.6	95.0	95.1	95.3
Mean	90.8	88.9	91.0	95.0	93.5	95.5

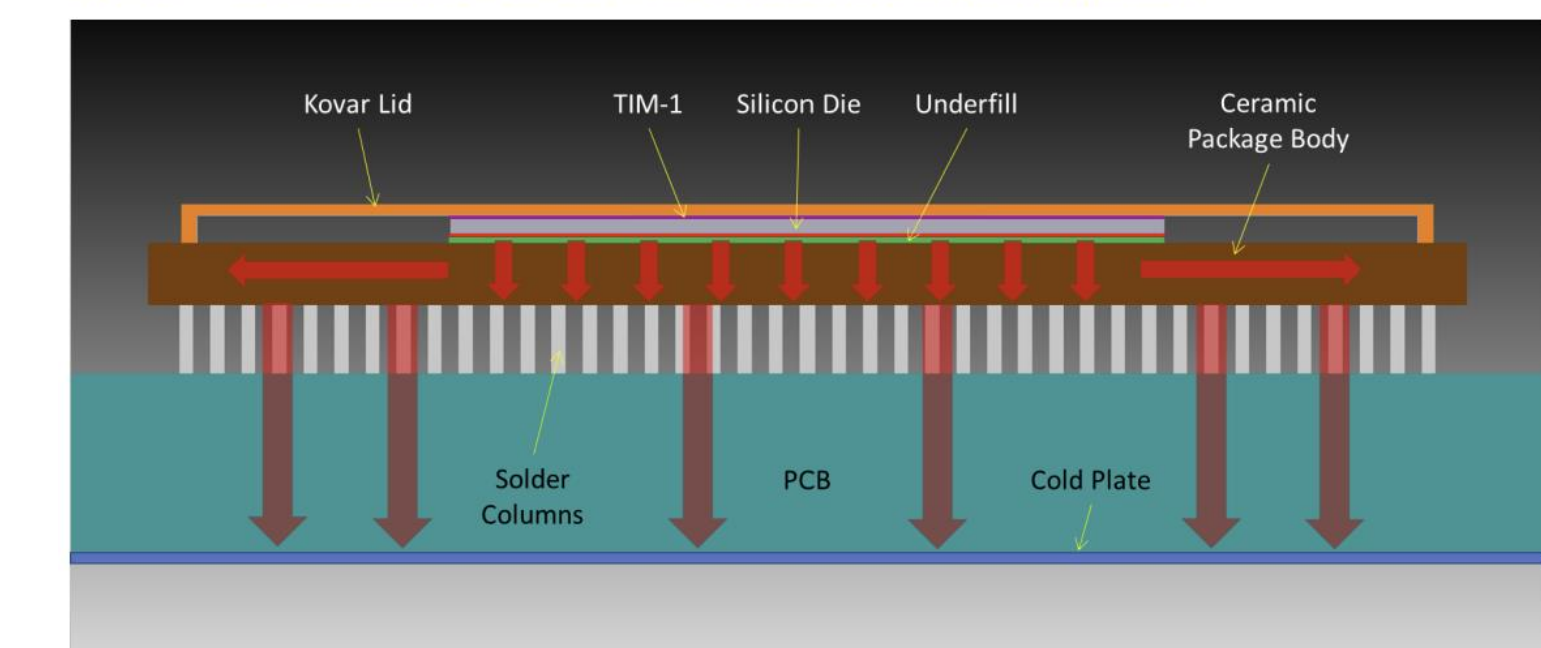
## Process/Issues:

As work progressed and eventually hit a wall in Ansys, a major problem arose. The exact operating of the microcontroller can't be replicated without the actual program it is meant to execute. This was less than attainable on the timescale of this project, but some initial research was done on the plausibility of future work in the same vein.

## Findings/Possible Future Work:

After the initial disappointment, the original work that inspired the project came in handy. The MICROCHIP paper on a heat sink solution for one of their products provided a framework for what would require heat control solutions, and the operating temperature of the microcontroller during preprogrammed modes gave a reference for the intensity of the heat generated by CubeSat designs.

Figure 1 • Conduction Heat Flow Path in RT4G150-CG1657 in Space Application



Graphic of proposed cooling solution from MICROCHIP report

Figure 2 • Conduction Heat Flow Path in RT4G150-CQ352 in Space Application

