**James Perrett 1672539 Synoptic Mechanical engineering Coursework 1 (Midterm)**

## **Convective Cooling of Electronics | Dr Jason Stafford**

## **Configuring Optimal Heat Exchange Solutions**

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## Problem Definition

Moore’s law is the observation that the number of transistors in a dense integrated circuit doubles about every two years. From 2013, this number has doubled every three. Nonetheless, the capability to integrate 7 billion plus transistors into a pence piece results in unavoidable waste heat through the second law of thermodynamics. Electronics left without significant cooling risk irreversible damage. Current cooling methods combine several passive and active technologies at both the macro and micro scale. The objective is to enable optimum performance while minimising energy consumption.

In 2019, IntelTM released its’ Core i9-10980XE Extreme Edition processor, which outputs a high heat flux of 100W/cm2[1]. Current releases are in the range of 150-250 Watts, and by 2026 it is predicted that the amount for heat generated from microprocessors will reach nearly 800 watts[2]. The question is, how will this heat be dissipated?

## Theory

## Solution

Temperatures must stay below 90’ maximum as failure can lead to semiconductor resistance increment breakdown or the melting of the solders inside the device.

Results

## Lessons Learnt

# References:

[1] Intel, 2021. [Online]. Available: Intel® Core™ i9 Processors (2021). Available at: <https://www.intel.co.uk/content/www/uk/en/products/details/processors/core/i9.html> (Accessed: 17 May 2021).

[2] T. G. Karayiannis and M. M. Mahmoud, "Flow boiling in microchannels: Fundamentals and applications," *Applied Thermal Engineering,* vol. 115, pp. 1372-1397, 2017/03/25/ 2017, doi: <https://doi.org/10.1016/j.applthermaleng.2016.08.063>.