## Optimizing the Performance of Thermoelectric for Cooling Computer Chips Using Different Types of Electrical Pulses

Authors : Saleh Alshehri

**Abstract :** Thermoelectric technology is currently being used in many industrial applications for cooling, heating and generating electricity. This research mainly focuses on using thermoelectric to cool down high-speed computer chips at different operating conditions. A previously developed and validated three-dimensional model for optimizing and assessing the performance of cascaded thermoelectric and non-cascaded thermoelectric is used in this study to investigate the possibility of decreasing the hotspot temperature of computer chip. Additionally, a test assembly is built and tested at steady-state and transient conditions. The obtained optimum thermoelectric current at steady-state condition is used to conduct a number of pulsed tests (i.e. transient tests) with different shapes to cool the computer chips hotspots. The results of the steady-state tests showed that at hotspot heat rate of 15.58 W (5.97 W/cm<sup>2</sup>), using thermoelectric current of 4.5 A has resulted in decreasing the hotspot temperature at open circuit condition (89.3 &deg;C) by 50.1 &deg;C. Maximum and minimum hotspot temperature was resulted by longer OFF pulse period. In addition, longer ON pulse period has generated the minimum hotspot temperature. **Keywords :** thermoelectric generator, TEG, thermoelectric cooler, TEC, chip hotspots, electronic cooling

1

**Conference Title :** ICCEEE 2020 : International Conference on Computer, Electrical and Electronics Engineering **Conference Location :** London, United Kingdom

Conference Dates : September 24-25, 2020