## Abstract

This study examined new innovative design of aluminum rectangular and triangular double-layered [microchannel](https://www.sciencedirect.com/topics/engineering/microchannel) heat sink (RDLMCHS) and (TDLMCHS), respectively, using Al2O3–H2O and SiO2–H2O [nanofluids](https://www.sciencedirect.com/topics/engineering/nanofluid" \o "Learn more about nanofluids from ScienceDirect's AI-generated Topic Pages). A series of experimental runs for different channel dimensions, different [nanoparticles](https://www.sciencedirect.com/topics/engineering/nanoparticle) concentrations and types and several pumping powers showed excellent [hydrothermal](https://www.sciencedirect.com/topics/engineering/hydrothermal) performance for DLMCHS over traditional single-layer (SLMCHS). The results showed that the sequential TDLMCHS provided a 27.4% reduction in the wall temperature comparing with RDLMCHS and has better temperature uniformity across the channel length with less than 2 °C. Sequential TDLMCHS provided 16.6% total [thermal resistance](https://www.sciencedirect.com/topics/engineering/thermal-resistance) lesser than the RDLMCHS at low pumping power and the given geometry parameters. Pressure drop observation showed no significant differences between the two designs. In addition, larger number of channels and smaller fin thickness referred less thermal resistance rather than only increasing the pumping power. Higher nanoparticle concentration showed better thermal stability for both nanofluids than pure water. The Al2O3–H2O nanofluid (0.9 vol.%) showed best performance with the temperature difference of 1.6 °C and lowest thermal resistance of 0.13 °C/W·m2.