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Ahmed A.Y. Al-Waaly, Manosh C. Paul, Phillip Dobson

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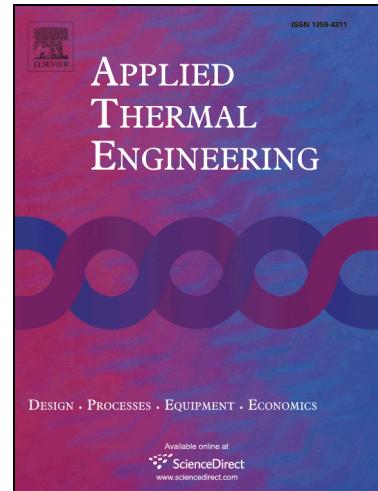
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Liquid Cooling of Non-Uniform Heat Flux of A Chip Circuit by Subchannels

Ahmed A. Y. Al-Waaly¹²³, Manosh C. Paul¹, Phillip Dobson²

¹Systems, Power & Energy, ²Electronics & Nanoscale Engineering, School of Engineering, University of Glasgow, G12 8QQ, UK

³Mechanical Engineering Department, College of Engineering, Wassit University, IRAQ
Email: Phil.Dobson@glasgow.ac.uk, Manosh.Paul@glasgow.ac.uk, aalwaaly@uowasit.edu.iq

Tel: +44(0)141 330 4314 (PD), +44(0)141 330 8466 (MP), +9647730888124(AH)

Abstract

Experimental and numerical analyses have been carried out to study the effect of using subchannels in a liquid cooled heat sink for minimising the effect of hotspots generated on a chip or circuit. Two heat sinks – with and without subchannels – were fabricated in order to investigate this effect. The first device was manufactured with normal parallel channels while the second was designed to extract more heat by dividing the main channels above the hotspot into two subchannels. The inlet and outlet manifolds were designed with two inlet ports to minimise any potential mal-distribution of mass flow rate through the channels. Three thermocouples were attached to the bottom surface of the inlet manifold and another three attached to the outlet manifold to record surface temperature. Five different mass flow rates were generated under gravity by changing water container height. The results show that adding subchannels improves the uniformity of temperature distribution and reduces the maximum temperature. Moreover, at the same pressure head 79cm the thermal resistance is reduced 20% whereas the pumping power is increased by 11%.

Keywords: Heat Transfer, Microchannels, Heat Sink, Microchannel fabrication, Numerical Simulation, Circuit cooling

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