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Reverse Engineered Design of Evaporative Micro-channels for Cooling of High Power Electronics

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Abstract

Micro-channels with evaporating fluids have been considered as one of the most effective methods for cooling electronic boards and chips. However, at the region where boiling occurs, expanding vapor induce severe pressure drops that alter flow distributions. As a result, boiling characteristics in micro-channels can become significantly different and lead to drying and subsequent high temperature spots.

Fluid flow and heat transfer within micro-channels of different widths and flow quality will be formulated. Then, reversed engineering design techniques will be applied to the micro-channels. System pressure drop and heat flux distribution will indicate the desirable web pattern of channel merges/splits and various channel widths to produce an optimal micro-channel system with uniform temperature distribution and very small thermal resistance.