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DYNAMIC THERMAL MODELING AND SIMULATION OF ELECTRONICS COOLING SYSTEM WITH LATENT HEAT STORAGE ENCAPSULATION

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ABSTRACT Various novel cooling solutions have been proposed to circumvent peak heat dissipation as part of endeavours in developing effective self-contained cooling methods for high heat flux management in electronics cooling systems. Dynamic thermal modelling and simulation of a heat sink making use of subcooled flow boiling in microchannel in presence of a phase changing material encapsulated inside fin array is presented here. Dynamic heat transfer model takes care of the heat stored in phase changing material, heat transferred by natural convection in addition to the subcooled boiling in micro channel. Simulations have been performed based on the developed heat transfer model, for wide range of time varying heat input from the processor as well as mass flux admitted through the channel and the condition of subcooled boiling in micro channel have been assessed in detail. Analysis of the response shows that the heat absorbed in variable area PCM storage helps to damp the wall superheat within the nucleate boiling regime.