



MMAE SEMINAR

Thursday, September 20, 2007

MTCC Ballroom

3:30 – 4:30 PM

ADVANCED ELECTRONICS COOLING USING MESO-SCALE EVAPORATIVE HEAT EXCHANGERS

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Abstract

Thermal management of electronic devices has become increasingly challenging over the past several years. Microprocessor and graphic processor powers have increased to 150W or more, and are projected to continue to rise, despite the move to multi-core designs (and the huge investment in software development that this entails).

Over two decades ago, adaptation of liquid cooling to small-scale devices was proposed, and in recent years has been applied to commercial products. Hybrid liquid-air cooling systems using single-phase water-based working fluids and microchannel cold plates can provide high thermal performance, but suffer from a number of drawbacks including the potential for corrosion and fouling as well as a fundamental incompatibility with electronics should a system leak occur.

Another liquid cooling approach is explored in this presentation: two-phase refrigerant loops using meso-scale evaporative heat exchangers. This approach allows considerable flexibility in the configuration of systems and the choice of materials, while maintaining very high heat transfer performance. The ability to cool 800W devices with chip-level heat fluxes approaching $1000\text{W}/\text{cm}^2$ has been demonstrated.