

# OFFICE OF TECHNOLOGY TRANSFER

# AUBURN UNIVERSITY

## Improved Microchannel Heat Sink Design for Cooling of High Powered Electronics

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Reference: Cooling Microchannels

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### Overview

Auburn University is seeking a licensee or development partner for a technology related to improved electronics cooling. Components, such as microprocessors, generate heat which needs to be removed to keep the device operational. Current methods use flowing air or liquid, with liquid typically performing better. However, today's electronic devices have ever increasing power density requirements, and associated increased heat generation challenges. Two phase heat transfer, wherein liquids are turned to vapor in the course of removing heat, demonstrate better thermal performance. One promising technique is the use of microchannel heat sinks which are very efficient heat removal devices. However, two-phase heat transfer in microchannels suffers from significant instabilities in the flow which lead to breakdowns in the system. This Auburn technology introduces a novel design in the cooling system which mitigates these instabilities. In turn, this enables increased usage of two phase systems, providing the improved cooling needed. This invention is expected to find use with personal computers, servers, laptops, and a variety of other electronics products.

### Advantages

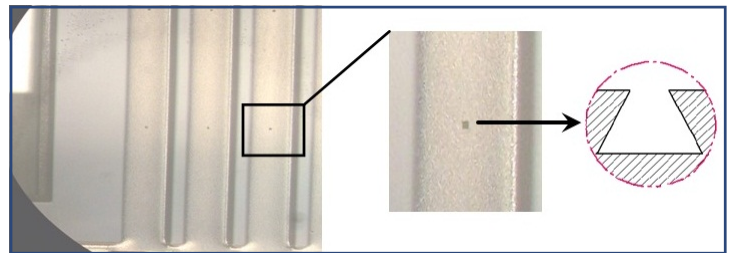
- Enables broader use of two-phase flow for superior heat removal in electronics
- Mitigates instabilities typically associated with a two-phase heat transfer in microchannels
- Can be used with a variety of electronics applications
- Can be implemented using standard photolithography methods

### Description

Advances in microelectronics persist, and gate density on microprocessor chips continues to increase. The demand for higher powered systems is rising. Given these factors, the need for new and innovative methods of heat removal is imminent.

Traditional air or liquid based cooling methods will soon be insufficient.

Two phase heat transfer systems show promise as a solution, but suffer from instabilities that lead to erratic thermal performance. This technology mitigates these instabilities. Using photolithography techniques, this increased control is accomplished by etching microscopic cavities in the base of each microchannel (see figure above). These cavities promote controlled nucleation of vapor bubbles (see [video of stable flow](#) using this design) and can be used to cool an array of electronics components.



### Status

- A US Patent application ([20080295996](#)) has been filed
- Proof of concept shown on silicon platform with FC-72 electronics cooling dielectric fluid

### Licensing Opportunities

- This technology is available for exclusive or non-exclusive licensing
- Joint development opportunities include funded research or a joint venture
- Similar Technology: [Pumpless System for Two-Phase Cooling of High Powered Electronics](#)