

# The Office of Technology Management

UNIVERSITY OF TEXAS  ARLINGTON

## Multidimensional Heat Transfer System for Cooling Electronic Components

Tech ID: UTA 10-29

**INVENTORS:** Dereje Agonafer, Huy Phan

### TECHNOLOGY NEED

An increase in demand for more functionality and capacity of microelectronic components within the same logistic footprint drives the growth of three-dimensional integrated circuit (3D-IC) packaging technologies in recent years. However, the reduction in size and an increase in transistors density also intensified the heat flux of stacked-dice, which introduces many thermal challenges at both the package and cooling levels. Traditional passive cooling system such as forced air convection cooling, phase change materials and passive or active heat sinks will become inadequate to cool future processors and cannot accommodate the demand of future sub-ambient cooling of 3D-ICs.

### INVENTION DESCRIPTION/SOLUTION

At UTA, researchers have developed a Multidimensional Heat Transfer System (MHTS) for cooling electronic components. MHTS utilizes the vertical dimension to accommodate four or more Thermo Electric Modules (TEMs) in order to cool high powered stacked devices. The MHTS also illustrated that without this new configuration, it is impossible to stack more than three full-size thermoelectric modules into the same real estate and utilize the same heat sink footprint and still maintain the system structural stability and integrity for high vibration applications. As the die power and architecture continues to grow vertically, the MHTS will prove to be a viable solution for the future of stack die.

### APPLICATIONS

- Thermoelectric cooling systems
- Three-dimensional circuit systems

### KEY BENEFITS

- Vertically dimension
- Cost-effectiveness
- Sub-ambient cooling capability
- Ability to accommodate more than four thermoelectric modules

### STAGE OF DEVELOPMENT

Prototype

### INTELLECTUAL PROPERTY STATUS

Patent Pending

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