

# SMU Department of Mechanical Engineering

## SEMINAR

### “Electronic Cooling: Challenges at the device and system level”



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Arlington**

**Friday, November 5, 2010**

**3:00 p.m. – 4:30 p.m.**

**Huitt-Zollars Pavilion**

**Abstract:** Following Moore’s Law, the number of transistors on a chip doubles every eighteen months leading to over a billion transistors on current high density interconnect microprocessors. This has resulted in a fast increasing power density and coupled with the increased dynamic power, is the fast increasing static power caused by leakage current (the gate oxide thickness for 90nm nodes is only 1.2nm). The push for multi-core processors and high k dielectric is partly attributed to this leakage current. Future directions of microprocessor performance will not be dictated by just “Moore’s Law” but by the so called “More than Moore” hypothesis. In this presentation, the presenter will discuss the studies that he and his graduate students in cooperation with numerous industry colleagues have conducted in the last ten years in the area of thermo/mechanical challenges in electronics cooling/packaging. The discussion will include stacked packaging and the related thermo/mechanical challenges; efforts to reduce thermal resistance due to highly non-uniform chip power distribution, development of a best known method (BKM) for design of microprocessors based on power and thermal-architectural co-design, thermal challenge related to leakage current, effect of weight of heat sink assembly on mechanical reliability of a wire bonded plastic ball grid array package, bump electromigration and back end design rules, development of constitutive equations for lead free solders and some discussion on data centers and related energy management.

**Bio:** After receiving his PhD, Professor Agonafer joined IBM in 1984. After 15 years at IBM, in 1999, Dereje joined the University of Texas at Arlington as Professor and Director of Electronics, MEMS, and Nanoelectronics Systems Packaging Center). He currently advises 16 graduate students including 6 PhD’s. Since joining UTA, he has graduated over 70 graduate students. The research areas cover a broad area in electronic packaging. Professor Agonafer has published over 100 conference and journal papers and eight issued patents. He has received Distinguished Alumni Award from both UC Boulder and Howard and serves on the Engineering board of both universities. Also, in November 1998, he received “ASME K-16/EEPDP Clock Award for Outstanding Contribution in Computer Aided Thermal Management of Electronic Packages.” In the 2007 academic year, he was on a leave of absence as a Dr. Martin Luther King Visiting Professor at MIT in the Mechanical Engineering Department. Professor Agonafer is a Fellow of the American Society of Mechanical Engineers International and a Fellow of American Association for the Advancement of Science. In March 2008, he received the IEEE SEMI-THERM Symposia “Significant Contributor to the field of semiconductor thermal management or Thermi Award.” In July 2009, he delivered a keynote seminar in San Francisco as a recipient of the 2009 InterPACK Excellence Award.