

**THERMAL BEHAVIOR OF NANOSCALE COPPER
STRUCTURES ON SILICON SUBSTRATE**

By

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ABSTRACT

Rapid changes in VLSI technology is leading to smaller devices. Nanoscale structures are progressively more common in commercial products. Thermal conductance along solid-solid interfaces at the nanometer length scale is becoming increasingly important in understanding the thermal behavior of these new smaller devices. Especially with the advent of copper interconnects in commercial technology, the understanding of copper silicon interface is essential. In recent years Intel has moved on from using 45nm half-pitch technology to using 32nm half-pitch technology as utilized in the Intel Core i7 processor. The next step will be 22nm half-pitch technology according to the International Technology Roadmap for Semiconductors(ITRS-2009). To this end we study the thermal behavior of copper strip structure with 20nm spacing on a silicon substrate using the Transient ThermoReflectance (TTR) technique. In addition TTR study is carried out on copper spiral structure on a silicon substrate, 28nm copper film on a silica substrate, 20nm copper film on a sapphire substrate. The copper strip structure shows a faster thermal decay than the thin film and copper spiral structure. The study shows interesting mechanical vibration due to thermal effects suggesting further analysis to study the vibrations creates on the copper surface.