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Abstract Details

Title: Effect of Heating on ICs Performance in Embedded Systems

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Abstract: Chip temperature is increasing with continued technology scaling due to increased power density and decreased device feature sizes. Since temperature has significant impact on performance and reliability, accurate thermal and circuit analysis are of great importance. Due to the shrinking device feature size, effects occur at the nanometer scale, such as ballistic transport of energy carriers and electron tunneling, have become increasingly important and must be considered. However, many existing thermal and circuit analysis methods are not able to consider these effects efficiently, if at all. This thesis presents methods for accurate and efficient multi-scale thermal and circuit analysis. For circuit analysis, the simulation of single electron device circuits is specifically studied. Interconnect is one of the main performance determinant of modern integrated circuits (ICs). The new technology of vertical ICs places circuit blocks in the vertical dimension in addition to the conventional horizontal plane. Compared to the planar ICs, vertical ICs have shorter latencies as well as lower power consumption due to shorter wires. This also increases speed, improves performances and adds to ICs density.

Keywords: ICs, MTTF, Security, Attacks, Tamper Mechanisms.