MAR14-2013-020355

Abstract for an Invited Paper
for the MAR14 Meeting of
the American Physical Society

Mechanical Computing Redux: Limitations at the Nanoscale[1]

TSU-JAE KING LIU, University of California, Berkeley

Technology solutions for overcoming the energy efficiency limits of nanoscale complementary metal oxide semiconductor (CMOS) technology ultimately will be needed in order to address the growing issue of integrated-circuit chip power density. Off-state leakage current sets a fundamental lower limit in energy per operation for any voltage-level-based digital logic implemented with transistors (CMOS and beyond), which leads to practical limits for device density (i.e. cost) and operating frequency (i.e. system performance). Mechanical switches have zero off-state leakag and hence can overcome this fundamental limit. Contact adhesive force sets a lower limit for the switching energy of a mechanical switch, however, and also directly impacts its performance. This paper will review recent progress toward the development of nano-electro-mechanical relay technology and discuss remaining challenges for realizing the promise of mechanical computing for ultra-low-power computing.

[1]Supported by the Center for Energy Efficient Electronics Science (NSF Award 0939514)