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TOPIC:

Selector Devices for Future Non-Volatile Memory Technologies

ABSTRACT:

Selection devices are required to enable large arrays for emerging memories like RRAM, STTRAM in a cross-point architecture. The goal is Flash, DRAM replacement in stand-alone as well as embedded applications. Conventionally high on-current density and non-linearity are device performance requirements and 4F2 size, 3D stackability are the density requirements. Ambipolar selectors for bipolar operation is attractive for energy efficient bipolar RRAM and fast STTRAM. New devices such as Mixed Ionic and Electronic Conductor (MIEC) selector by IBM, Metal Insulator transition (MIT) based VO2 selector, tunneling based MIM (metal insulator metal) selector, Ovonic Threshold Switch (OTS) by Intel etc. have been proposed. Our group has proposed a punch-through diode based NPN selectors on the Si platform. In addition to conventional metrics, challenges like dynamic power, variability and compatibility with myriad RRAM technologies with say different operating voltages & currents are new challenges that have been identified. Based on these holistic set of requirements, the various selector devices is valued to identify further technical challenges and opportunities.

PROFILE:

Udayan Ganguly received the B.Tech. degree in Metallurgical Engineering from the IIT Madras, in 2000 and the M.S. and Ph.D. degrees in Materials Science and Engineering at Cornell University, Ithaca, NY, in 2004 and 2006 respectively. His research interests are in semiconductor device physics and processing technologies for high density non-volatile memory applications and nanoscale sensing. From 2000 to 2002, he worked on development of seamless tiled microdisplay technology pioneered at Rainbow Displays Inc., In 2004, he interned at Intel Research, where he published and patented nanoscale memory based on carbon nanotubes with charge storage in metal nanocrystals. His PhD thesis was titled "Integration of carbon molecules (fullerenes and nanotubes) in CMOS for non-volatile memory applications". In 2006, after a short Postdoctoral Scholarship position at NASA Ames Research, Udayan joined Applied Materials to serve as the technical lead for Flash Memory Applications Development at Applied Materials' Front End Product Division, Sunnyvale, CA, most recently as a Member of Technical Staff. He has joined Dept of Electrical Engineering as an Assistant Professor at IIT Bombay in July 2010 and has been promoted to Associate Professorship in 2014. He has authored/ co-authored 20+ journal, 40+ conference and 15+ patents (applied/granted).