Electric-field-induced thermally assisted switching of monodomain magnetic bits

Author: Khalili Amiri, P. and Upadhyaya, P. and Alzate, J. G. and Wang, K. L.


Abstract

We present a study of the electric-field-induced switching of magnetic memory bits exhibiting interfacial voltage-controlled magnetic anisotropy (VCMA). Switching is analyzed in the single-domain approximation and in the thermally activated regime. The effects of external magnetic fields, magnitudes of the perpendicular anisotropy and VCMA effect, and voltage pulse width on the switching voltage are discussed. Both in-plane and perpendicular magnetic memory bits are considered. Experimental results are presented and compared to the theoretical model.

References


26. Z. Zeng et al., “High-power coherent microwave emission from magnetic tunnel junction nano-oscillators with perpendicular anisotropy,” ACS Nano 6, 6115–6121 (2012). http://dx.doi.org/10.1021/nn301222v

27. This switching approach is unidirectional for a fixed external magnetic field. Experimentally, however, this can be resolved by allowing for a non-zero current to flow through the device, thus, providing additional current-induced torque.


31. Note, however, that the validity of the present analysis does not depend on the sign of the VCMA effect.
