Cosmic-Ray Multi-Error Immunity for SRAM, Based on Analysis of the Parasitic Bipolar Effect

Kenichi Osada, Ken Yamaguchi*, Yoshikazu Saitoh**, and Takuyuki Kawahara

Central Research Laboratory, Hitachi, Ltd., Tokyo, Japan

*Advanced Research Laboratory, Hitachi, Ltd., Tokyo, Japan

**Semiconductor & Integrated Circuits, Hitachi, Ltd., Tokyo, Japan

This paper describes an investigation of cosmic-ray-induced multi-cell error behavior in SRAMs through device- and circuit-level simulation methods developed on the basis that a parasitic bipolar effect is responsible for such errors. The first demonstration that the maximum number of cell errors per cosmic-ray strike depends on the number of cells between well contacts (Nc) is presented. The results are applied in an ECC design guideline, which reduced SER for an SRAM by 88%.