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Calculation of distributio of Temperature and potential on RRAM using finite element method[1] BINOD D.C., WILHELMUS GEERTS, ARON MEDIAN, Department of physics ,Texas state university ,San Marcos,TX 78666, ARON MEDIAN COLLABORATION, WILHELMUS J.GEERTS COLLABORATION — Finite element calculations are being performed on resistive RAM (RRAM) devices to determine the electric potential and temperature distribution across the wafer. RRAM is a non-volatile memory technology that is currently being considered to replace Flash memory beyond 14 nm technology node. The calculations are performed using Comsol Multiphysics using the electric current and heat transfer in solids features. We used three Multiphysics nodes, i.e. Electromagnetic heat source, the boundary heat source and temperature coupling. The device was built from a plane geometry of substrate (fused quartz), bottom electrode (Pt), oxide (NiO), and top electrode (Pt) and then extruded each in the z-direction. A physics controlled normal mess was used for the calculations consisting of tetrahedral elements. Calculations were performed for a high and low resistive memory layer. In both cases the potential varies linearly along the electrodes. For the high resistive device, the temperature is highest in the center. For the low resistive device Joule heating mainly takes place along the electrodes and the temperature varies much less across the wafer. This work was supported by a DOD grant (HBCU/MI grant W911NF-15-1- 0394).

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