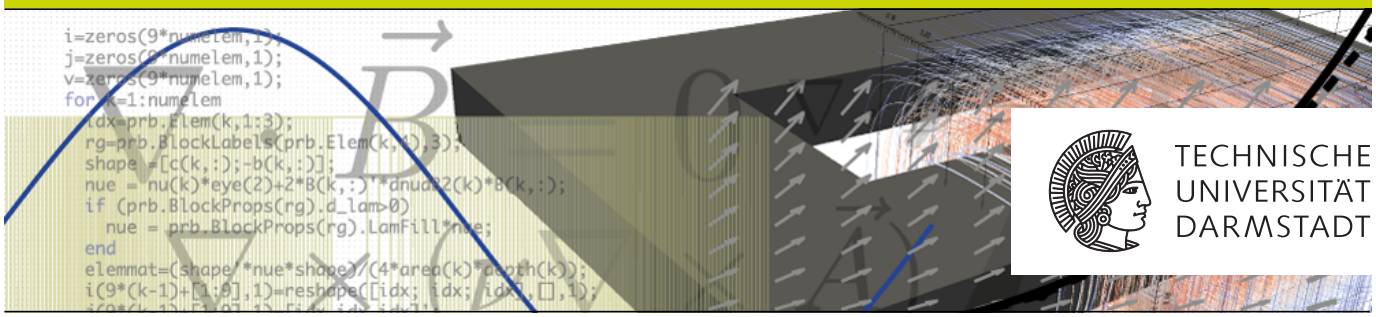
Simulation of Electromigration Effects in Electronic Devices

Bachelor's or Master's Thesis

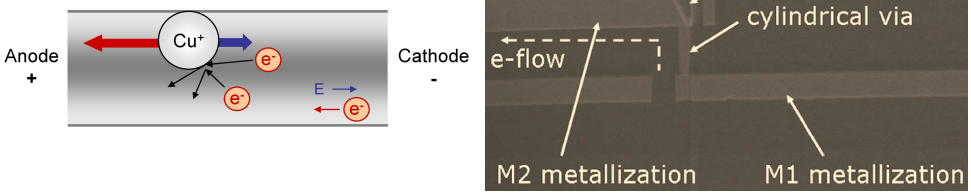
Computational Engineering / Electrical Engineering / Numerics

Start: Immediately



TECHNISCHE UNIVERSITÄT DARMSTADT

In electronics, the most serious failure mechanism is due to electromigration (EM) in the interconnects. This effect is triggered by high current densities that lead to electron collisions with metal ions resulting in a material transport in the direction of the electron flow (see figure[1]). Typically, void formation at the cathode is observed since electrons move in the direction of the anode.



The most important measure for a device's reliability is given by the Mean Time to Failure (MTTF). Apart from analytical models as, e.g., Black's equation, the MTTF can be estimated using accelerated tests by stressing devices with high voltages/currents or high temperatures. From a simulation perspective, modern CAD tools assess electromigration by computing current densities and deciding whether the corresponding design rules are met. For the thesis, an environment for the accurate simulation of EM effects shall be developed. Therefore, the major tasks are

- Setup of a simulation environment that incorporates electromigration
- Compare simulation results for simple examples to electromigration models and to measurement results from the literature
- Apply the developed methodology to practical examples

Graduate School of Computational Engineering

Institut für Theorie Elektromagnetischer Felder

M.Sc. Thorben Casper

Tel. +49 (0)6151 16-24414
casper@gsc.tu-darmstadt.de

http://www.graduate-school-ce.de/
http://www.temf.de/

[1] https://en.wikipedia.org/wiki/Electromigration,
A. Roy, C. M. Tan, *Very high current density package level electromigration test for copper interconnects*, 2008