

Licensing Opportunity

Upgrading DRAM modules for the protection against Rowhammer attacks



Photo: Test-rig for DRAM modules. Over 40 modules of various manufactures showed vulnerability to sophisticated Rowhammer attacks. The presented method protects against Rowhammer and is easily integrated into the hardware.

Application

An on-chip mitigation closes a security gap left by manufacturers of dynamic random-access memory (DRAM). The mitigation keeps track of Rowhammer attacks and proactively initiates countermeasures.

Features & Benefits

- low hardware cost
- overhead: < 3% power, < 4% area
- seamless integration into current and future DRAM technologies

Publications

- [1] "BLACKSMITH: Scalable rowhammering in the frequency domain", https://comsec.ethz.ch/wp-content/files/blacksmith_sp22.pdf
- [2] "ProTRR: Principled yet Optimal In-DRAM Target Row Refresh", https://comsec.ethz.ch/wp-content/files/protrr_sp22.pdf

Patent pending

Background

When a row of a DRAM device is repeatedly accessed during a short window of time the adjacent rows start to flip. This parasitic charge leakage is a well-known phenomenon, which aggravates with further down-sizing of technology nodes. Rowhammer exploits this vulnerability in computer memory to corrupt the data. DRAM manufacturers mitigate the risk of data corruption by estimating the attack pattern and refreshing potential target rows. Sophisticated attacks, however, still get through [1].

Invention

This invention builds a formal foundation that is used to calculate the worst possible Rowhammer attack based on specific DRAM technologies.

Using the bounds from this attack, the mitigation configures a new in-DRAM frequent counting scheme that is proven to be area- and energy- optimal.

Given its formal foundation, the mitigation provides the best possible trade-offs for securing a given DRAM device with deterministic guarantees. There is an ASIC implementation of the mitigation that is ready to be deployed on DRAM devices based on current and future technologies.

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Technology Readiness Level

