A Bulk Built-In Current Sensor for Detection of Fault Attacks

R. Possamai Bastos¹, F. Sill Torres³, J.-M. Dutertre³, M.-L. Flottes⁴, G. Di Natale⁴, B. Rouzeyre⁴

This work presents a novel scheme of built-in current sensor (BICS) for detecting transient fault-based attacks of short and long duration as well as from different simultaneous sources. The new sensor is a single mechanism connected to PMOS and NMOS bulks of the monitored logic. The proposed protection strategy is also useful for improving any state-of-the-art Bulk-BICS from pairs of PMOS and NMOS sensors to single sensors.

Integrated circuits are more and more Transient-Fault (TF) sensitive through new technologies.

The today’s trend in efficient protections against transient faults:
Concurrent Error Detection (CED) mechanisms
Recovery-based Error Correction Procedures

Mitigation of Transient faults by using CED schemes based on Bulk Built-In Current Sensors (BICS):

Single BBICS Protecting 6 Chains of 10 inverters:

Comparative Analysis, Transistor-level Simulation Results, and Conclusions:

1) Only 12 transistors for monitoring PMOS and NMOS networks;
2) No impact on system operating frequency;
3) No modifications on the target system’s standard cells;
4) Only 15% of increase in power consumption and 23% of area overhead;
5) Ongoing works are the fabrication of a prototype and the validation of the approach using a laser beam.

1) TIMA Laboratory (Grenoble INP, UJF, CNRS), Grenoble, France (bastianimag.fr)
2) UFMG (Dept. of Electronic Engineering), Belo Horizonte, Brazil (franksill@ufmg.br)
3) Centre Microélectronique de Provence - Georges Charpak, Gardanne, France (dutertre@emse.fr)
4) LIRMM (Université Montpellier II / CNRS UMR 5506), Montpellier, France (flottes, dinatale, rouzeyre@lirmm.fr)