Southern Illinois University System

A Hardware Trojan Detection Method Using Built-In Current Sensors

Integrated circuits (ICs) are at the risk of being maliciously modified at IC fabrication facilities through the insertion of a class of components known as a hardware Trojan (HT). A HT may steal sensitive data through a back-door channel, cause malfunctioning and affect the overall reliability of the IC.

Invention

SIU researchers have developed an approach for detecting HTs during the testing phase of IC development by using transient power supply current (I_{DDT}) sensors included as part of the IC design. This technology embodies a sophisticated placement of standard cells and interconnect routing whereby current sensors would be inserted at multiple locations in the power distribution network to observe the I_{DDT} associated with each logic gate. More specifically, this approach ensures that the observed I_{DDT} during a given time period correctly represents the switching activity associated with a specific gate when applying the tests created by the automatic test pattern generator.

Key Advantages

- Increased ability to detect HTs that dissipate low amounts of power
- Increased ability to detect HTs with minimal payload
- Greater ability to scale the detection method among various ICs in terms of differing sizes and complexities
- Experimental results on benchmark ICs demonstrate the inclusion of the current sensors results in no change to the area of the IC and negligible performance degradation
- Can more easily trigger and detect the HT anomaly as compared to HT detection using logic testing methods
- More reliable than conventional side-channel analysis which inappropriately assumes that the HT measurably affects the power and delay characteristics of the IC
- Less sensitive to process variations and environmental noise while allowing for increased elimination of background switching activity in I_{DDT} as compared to similar, current-based approaches to HT detection

Status

A U.S. provisional patent application was filed for this technology on July 26, 2019. The technology is available for license.

Other opportunities related to this technology, included but not limited to sponsored and/or collaborative research, may be available. Please reach out to the designated contact identified at left for more information.

Applications

- Design and testing of ICs
- Use in particularly sensitive industries (e.g., defense industry)

Inventors

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