Special Session 1
Panel

Guaranteeing Quality Throughout the Product Life Cycle: On-Line Test and Repair to the Rescue

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Abstract

The panel will address the following issues:

- Many of the defect behaviors in very-deep-sub-micron technologies are complex functions of voltage, temperature and input signals [ITC 00]. Many of these defects may be just flaws that can cause early-life failures. Detecting all these defects during production may increase the test cost in terms of resources (e.g., low temperature, voltage or temperature burn-in) or test time. Should we test for these defects during production? Should we rely on on-line test to detect these defects if they cause failures in the field?; after detection, we have to rely on on-line repair.

- In a recent paper in the SRC Topical Research Conference on Reliability [Shirley 00], the author observed that if infant mortality defects can be repaired “in use” using fault-tolerance techniques (in caches for example), and parts of the die can therefore be turned off during burn-in, then the burn-in power requirements can be greatly reduced. If we have on-line test and repair capabilities for logic, can we avoid burn-in? What are the trade-offs?

- In nanometer technologies, transients are going to be a big problem. EE Times (June 1999) reported that “soft-errors” from various sources (e.g., noise, coupling, radiation from packaging) are going to be a problem. Should we test for these problems? It may not even be possible to detect all these errors during production test.

- Some of the current (and future) generations of IC chips are pin-limited – hence, there is a possibility that we will have silicon area available for implementing on-line test structures inside the chip. The associated problems are lack of automation tools, increased design effort and possible yield degradation.

- On-line test can be helpful for system test and system-diagnostics – for example, it may be easier to identify which chip in the system is faulty so that the faulty chip or the board can be replaced. If we have on-line repair capabilities, system availability can increase significantly.

- Defect-tolerance is an accepted practice for memories. Is it time to investigate defect tolerance for logic?