AC-Scan: Microprocessors are ready
But Where is the Infrastructure?

Rajesh Raina
rajesh.raina@motorola.com
Motorola Inc., Austin, Texas

Position Paper

The magnified photo of cross section of a metal layer (Figure 1) shows the kind of manufacturing defect – a stringer between two wires - we don’t want our customers to tell (yell at) us about!

It was caught only with an AC-scan test pattern [2]. The analysis of the circuit revealed that a functional pattern would have had to tread through a sequential depth of over 4000, just to sensitize the delay fault. Observing the fault on the chip pin would be another journey through the sequential maze. The thousands of test engineers who have come and gone aren’t lying when they assert – Functional Test Generation is Hard.

I assert that the only reason functional test patterns have sufficed this long is because AC defects were a relatively small fraction of the total variety of defects seen on our chips. With Deep Sub-micron manufacturing processes commonplace, the occurrence of AC defects, such as the one shown in Figure 1, is increasing. Hence there is a need to methodically generate and measure quality of AC-tests. In the world of functional patterns, even stuck-at fault patterns cannot be generated automatically – let alone patterns to detect AC defects. In this respect, at least Scan enjoys a good head start – in that – we have an established and proven framework for design, DFT, analysis, generation and diagnosis of DC defects.

Proponents of functional testing claim that it remains the purest, most accurate form of testing especially for AC defects. And for a design, it remains the least intrusive and least costly of all methods. Sure, they concede, it takes an effort to develop & fault-grade functional test patterns – but this work can be done after a design is released for fabrication. After all, what else do the idling designers have to do after they tape-out a design! Moreover, minor implementation changes and bug fixes in subsequent revisions of the design do not require re-generation of test patterns.

I agree AC-scan is not a perfected technology yet. I beg to disagree that it cannot be perfected to replace functional testing.

My position is – we should accelerate AC-scan development efforts and even collaborate on an industry-wide basis towards development of an AC-scan design and ATPG framework.

1. Photo courtesy: NSCG Silicon Systems Diagnostic Center, Motorola Inc.