Introduction to Component Testing, Anthony K. Stevens, Addison-Wesley, Reading, Mass., 1986; $28.95

Reviewed by David Palmer

Introduction to Component Testing provides an overview of IC testing for new test engineers or for those thinking about getting into the field. The book presents information of interest to someone considering the purchase of automatic IC test equipment. It might also appeal to anyone involved in IC design.

The author starts with an overview of the goals of IC testing, as well as some basic test definitions. A problem often encountered in test engineering is when the test engineer loses sight of the real objective and designs the test program with an artful use of the test language—but not necessarily of the test system. The true goal of IC testing is to ensure that the device performs all its designed functions within a set of specifications.

The first chapter continues with a brief but concise definition of the various purposes of IC testing, such as characterization, production, and incoming inspection, and the tests performed in each case.

The next chapter gives valuable insight into functional testing. The various methods used to develop test patterns, such as auto-learn, CAD, and golden device, are presented. A discussion of fault coverage correctly determines that it is practically impossible to develop a test pattern that provides 100% fault coverage on a VLSI device. The section on test patterns provided by CAD software packages could have been enhanced, since most patterns for VLSI devices come from this source.

The chapter also details how the pattern is then formatted to provide precisely timed input data and output compare-strobes to the device under test. The section dealing with compare-strobes does not discuss the ability to turn the comparator on and off during the test cycle (time I/O). This feature is useful because it allows test patterns for common I/O devices to be compacted. Other than a few minor omissions, the functional test description is clear and understandable.

The author also provides interesting information on interfacing the device under test to the test system. Aspects such as connection of the device power supplies and the loading of the device under test by the test system are discussed. The importance of proper bypassing of the device power supplies is not mentioned, however.

Functional testing with respect to memory devices is presented next. There is a very clear explanation of the types and purposes of various algorithmic patterns used to test memories. The explanation on checkerboard patterns is not quite correct, however. To develop a true checkerboard pattern, the algorithm must write complement data to the memory each time both the X and Y addresses are even or odd. The chapter continues with an explanation of how algorithmic memory test patterns are developed. The discussions on topological scrambling, page mode, and memory refresh are quite understandable. In some cases, though, the reader erroneously is led to believe that the system architecture described is all that is commercially available.

The next chapter describes dc parametric testing. The test system resources available for dc testing are presented, and the results are briefly discussed. The explanations of the various dc tests are well done, and should leave the reader with a good understanding of how and why various tests are performed. In some cases, the techniques described are not quite current, though. For example, the description of continuity testing uses the system PMU. With most modern VLSI test systems, the programmable current loads per pin are used in conjunction with the dual comparators to check for opens and shorts (continuity). Overall, the chapter on dc testing is very informative.

What follows is a discussion on ac parametric testing. This chapter provides excellent information with respect to propagation delay, time to tristate, and setup and hold measurements. A brief example of using a time search utility within the main device program is provided. The discussion on time to tristate is the best I have ever read. The author displays a tremendous amount of practical experience in this area. I also found the information on setup and hold testing very interesting. I believe many experienced test engineers could benefit from reading this chapter.

The final chapter deals with some of the more advanced topics in test engineering. The author provides a good description of some of the utility programs available to make the test engineer more productive. Manual Analysis (Interactive Debug), shmoo plot, test pattern editor, and edge search are a few of the utilities described. The chapter continues by providing information on some of the features desirable in a state-of-the-art VLSI test system.

In general, I found the book very informative. Each topic is well-treated and the reader is provided with a good set of examples from which to gain practical experience. There are, however, a few errors, some of which I mentioned, that need to be corrected in the next edition. I believe the book is a very good source of information for students wishing to learn about IC test engineering, as well as a refresher for more experienced test engineers.

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