

Preface

Semiconductor memories are usually considered to be the most vital microelectronics component of the digital level designs for main-frame computers and PCs, telecommunications, automotive and consumer electronics, and commercial and military avionics systems. Semiconductor memory devices are characterized as volatile random access memories (RAMs), or nonvolatile memory devices. RAMs can either be static mode (SRAMs) where the logic information is stored by setting up the logic state of a bistable flip-flop, or through the charging of a capacitor as in dynamic random access memories (DRAMs). The nonvolatile memory data storage mode may be permanent or reprogrammable, depending upon the fabrication technology used.

In the last decade or so, semiconductor memories have advanced both in density and performance because of phenomenal developments in submicron technologies. DRAMs are considered key technology drivers and predictors of semiconductor manufacturing process scaling and performance trends. According to the Semiconductor Industries Association's recent technology road map, the DRAMs are expected to increase in density from 64 Mb in 1995 to 64 Gb in 2010. The growing demands for PCs and workstations using high-performance microprocessors are the key targets of DRAM designers and manufacturers. The technical advances

in multimegabit DRAMs have resulted in a greater demand for application-specific products such as the pseudostatic DRAM (PSRAM), video DRAM (VDRAM), and high speed DRAM (HSDRAM), e.g., synchronous, cached, and Rambus (configurations using innovative architectures). Each of these specialty memory devices has its associated testing and reliability issues that have to be taken into consideration for board and system level designs.

Nonvolatile memories such as read-only memories (ROMs), programmable read-only memories (PROMs), and erasable and programmable read-only memories (EPROMs) in both ultraviolet erasable (UVEPROM) and electrically erasable (EEPROM) versions have also made significant improvements in both density and performance. Flash memories are being fabricated in 8 and 16 Mb density devices for use in high-density nonvolatile storage applications such as memory modules and memory cards.

The continuously evolving complexity of memory devices makes memory fault modeling, test algorithms, design for testability (DFT), built-in self-test (BIST), and fault tolerance areas of significant concern. The general reliability issues pertaining to semiconductor devices in bipolar and MOS technologies are applicable to memories also. In addition, there are some special RAM failure modes and mechanisms, nonvolatile memory reliability issues,

