AUTOMATIC OPERABILITY RESTORATION OF SEMICONDUCTOR MEMORY'S MODULES DURING MULTIPLE FAULTS

Ryabtsev V. G.
Department of Electrical Engineering
Volgograd Agricultural State University
RUSSIA

Utkina, T. Yu.
Department of Specialize Computer Systems
Cherkassy State Technological University
UKRAINE

Mudar Almadi
Semeon Analytics
Inc.
CANADA

ABSTRACT

A structure of the memory modules with built-in self-test and recovery means, which will perform the replacement of data bits of the main memory cell array in which faults were accrued at the output data from the spare memory cell array, is proposed. The automatic reconfiguration of the memory structure, while faults detection, provided by the suggested hardware and software means. Implementation of self-testing semiconductor memory modules with recovery efficiency at multiple faults can substantially reduce the cost and increase the rate of fault coverage, as the self-test takes place on the operating frequencies and thus does not require external test bench equipment. Semiconductor memory modules with automatic recovery functionality at multiple faults can be used in systems of critical applications protection and management where the use of fault-tolerant digital devices is a necessity due to the inability of traditional methods of repair by replacing the failed elements. For critical application systems, which control nuclear power plants and other energy facilities, air, sea and ground vehicles, the needs to ensure their operability are increased. To fulfill this requirement, it is necessary to increase the technical readiness coefficient, the value of which increases with decreasing recovery time control system in case of fault of its constituent units. The main control system components critical applications are memory devices, which store programs and used for performing algorithms control. RAM is one of the most reliable components of the computer, because manufacturers of memory modules carefully tested its products before they hit the market as finished products. However, in memory circuits due to static electricity, the migration of electrons because of the high conductivity oxide, the tunnel effect, etc. over the time, there may be faults due to the instability of the charges.

Keywords: Storage devices, built-in, self-test, operability restoration.