Abstract

Electronic circuit modeling using computer-based simulation tools is well established and device models are available for common electronic components. Integrated circuit design using computer simulators have replaced the method of building a "bread-board". Using computer simulators are more flexible and capable. It will reduce cost and save design time.

PSPICE is the PC version of the SPICE which is one of the most commonly used simulators. It is composed of an analog simulator, a digital simulator, A/D interface subcircuits, D/A interface subcircuits, library, etc. As a result, it can simulate analog circuits, digital circuits and mixed analog digital circuits.

Simulation by PSPICE needs models of devices and circuit blocks. There are many efficient and accurate device models in the library of PSPICE, but they are not sufficient for the simulation of complex circuits and systems. Macromodels which belong to a higher level of models, simply handle the input and output signals of the system, and as a result, save simulation time and system memory.

With the advance of technology, new devices will grow very fast so there is a continuous need for macromodeling. A/D and D/A converters play an important role in many fields. They are the key devices in "Signal Processing" and "Signal Transmission", because analog signals are often more convenient to express in digital form for such purposes. However, the complete models of A/D converters and D/A converters are not available in PSPICE version 5.0. This causes difficulty for designers of circuits who want to simulate the circuits which include A/D and D/A converters by using PSPICE version 5.0.

In this paper, a new unified approach is used to create some macromodels of A/D converters and D/A converters as well as some digital circuits with PSPICE. A/D and D/A interface subcircuits must exist if PSPICE is used to simulate the digital and mixed analog digital circuits. By using the new approach, the A/D and D/A interface subcircuits are no longer necessary. At the same time, we can save the memory which the simulator uses.

The macromodels achieved by using the new approach are accurate enough to be used for practical simulations. In this paper, there are some comparisons between the new approach and the original one by using library device models. The simulator is PSPICE version 5.0, simulated by a personal computer with Pentium CPU, 90MHz clock and 16M RAM.