Electromagnetic Parameters Extraction for Integrated-Circuit Interconnects for Open Three Conductors with Two Levels System

Sarhan M. Musa[1], M.N.O. Sadiku[1], J.D. Oliver[1]

[1]Prairie View A&M University, Prairie View, TX, USA

Abstract

The accurate estimate of values of electromagnetic parameters is essential to determine the final circuit speeds and functionality for designing of high-performance integrated circuits and integrated circuits packaging. In this paper, a new quasi-TEM capacitance and inductance analysis of multiconductor multilayer interconnects is successfully demonstrated using the finite element method (FEM). We specifically illustrate two electrostatic models of open three interconnected lines with two levels system. Figure 1 shows the first designed model with its results compared to the method of moment (MoM) and on-surface measured equation of invariance (OSMEI) method. Indeed, excellent agreement with results from the previous methods is demonstrated. Figure 2 shows the second designed model which was recently developed by the authors. Also, we determine the quasi-static spectral for the potential distribution of the integrated circuits. We used COMSOL Multiphysics to design our systems by using the AC/DC Module and a 2D geometry. The modeling work flow adopted within COMSOL was: draw the geometry, apply subdomain and boundary settings, mesh the geometry, solve the model, and post-process the results in order to find the capacitances values. We saw accurate results from the FEM solution obtained from COMSOL and found them to be in good agreement when compared to results from other methods.

Reference

1. Y. Liu,K. Lan, and K. K. Mei,"Capacitance extraction for Electromaganetic multiconductor problems by on surface MEI,"IEEE Transactions on Advanced Packaging, Vol. 23, No. 3, 2000, pp.489-493.

Figures used in the abstract

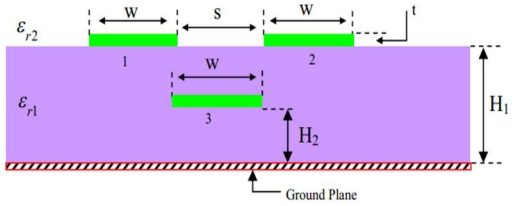

Figure 1: Cross section of open three interconnected lines with two levels system with one conductor embedded in the substrate.

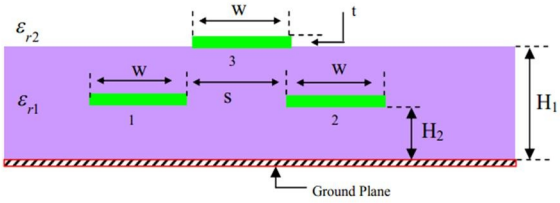

Figure 2: Cross section of open three interconnected lines with two levels system with two conductors embedded in the substrate.