Abstracts

FDTD Analysis of High Frequency Electronic Interconnection Effects

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A full-wave analysis of coupled high-frequency interconnect discontinuities is presented using the finite-difference time-domain (FDTD) method. The electromagnetic effects of two via holes on microstrip lines in close proximity to one another are examined and equivalent circuits are presented. The effects of two adjacent lines with bond wires, used, for example, to connect a die to the leadframe of an integrated circuit (IC) package are also analyzed. Frequency domain results are presented by using the discrete Fourier transform of the time-domain results. Guidelines regarding the effective use of the FDTD code including the use a priori calculated electric field distribution in the excitation plane, and the use of a weighted epsilon/sub r, eff/ to minimize reflections at the absorbing boundaries are described. The obtained FDTD results and the developed equivalent circuit models show the importance of radiation effects at frequencies beyond 20-30 GHz, the possibilities of reducing the inductive effect of bond wires by using two parallel bond wires instead of one, and the importance of including mutual inductance elements in the equivalent circuit model to account for the crosstalk between parallel vias across a ground plane.

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