Abstracts

Capacitance Computations in a Multilayered Dielectric Medium Using Closed-Form Spatial Green's Functions (Aug. 1994 [T-MTT])

K.S. Oh, D. Kuznetsov and J.E. Schutt-Aine. "Capacitance Computations in a Multilayered Dielectric Medium Using Closed-Form Spatial Green's Functions (Aug. 1994 [T-MTT])." 1994 Transactions on Microwave Theory and Techniques 42.8 (Aug. 1994 [T-MTT]): 1443-1453.

An efficient method to compute the 2-D and 3-D capacitance matrices of multiconductor interconnects in a multilayered dielectric medium is presented. The method is based on an integral equation approach and assumes the quasi-static condition. It is applicable to conductors of arbitrary polygonal shape embedded in a multilayered dielectric medium with possible ground planes on the top or bottom of the dielectric layers. The computation time required to evaluate the space-domain Green's function for the multilayered medium, which involves an infinite summation, has been greatly reduced by obtaining a closed-form expression, which is derived by approximating the Green's function using a finite number of images in the spectral domain. Then the corresponding space-domain Green's functions are obtained using the proper closed-form integrations. In both 2-D and 3-D cases, the unknown surface charge density is represented by pulse basis functions, and the delta testing function (point matching) is used to solve the integral equation. The elements of the resulting matrix are computed using the closed-form formulation, avoiding any numerical integration. The presented method is compared with other published results and showed good agreement. Finally, the equivalent microstrip crossover capacitance is computed to illustrate the use of a combination of 2-D and 3-D Green's functions.

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