Abstracts

Characterization of High Frequency Interconnects Using Finite Difference Time Domain and Finite Element Methods

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MIC and MMIC packages capable of good performance at frequencies as high as 60 GHz need to have small volume, low weight, microstrip and/or coplanar waveguide (CPW) compatibility and exhibit negligible electrical interference with the rest of the circuit. In order to acquire some of these characteristics, special provisions need to be made during circuit layout and design, resulting in high-density packages. The designed circuits have a large number of interconnects which are printed on electrically small surface areas and communicate through the substrate in a direct through-via fashion or electromagnetically through appropriately etched apertures. In a circuit environment of this complexity, parasitic effects such as radiation and cross talk are intensified, thus, making the vertical interconnection problem very critical. In this paper, transitions using through-substrate vias are considered and analyzed both in the time and frequency domains using the Finite Difference Time Domain (FDTD) technique and the Finite Element Method (FEM), respectively. The merits of each method in conjunction with accuracy, computational efficiency and versatility are discussed and results are compared showing excellent agreement. Specifically, a microstrip short-circuit, a microstrip ground pad, a CPW-to-microstrip through-via transition and a channelized CPW-to-microstrip transition are analyzed and their electrical performance is studied.

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