Abstracts

Dissipation Loss Effects in Isolated and Coupled Transmission Lines

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This paper describes a computer-aided analysis of dissipation losses in uniform isolated or coupled transmission lines for microwave and millimeter-wave integrated-circuit applications. The analysis employs a quasi-TEM model for isolated transmission lines and for the even- and odd-mode transmission lines associated with coupled-line structures. The conductor and dielectric losses are then related to equivalent charge density distributions, which are evaluated using a method-of-moments solution. The transmission lines treated by this analysis may contain any number of lossy conductors and inhomogeneous dielectrics, consisting of any number of different homogeneous dielectric regions. A development is provided to explicitly relate the four-port terminal-electrical performance of directional couplers to evaluated even- and odd- mode loss coefficients. Examples of evaluated losses are presented in graphical form for isolated lines of inverted microstrip and trapped inverted microstrip and edge-coupled microstrip with a dielectric overlay. The analysis accuracy has been confirmed using microstrip and coplanar waveguide configurations. A comparison is made of the total loss characteristics for microstrip, coplanar waveguide, inverted microstrip, and trapped inverted microstrip. Calculations are compared with measurements for the coupled-line structure. Accuracy of the solution and suggested refinements are discussed. Five computer programs are documented.

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