Abstracts

Hybrid-Mode Analysis of Homogeneously and Inhomogeneously Doped Low-Loss Slow-Wave Coplanar Transmission Lines

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A hybrid-mode analysis is presented to characterize the propagation properties of uniplanar slow-wave MIS coplanar transmission lines. The effect of homogeneous versus gradually inhomogeneous doping profile is investigated as well as the influence of the metal conductor losses and finite metallization thickness on the slow-wave factor and the overall losses. Numerical results indicate that thick-film MIS CPW's can support a slow-wave mode with moderate loss up to 40 GHz when the line dimensions are kept in the micrometer range. Furthermore, it is found that an inhomogeneous doping profile can reduce the overall losses and that the effect of metal conductor losses in heavily doped MIS structures is only marginal. On the other hand, in weakly doped or insulating GaAs material a lossy metal conductor leads to a higher propagation constant exhibiting a negative slope with increasing frequency. The numerical simulation is carried out by using the spectral-domain approach for lines with homogeneously doped semiconductor and the method of lines for the ones with inhomogeneously doped semiconductor, respectively. A self-consistent approach is used to represent lossy metal conductor planes.

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