

## Characterization and Modeling of Multiple Line Interconnections from Time Domain Measurements

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Methods have been developed to extract electrical circuit models from time domain measurements of lossless, nonuniform, multiconductor transmission lines for two broad classes of structures. Although unique solutions are not feasible for general structures that scatter the propagating wave-front, approximate solutions have been identified. For the first class of structures a single velocity wave-front is assumed, equivalent to the homogeneous media case. The second class is for structures with identical lines, such as a parallel line bus structure, where separable modal wave-fronts propagate. For these cases the propagation behavior (eigenvector matrix) is determined only by the known number of lines,  $N$ , allowing decoupling of the system into  $N$  orthogonal modal transmission lines. Circuit models have been developed for these decoupled nonuniform lines, as well as for the equal modal velocity assumption which relies on a matrix impedance profile to fully describe the system.

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