

Finite Element Analysis of Skin Effect in Copper Interconnects at 77K and 300K

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We present the methodology for calculating normal skin effect in complex geometries using finite elements. We have used these results to analyze the performance of copper interconnects at 77K and 300K for both digital and microwave applications. This includes attenuation per unit length, phase velocity and characteristic impedance as a function of frequency from d.c. to 10 GHz. For digital signal propagation, skin effects are important for predicting rise time degradation for times less than 1.2 times the time of flight delay, while for larger times the d.c. resistance corresponding to the cross section of the signal line is adequate for explaining the lossy characteristics.

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