Abstracts

Analytical IC Metal-Line Capacitance Formulas (Short Papers)

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In semiconductor IC technology, capacitance formed by the multilevel interconnection metal lines usually dominate circuit performance. However, for lack of accurate formulas, a numerical method usually has to be used to determine these capacitances. Two analytical capacitance formulas were derived using approximate conformal mapping techniques. One formula gives the capacitance of a finite-thickness metal line over a conducting ground plane, or over a silicon surface. The other formula gives the capacitance of the same metal line, but with an additional conducting metal line over it. The formulas are most accurate for metal lines whose width exceeds the dielectric thickness; accuracy increases with linewidth. They are accurate to 1 percent for a metal line whose width is comparable to the dielectric thickness. With these simple formulas, statistical distribution of the metal-line capacitances can be easily determined in a few seconds of computer time.

❑ Return to main document.