

A modeling approach for shot noise effect on feature roughness

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We propose a practical yet rigorous enough approach to modeling shot noise effects on feature roughness in CAR.

Gallatin's first principles derivation is generalized to obtain basic formulas in terms of integrals. Rather than stopping at the level of abstract integrals or resorting to overreaching simplifications, we assume the Gaussian blurs of Kruit's models, and arrive at final formulas in terms of error functions for lines or integrals of Bessel-Gaussian products for vias.

Kruit proposed heuristic formulas with fitting constants derived from Monte Carlo simulation experiments. Our first principles equations are demonstrated to fit Kruit's Monte Carlo simulations at the same or better accuracy than his formulas. Kruit's formulas are also obtained as a limiting case.

Our expressions provide a uniform description over a wide range of parameters without a need to worry about a validity range for fitting constants. The expressions also readily lend themselves to practical use without recourse to sophisticated numeric software.