Noise Modeling Technical Note – BSIM3v3.2.4

1. Flicker Noise

BSIM3v3 provides two flicker noise models. BSIM3v3.2.4 improves the continuity of the unified flicker noise model over its previous versions in that it uses V_{gsteff}, V_{dseff} to replace (V_{gs}-V_{th}), and min(V_{ds} , V_{dsat}). Also the bulk charge effect is taken into account in unifed flicker noise model.

For the equation that considers bulk charge effect, following equation is used to replace original (8.4) in BSIM3v3.2.3 manual:

$$N_l = C_{oxe} \cdot V_{gsteff} \cdot \left(1 - \frac{A_{bulk} V_{dseff}}{V_{gsteff} + 2v_t} \right) \Big/ q \qquad (8.4)$$

2. Channel Thermal Noise

There exist two models for channel thermal noise modeling. One is called SPICE2 thermal noise model. The other is BSIM3 thermal noise model. In BSIM3v3.2.4, the later model is improved by adding Rds in the BSIM3 charge-based thermal noise model. This thermal noise model is described as:

$$\frac{4k_b T m_{eff}}{L_{eff}^{\ 2} + m_{eff} \left| \mathrm{Q_{inv}} \right| \cdot \mathrm{R_{ds}}} \cdot \left| \mathrm{Q_{inv}} \right|$$