

## Extending Drift-Diffusion Simulations to the Nanoscale

Dan Connelly

### **Abstract**

Drift-diffusion has been the mainstream semiconductor device model for decades. Despite the underlying theoretical assumptions having lost validity, it remains the most popular model for modeling the behavior of transistors even for channel lengths at the 10 nm scale. In this nanoscale regime, the drift diffusion model transitions from being a theory to a phenomenology, with parameters determined by calibration rather than direct reference to physical constants, the calibration using more fundamental but computationally intensive numerical approaches rather than the test structure measurement which has been used in the past. Other aspects of modeling, including electrostatics, thermal conductivity, and variability will also be discuss