CHAPTER 7: Benchmark Test Results

A series of tests [26] have been performed on BSIM3v3 to check its robustness (lack of discontinuities), accuracy, and performance. Although all benchmark test results could not be included in this chapter, the most important ones will be presented in this chapter for a 0.5μm, 90 Angstrom, 3.3V technology.

7.1 Benchmark Test Types

Table 7-1 lists the various benchmark tests and its associated figure number included in this section. Notice that for each plot, smooth transitions are apparent for current, transconductance, and source to drain resistance for all transition regions regardless of bias conditions.

Device Size	Bias Conditions	Notes	Figure Number
W/L=20/5	Ids vs. Vgs @ Vbs=0V; Vds=0.05, 3.3V	Log scale	7-1
W/L=20/5	Ids vs. Vgs @ Vbs=0V; Vds=0.05, 3.3V	Linear scale	7-2
W/L=20/0.5	Ids vs. Vgs @ Vbs=0V; Vds=0.05, 3.3V	Log scale	7-3
W/L=20/0.5	Ids vs. Vgs @ Vbs=0V; Vds=0.05, 3.3V	Linear scale	7-4
W/L=20/5	Ids vs. Vgs @ Vds=0.05V; Vbs=0 to -3.3V	Log scale	7-5
W/L=20/5	Ids vs. Vgs @ Vds=0.05V; Vbs=0 to -3.3V; W/L=20/5	Linear scale	7-6
W/L=20/0.5	Ids vs. Vgs @ Vds=0.05V; Vbs=0 to -3.3V	Log scale	7-7

Device Size	Bias Conditions	Notes	Figure Number
W/L=20/0.5	Ids vs. Vgs @ Vds=0.05V; Vbs=0 to -3.3V	Linear scale	7-8
W/L=20/5	Gm/Ids vs. Vgs @ Vds=0.05V, 3-3V; Vbs=0V	Linear scale	7-9
W/L=20/0.5	Gm/Ids vs. Vgs @ Vds=0.05V, 3-3V; Vbs=0V	Linear scale	7-10
W/L=20/5	Gm/Ids vs. Vgs @ Vds=0.05V; Vbs=0V to -3.3V	Linear scale	7-11
W/L=20/0.5	Gm/Ids vs. Vgs @ Vds=0.05V; Vbs=0V to -3.3V	Linear scale	7-12
W/L=20/0.5	Ids vs. Vds @Vbs=0V; Vgs=0.5V, 0.55V, 0.6V	BSIM3 Version 2.0 vs. BSIM3v3	7-13
W/L=20/5	Ids vs. Vds @Vbs=0V; Vgs=1.15V to 3.3V	Linear scale	7-14
W/L=20/0.5	Ids vs. Vds @Vbs=0V; Vgs=1.084V to 3.3V	Linear scale	7-15
W/L=20/0.5	Rout vs. Vds @ Vbs=0V; Vgs=1.084V to 3.3V	Linear scale	7-16

Table 7-1. Benchmark tests.

7.2 Benchmark Test Results (Figures)

All of the figures listed in Table 7-1 will now be listed in order. Unless indicated otherwise, symbols represent actual data and lines represent the results of BSIM3v3 calculations. All of these plots serve to demonstrate the robustness and continuous behavior of the unified model expression for not only Ids but Gm, Gm/Ids, and Rout as well.

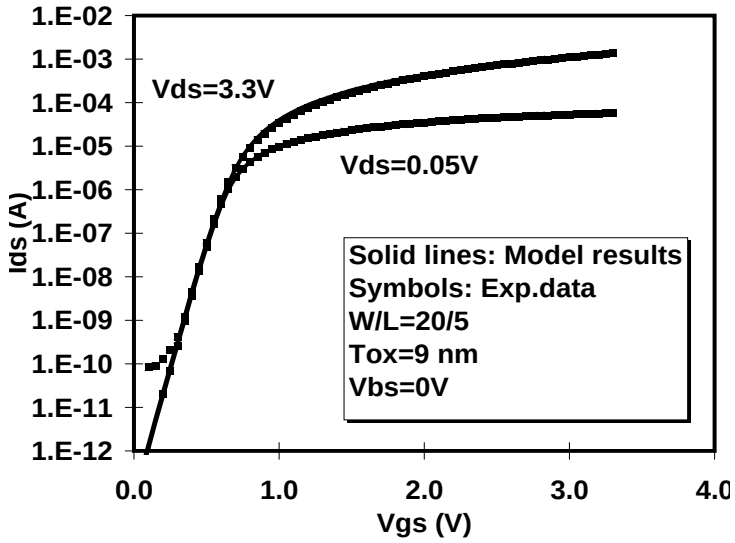

Figure 7-1. Continuity from subthreshold to strong inversion (log scale).

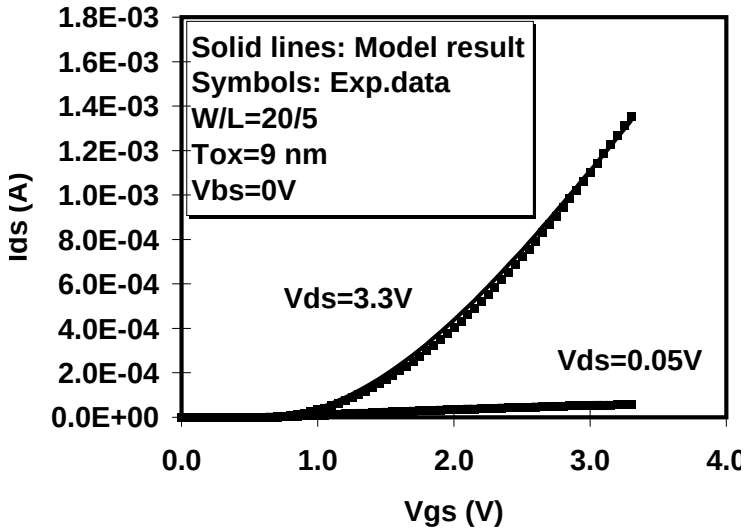

Figure 7-2. Continuity from subthreshold to strong inversion (linear scale).

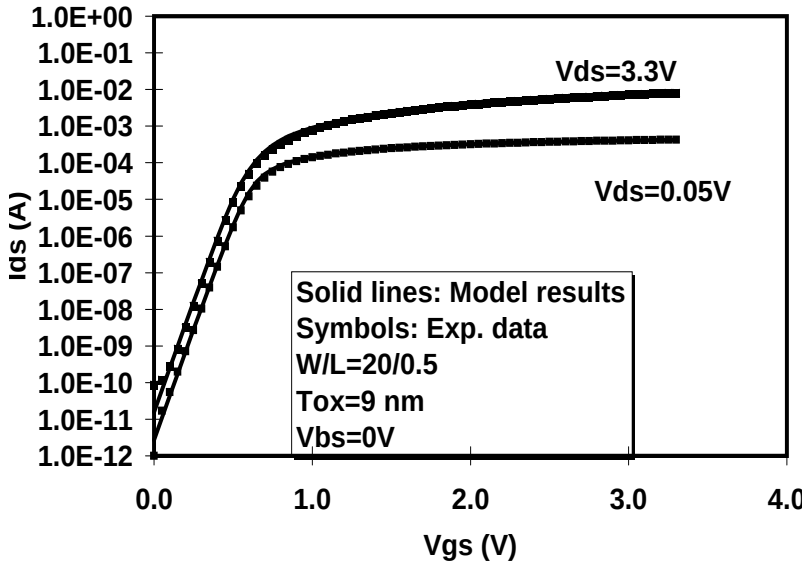

Figure 7-3. Same as Figure 7-1 but for short channel device.

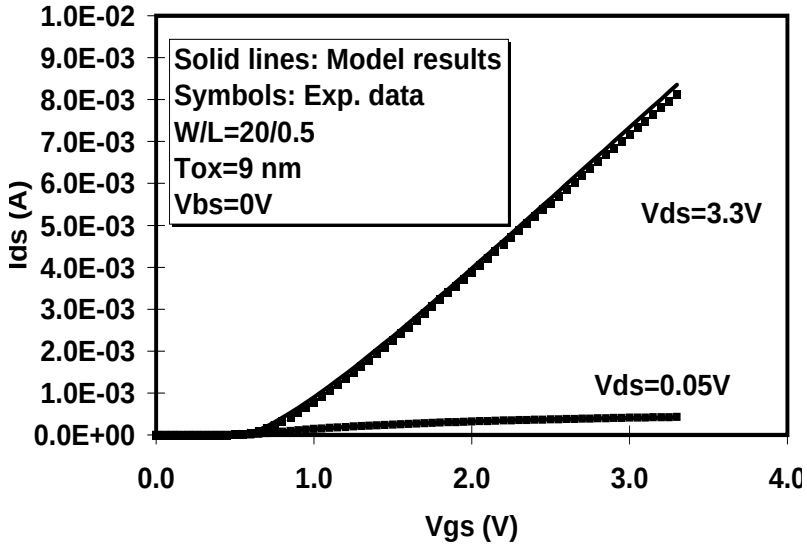

Figure 7-4. Same as Figure 7-2 but for short channel device.

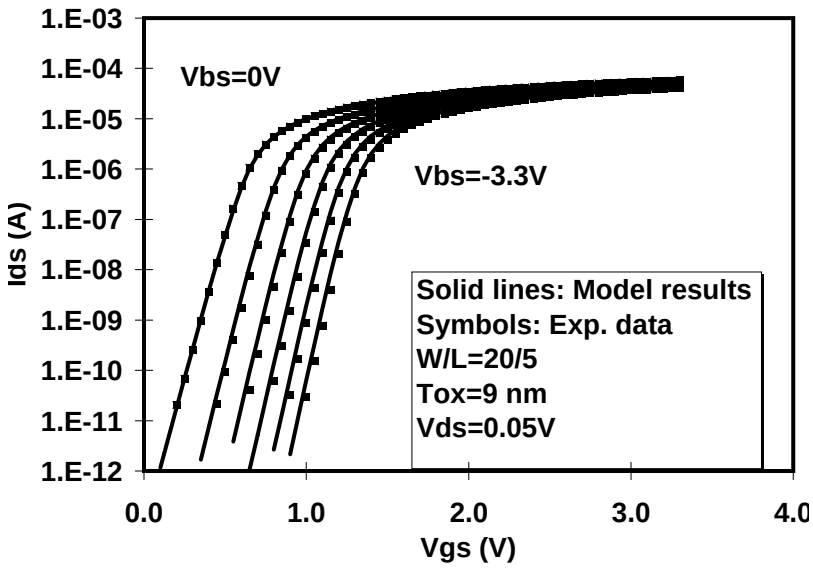

Figure 7-5. Subthreshold to strong inversion continuity as function of Vbs.

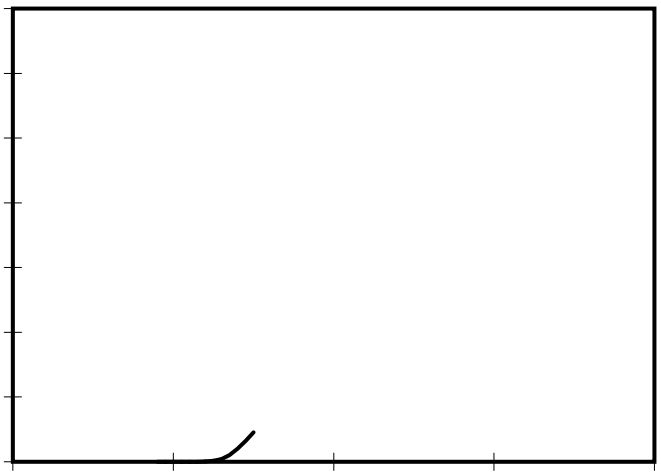

Figure 7-6. Subthreshold to strong inversion continuity as function of Vbs.