Lecture #22

ANNOUNCEMENTS

- Contact Dave Nguyen (nguyendt@uclink) if you lost a calculator in the lab
- The EECS40 Course Reader (containing supplemental reading from Schwarz & Oldham) is now available at Copy Central, 2483 Hearst Ave.
- Try the educational applets available online! (Visit the class website.)

OUTLINE

- The MOSFET as a controlled resistor
- Pinch-off and current saturation
- Channel-length modulation
- Velocity saturation in a short-channel MOSFET

Reference Reading

- » Rabaey et al.: Chapter 3.3.2
- » Schwarz & Oldham: Chapter 13.4
- » Howe & Sodini: Chapter 4.3

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MOSFET as a Controlled Resistor (cont'd)		
$I_D = \frac{V_{DS}}{R_{DS}}$		
$R_{DS} = R_{s}(L/W) = \frac{L/W}{\mu_{n}Q_{i}} = \frac{L/W}{\mu_{n}C_{ox}(V_{GS} - V_{T} - \frac{V_{DS}}{2})}$		
$I_D = \mu_n C_{ox}$	$\frac{W}{L}(V_{GS}-V_T-\frac{V_{DS}}{2})V_{DS}$	average value of <i>V(x</i>)
We can make <i>R_{DS}</i> low by		
• applying a large "gate drive" ($V_{GS} - V_T$)		
 making W large and/or L small 		
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