

*EE141-Fall 2012
Digital Integrated
Circuits*

Lecture 10
Using the MOS Model:
Inverter VTC

EECS141 Lecture #10 1

*CMOS Inverter
VTC*



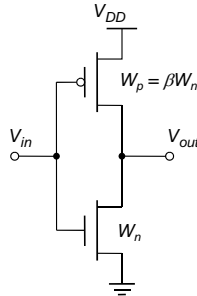
EECS141 Lecture #10 4

Announcements

- Homework #5 due Thursday
 - Homework #6 out next week
- Midterm #1 Thurs. Oct. 4th, 6:30-8:00pm
 - Location TBD
 - Exam is open notes, book, calculators, etc.
 - Midterm review session next week
- Elad out of town this Thurs. and Fri.
 - Thurs. lecture will be taped ahead tomorrow (Wed.) 11am-12:30pm – location TBD

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The CMOS Inverter



EECS141 Lecture #10 5

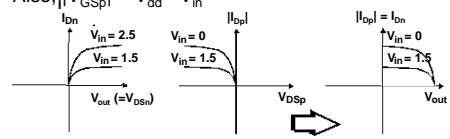
Class Material

- Last lecture
 - MOS Transistor Model
- Today's lecture
 - Using the MOS Model: Inverter VTC
- Reading (5.1-5.3)

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PMOS Load Lines

- For DC VTC, $I_{Dn} = I_{Dp}$
 - Graphically, looking for intersections of NMOS and PMOS IV characteristics
- To put IV curves on the same plot, PMOS IV is “flipped” since $|V_{Dsp}| = V_{DD} - V_{out}$
 - Also, $|V_{GSp}| = V_{dd} - V_{in}$

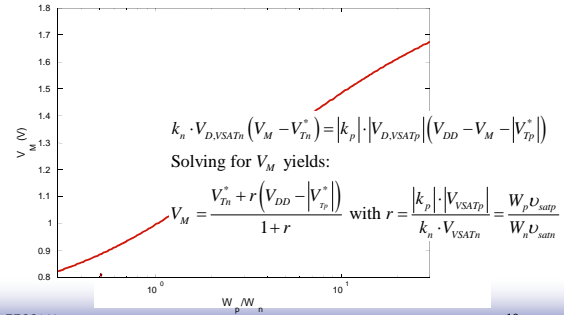


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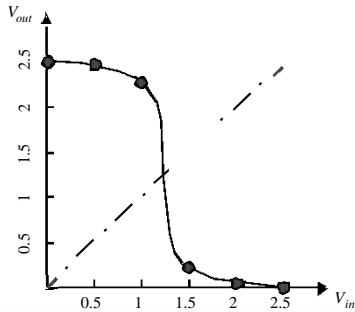
Note on Transistor IV Problems

- “Guess and Check”
 - Guess region(s) of operation
 - Check consistency

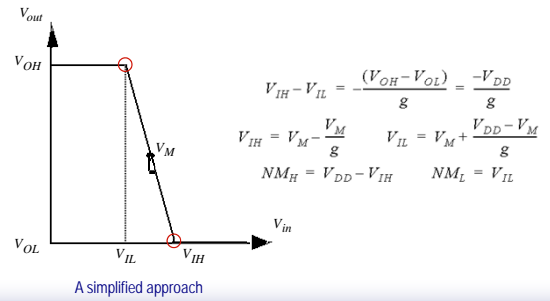
Switching Threshold as a Function of Transistor Ratio



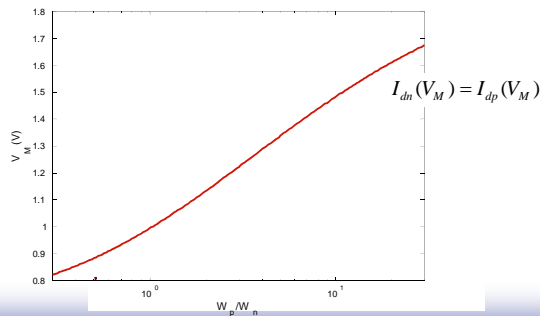
CMOS Inverter VTC



Determining V_{IH} and V_{IL}



Switching Threshold as a Function of Transistor Ratio



Gain as a function of VDD

