

ECE 126 – Logic Gate Creation: 2 input NAND Gate Schematic + Test Bench

Created at GWU by Anis Nurashikin Nordin & Thomas Farmer

Objectives:

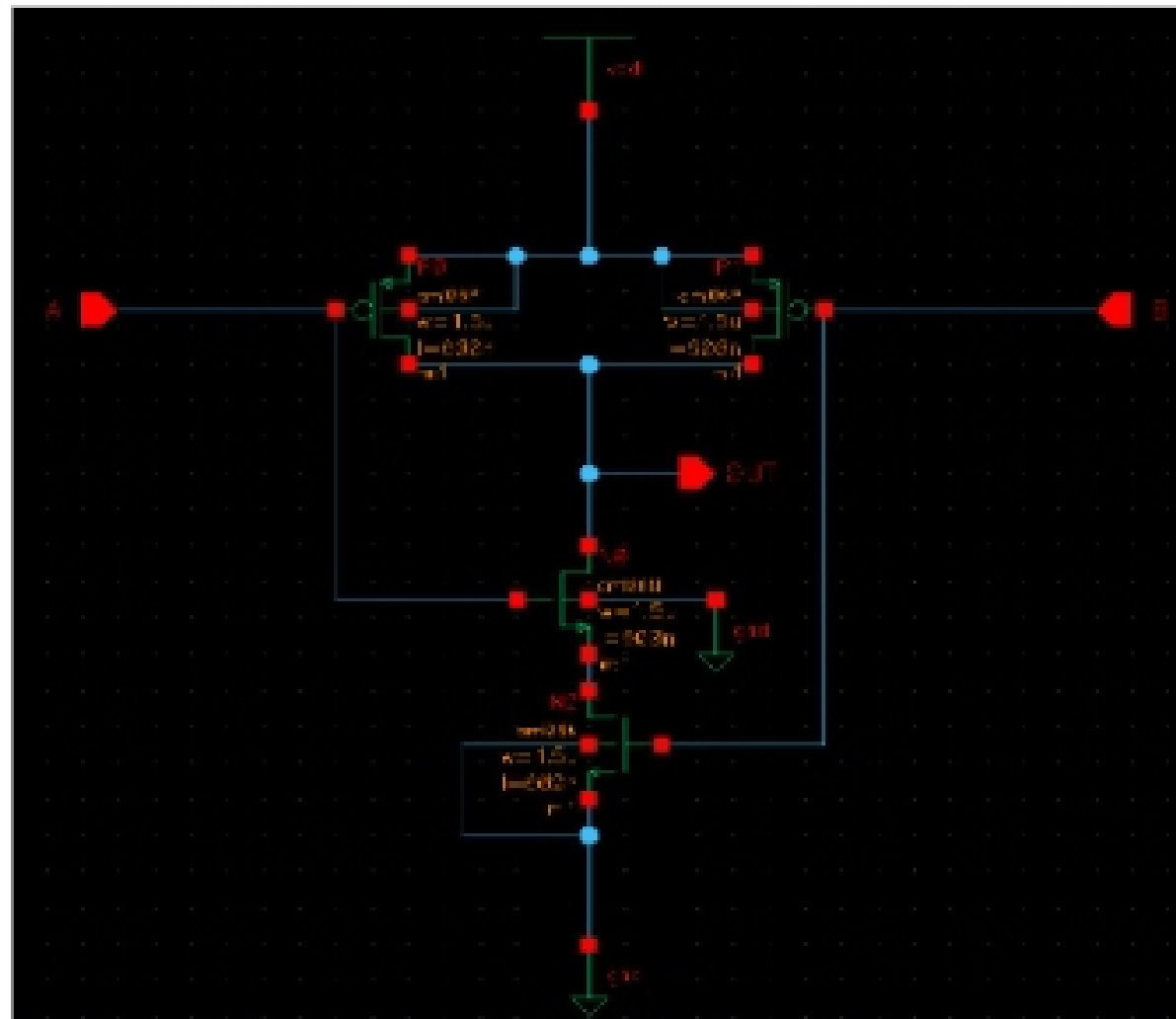
- Create a schematic for a 2 input NAND gate
- Create a symbol for a 2 input NAND gate
- Create a test bench for a 2 input NAND gate, that allows for transient simulation to verify functionality of NAND gate
- Create a test bench for a 2 input NAND gate, that allows for a swept DC analysis
- Create a layout for a 2 input NAND gate
- Create an AND gate using Inverter (from Lab 3) with NAND gate (from this lab)

Assumptions:

- Student has successfully completed Lab 1, 2, and 3

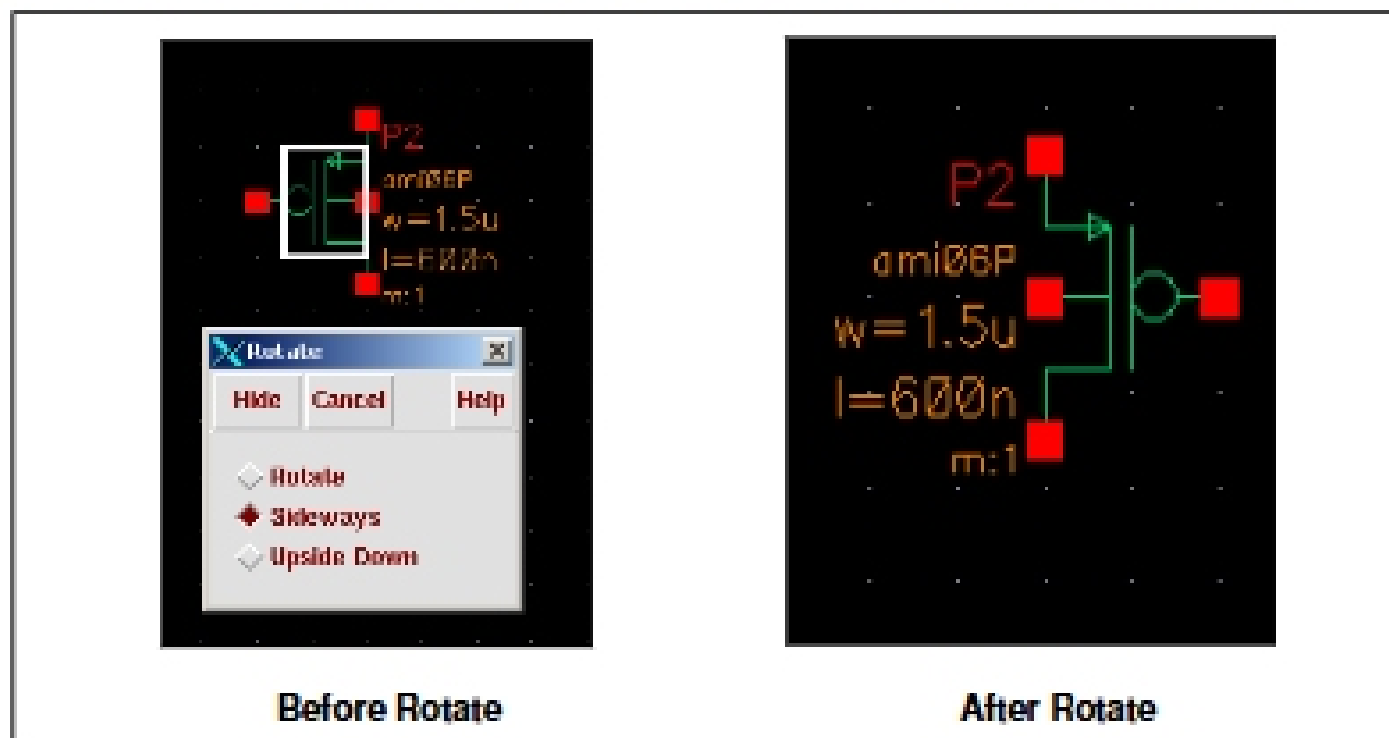
Part 1: Creating NAND Schematic

1. Login to workstation and start cadence
2. From the Library Manager, click on your "DIGITAL" library
 - o Choose File->New->Cell View...
 - o Fill in the form:
 - o Library Name: **Digital**
 - o Cell: **nand2**
 - o View: **schematic**
 - o Type: **schematic**
 - o Application: **Schematics-L**
3. Instance parts: pmos4, nmos4, vdd, gnd, to create the following schematic



- o For now, use "minimum" sizes for W/L of each transistor, later you will adjust them

- o You must "rotate" the PMOS and NMOS **SIDEWAYS** by doing the following:



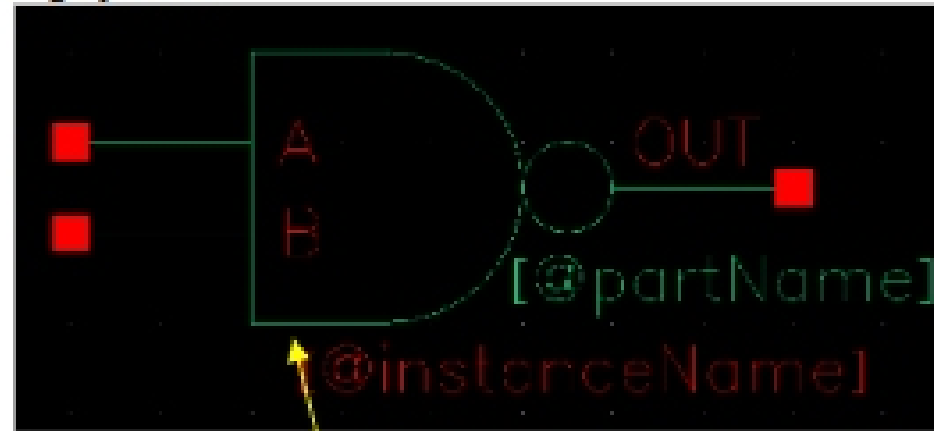
(notice, current flow direction is still the same)

- o Menu: Edit->rotate or press the letter "r"
- o Click "Sideways"
- o **Note the current flow direction after you rotate is still correct! (this is important)**
- o You can also rotate the input/output pins as well

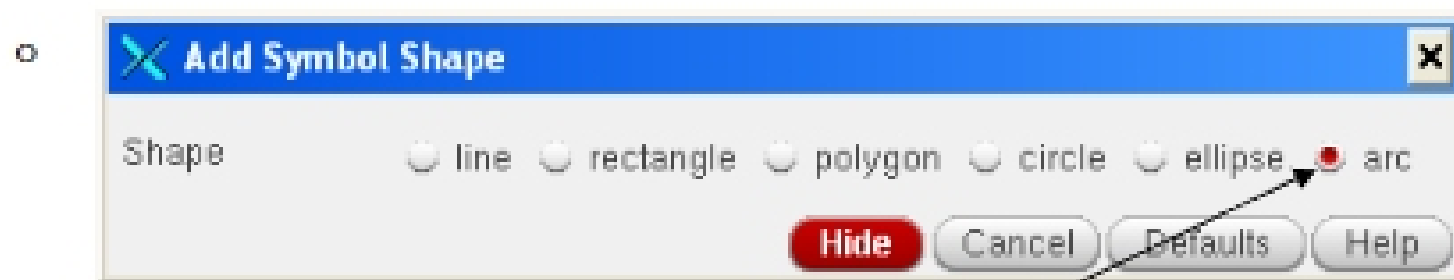
4. Check and save schematic, make sure there are no warnings/errors

Part 2: Creating NAND Symbol

1. In the schematic editor, from the menu choose: Create->Cellview->From Cell View
 - o Accept the defaults and press OK
 - o The symbol editor appears
2. Press the "delete" key and click on the green box and red box in the editor
 - o Do NOT delete the PINS or labels for the PINS, if you do, close the window and DO not save, simply restart from step 1 above
3. Create the following symbol:



- o From the menu choose: Create->Shape->Line, draw the left, top and bottom lines



- o Choose "Arc" shape to draw the Arc of the NAND gate
- o Choose the "Circle" shape to draw the circle of the NAND gate

4. Save and close the symbol
5. Save and close the schematic