ENSC 450: Assignment 5

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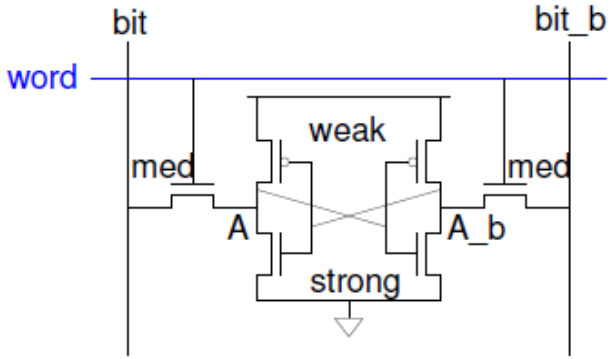
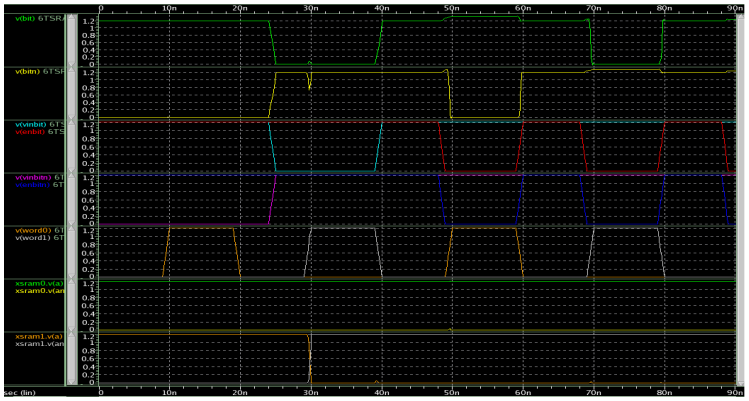
Outline

- Scope of Presentation:
  - Built 6TSRAM subcircuit
  - Instantiate 2 cells: cell 0 and cell 1
  - Want to write one into cell 0, zero into cell 1, read from cell 0, and read from cell 1
  - Optimization of criteria for transistor balancing
- Methodology
- Results
- Conclusion

Methodology

- Built SRAM using 6 transistors with PMOS having width 2*Wm and NMOS having width Wm

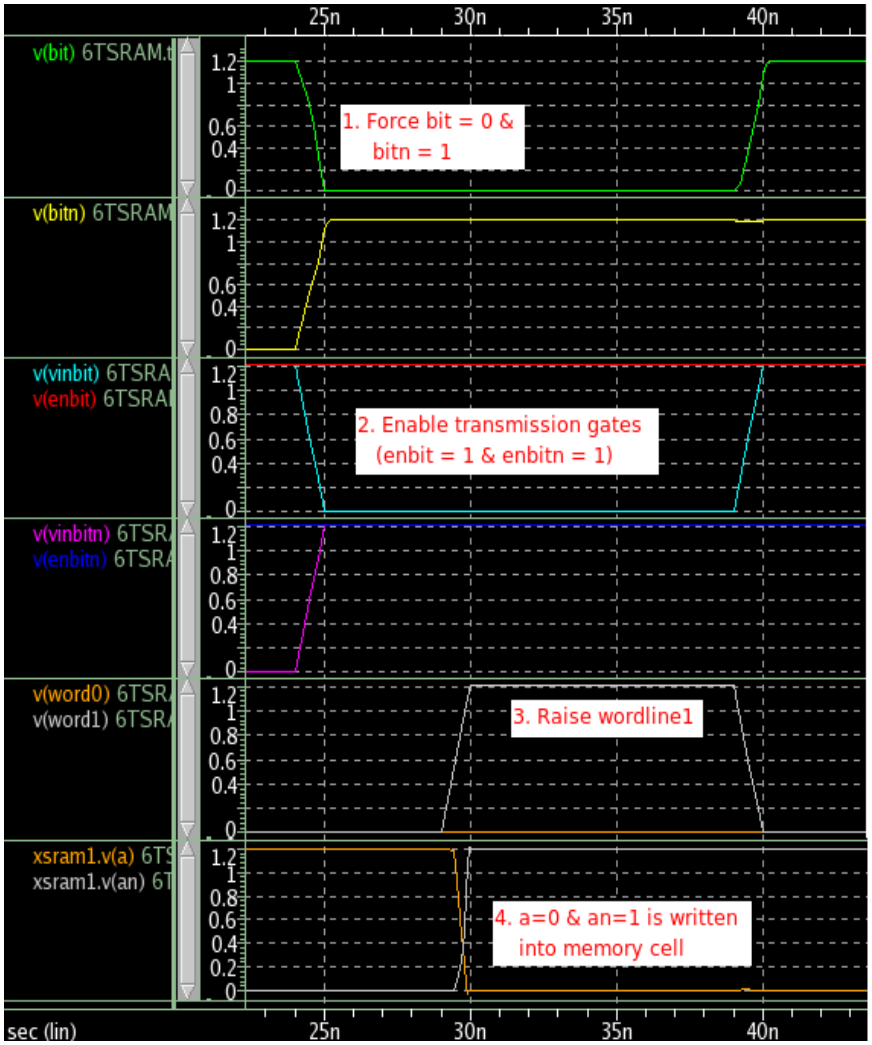




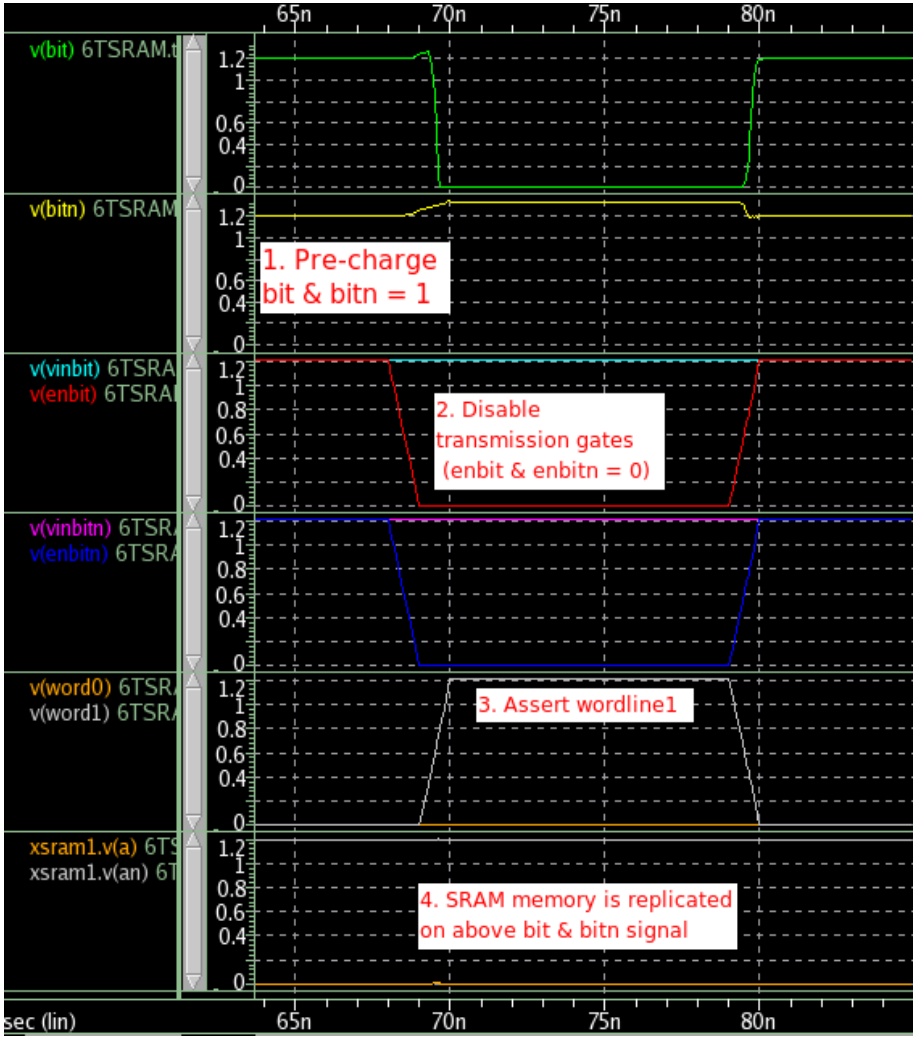
- Instantiated 2 SRAM subcircuit: cell 0 and cell 1
- Want to write one into cell 0, zero into cell 1, read from cell 0, and read from cell 1
- Added transmission gates for bitlines in order to control when bitline is an input and when it's an output
- Write:
    1. Force desired value onto bitline by enabling transmission gate
    2. Raise wordline
- Read:
    1. Pre-charge bitline and bit_b to 1
    2. Disable transmission gates
    3. Raise wordline
- Once the SRAM was able to be correctly written into and read out from (above waveform diagram) we determined the minimal widths of the transistors.
- After the minimal width was determined we moved on to building an extra 6 SRAM cells

Results

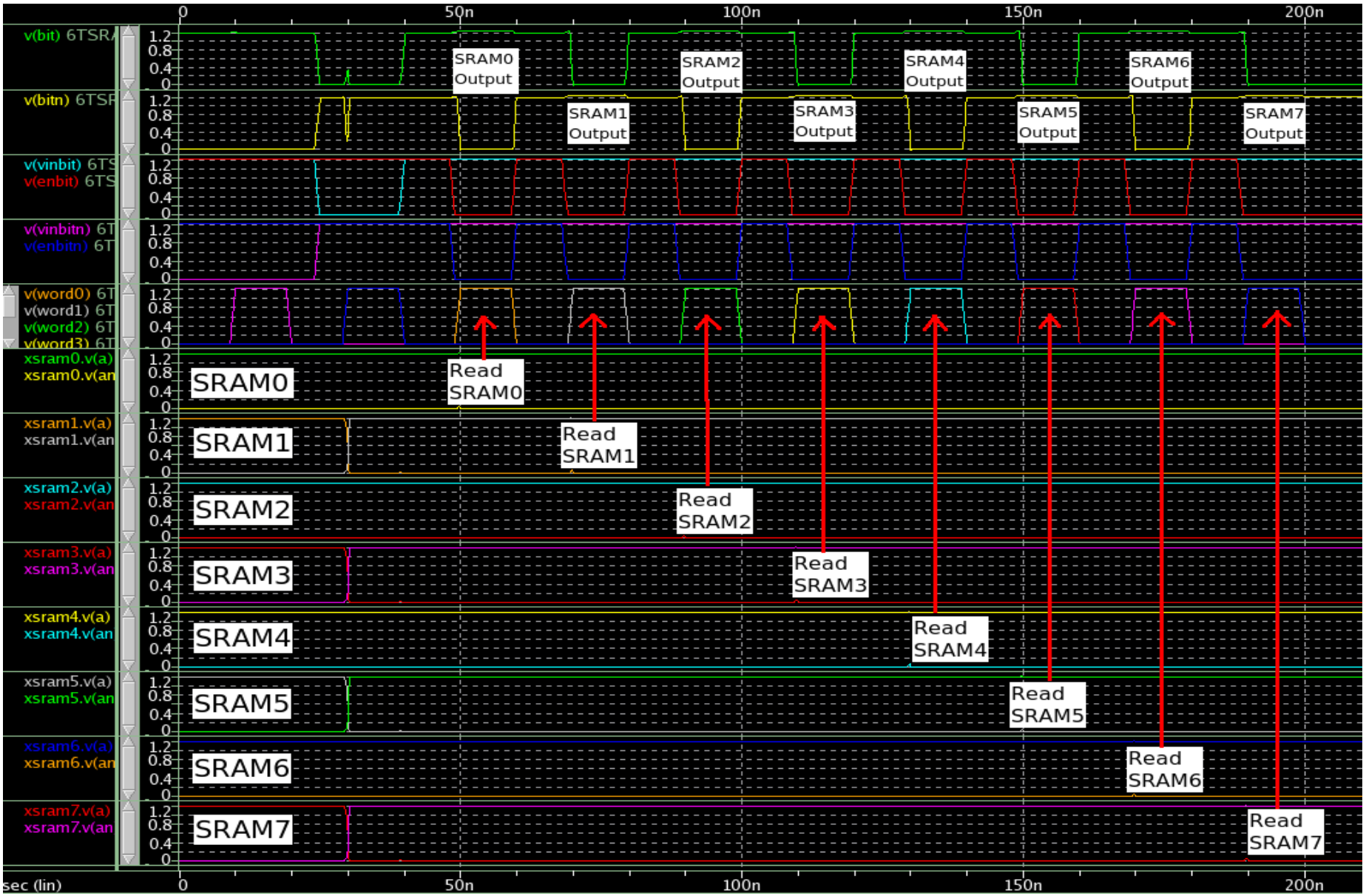
- Write 0 into cell 1



- Read 0 from cell 1



Results (2)


0
50n
100n
150n
200n
v(bit) 6TSR
v(bitn) 6TSR
v(vinbit) 6TS
v(enbit) 6TS
v(vinbitn) 6T
v(enbitn) 6T
v(word0) 6T
v(word1) 6T
v(word2) 6T
v(word3) 6T
xsram0.v(a)
xsram0.v(an
xsram1.v(a)
xsram1.v(an
xsram2.v(a)
xsram2.v(an
xsram3.v(a)
xsram3.v(an
xsram4.v(a)
xsram4.v(an
xsram5.v(a)
xsram5.v(an
xsram6.v(a)
xsram6.v(an
xsram7.v(a)
xsram7.v(an
1.2
0.8
0.4
0
SRAM0 Output
SRAM1 Output
SRAM2 Output
SRAM3 Output
SRAM4 Output
SRAM5 Output
SRAM6 Output
SRAM7 Output
SRAM0
SRAM1
SRAM2
SRAM3
SRAM4
SRAM5
SRAM6
SRAM7
Read SRAM0
Read SRAM1
Read SRAM2
Read SRAM3
Read SRAM4
Read SRAM5
Read SRAM6
Read SRAM7
sec (lin)

Conclusion

- Final area of 8 SRAM cells is 6*8*1 = 48um^2
- We decided leave all PMOS and NMOS transistor widths to just Wm
  - From the diagram below it is evident that this balancing works
  - With such small areas we can have higher density and lower power consumption in a cell