

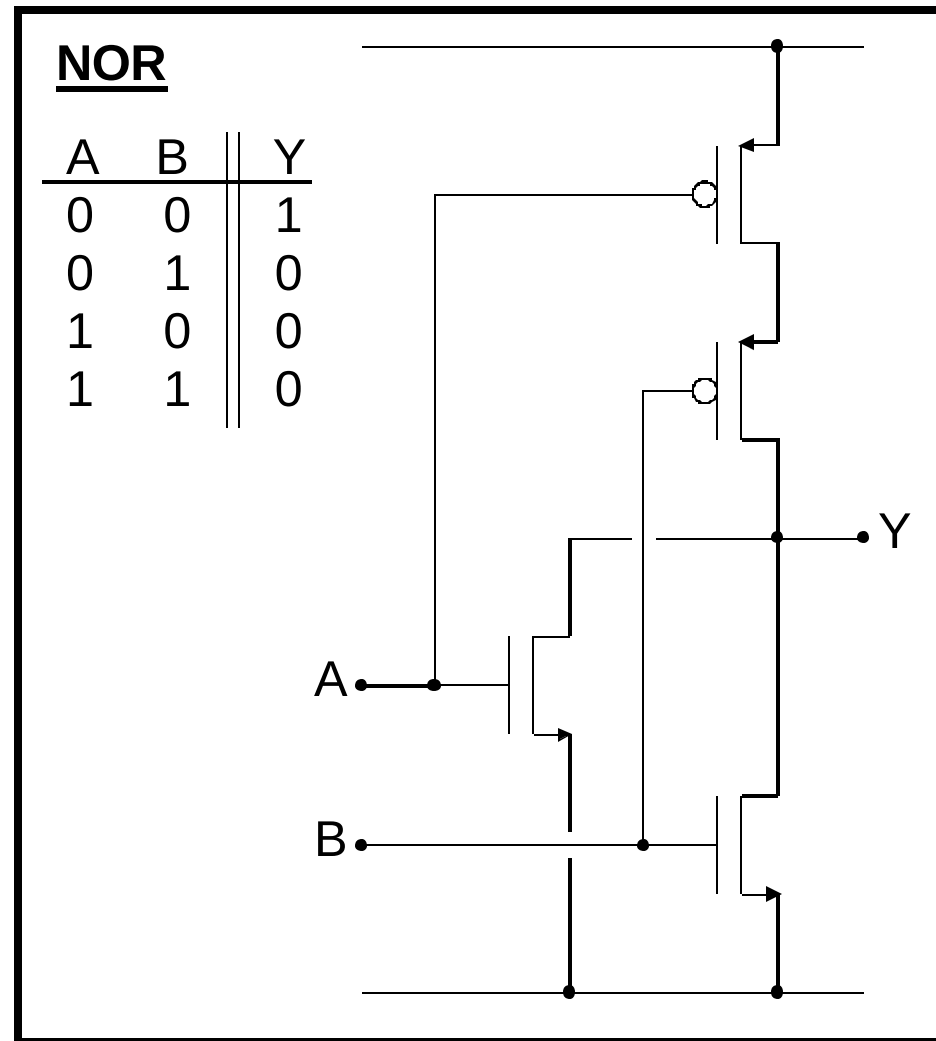
Outline

- Introduction – *“Is there a limit?”*
- Transistors – *“CMOS building blocks”*
- Parasitics I – *“The [un]desirables”*
- Parasitics II – *“Building a full MOS model”*
- The CMOS inverter – *“A masterpiece”*
- Technology scaling – *“Smaller, Faster and Cooler”*
- Technology – *“Building an inverter”*
- Gates I – *“Just like LEGO”*
- The pass gate – *“An useful complement”*
- **Gates II – “A portfolio”**
- Sequential circuits – *“Time also counts!”*
- DLLs and PLLs – *“A brief introduction”*
- Storage elements – *“A bit in memory”*

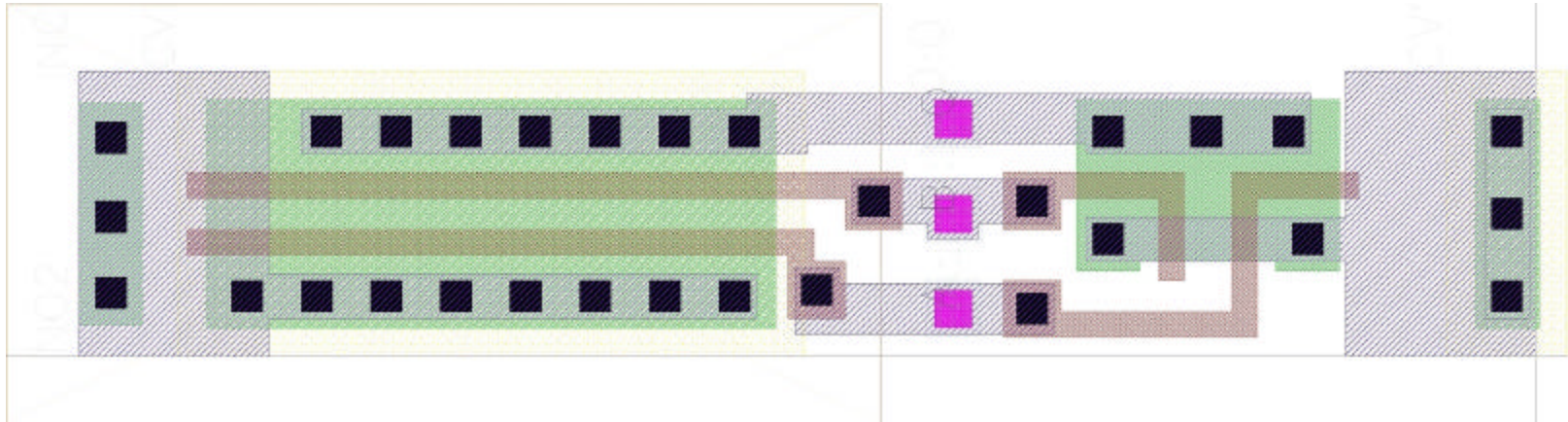
“A portfolio”

- NOR 2-inputs
- Tri-state inverter
- Mux 2-inputs
- Xor 2-inputs
- AOI 4-inputs
- Full adder

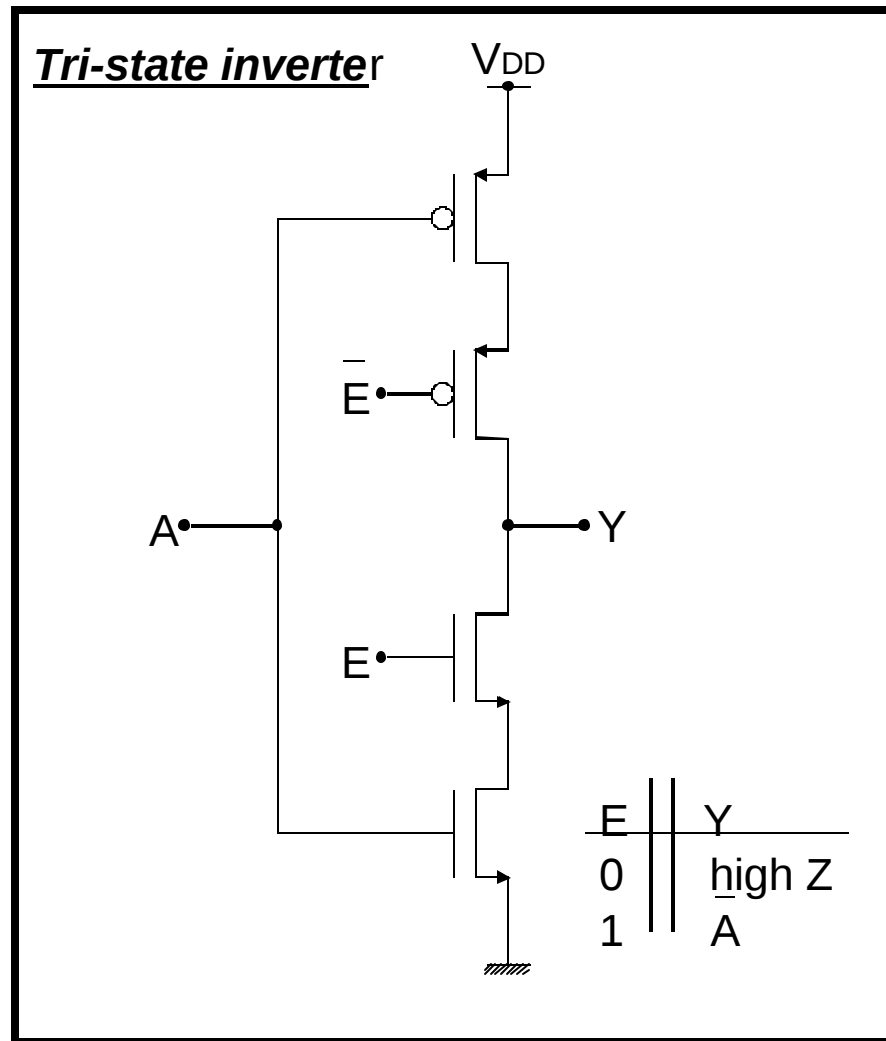
NOR 2-inputs



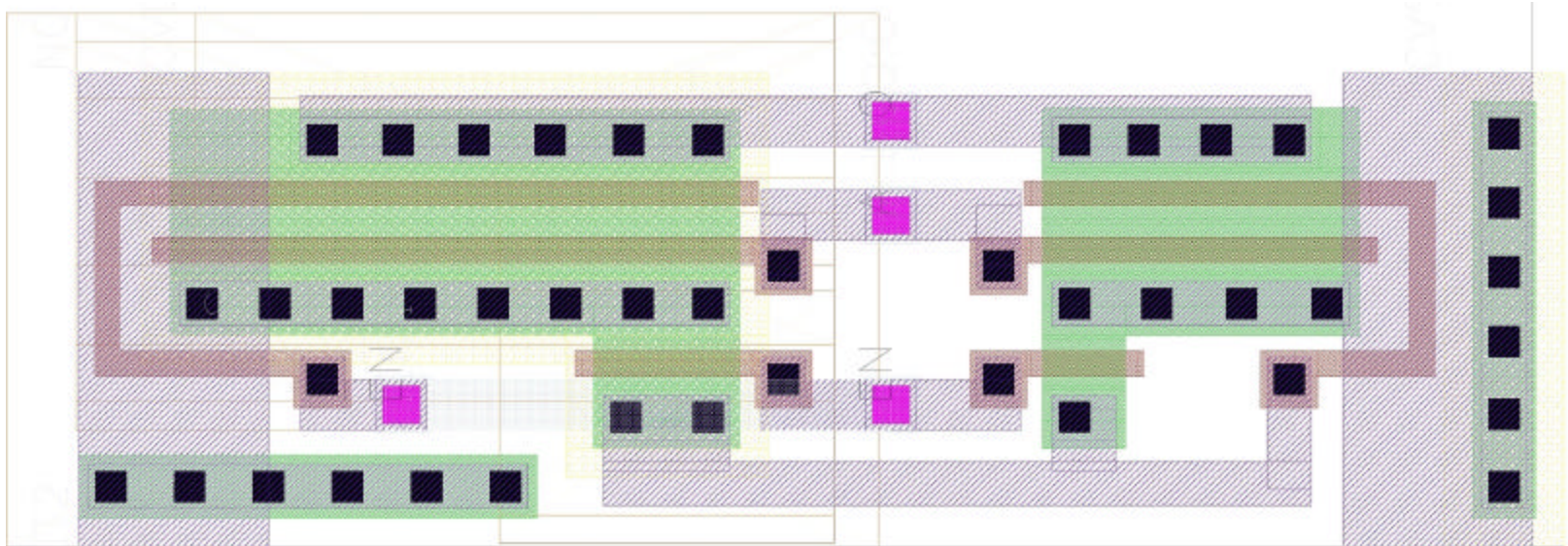
NOR 2-inputs



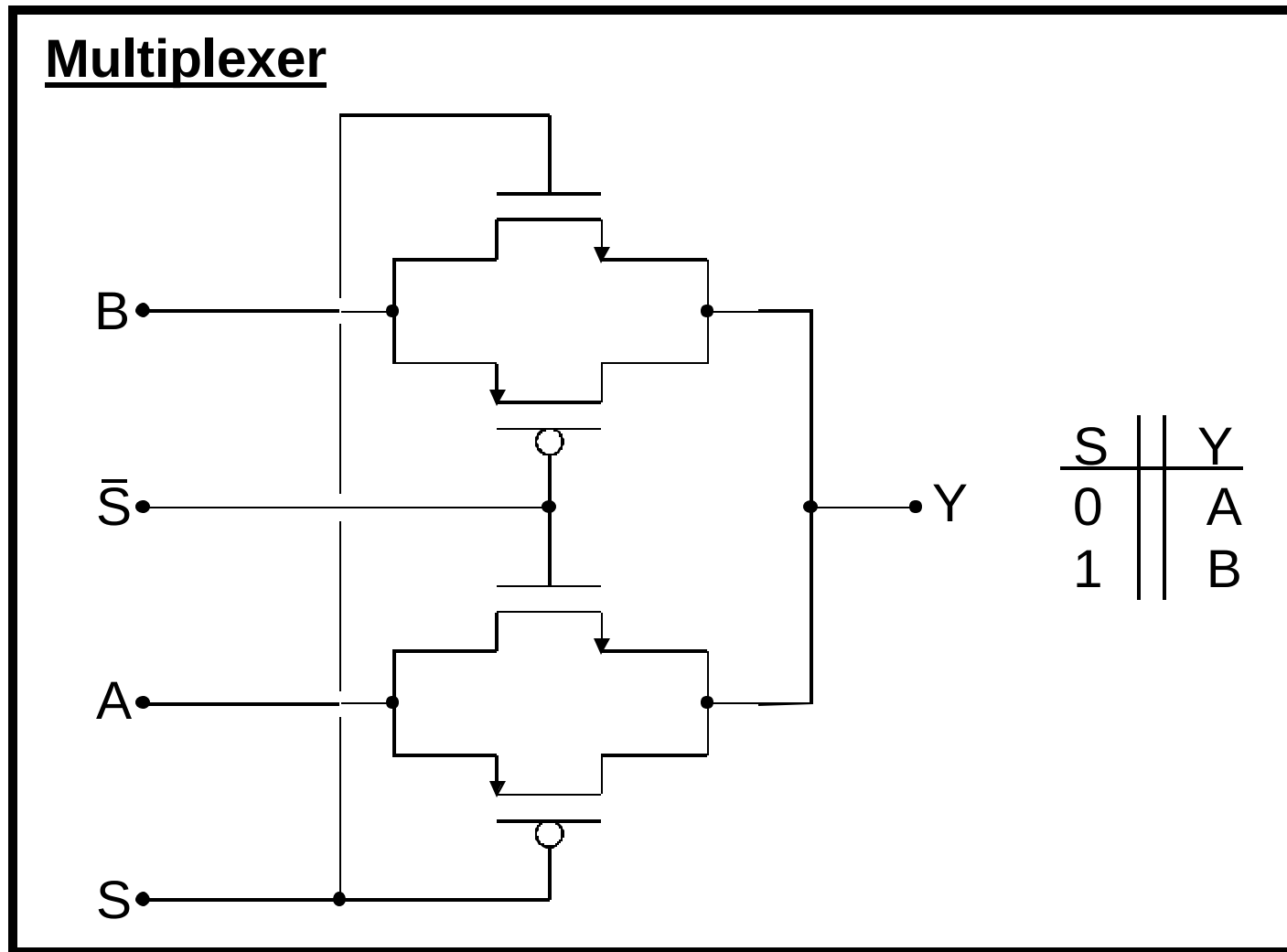
Tri-State Inverter



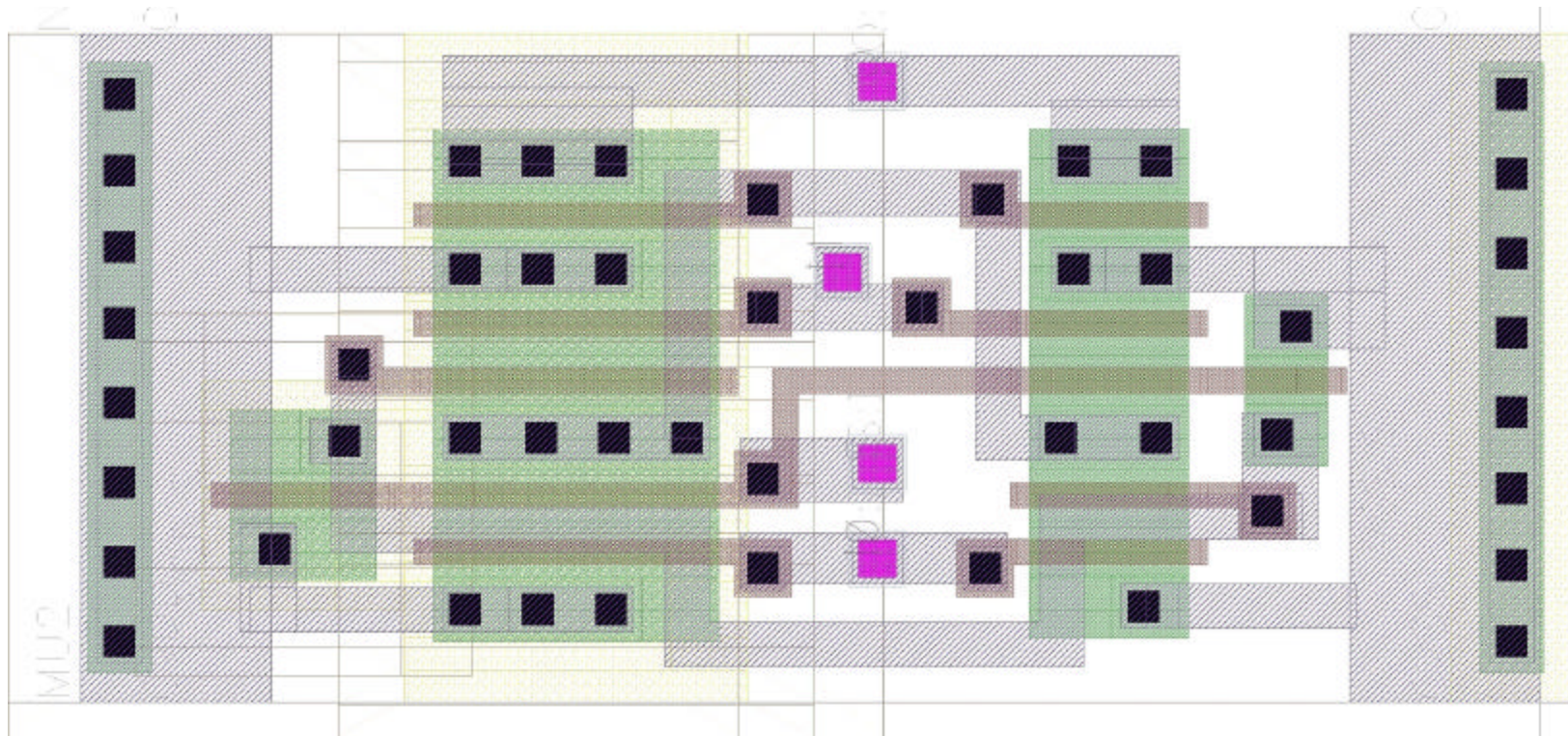
Tri-State Inverter



MUX 2-inputs

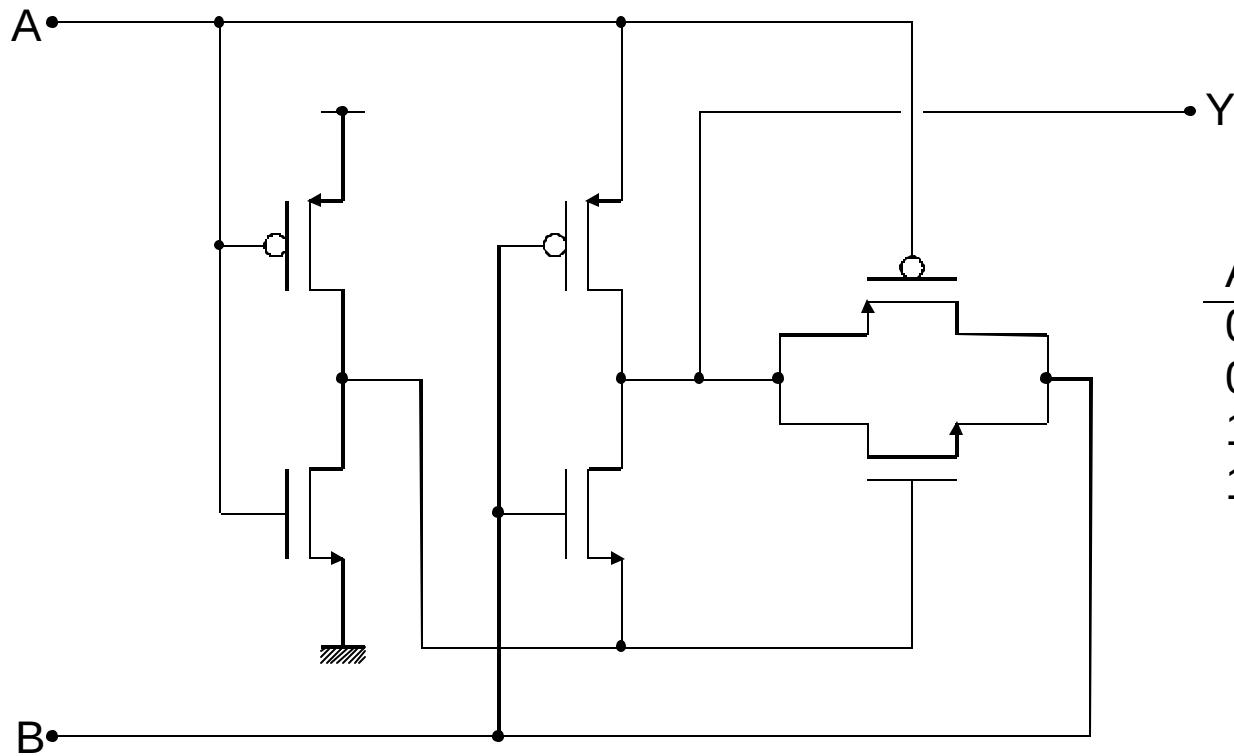


MUX 2-inputs



XOR

Exclusive OR

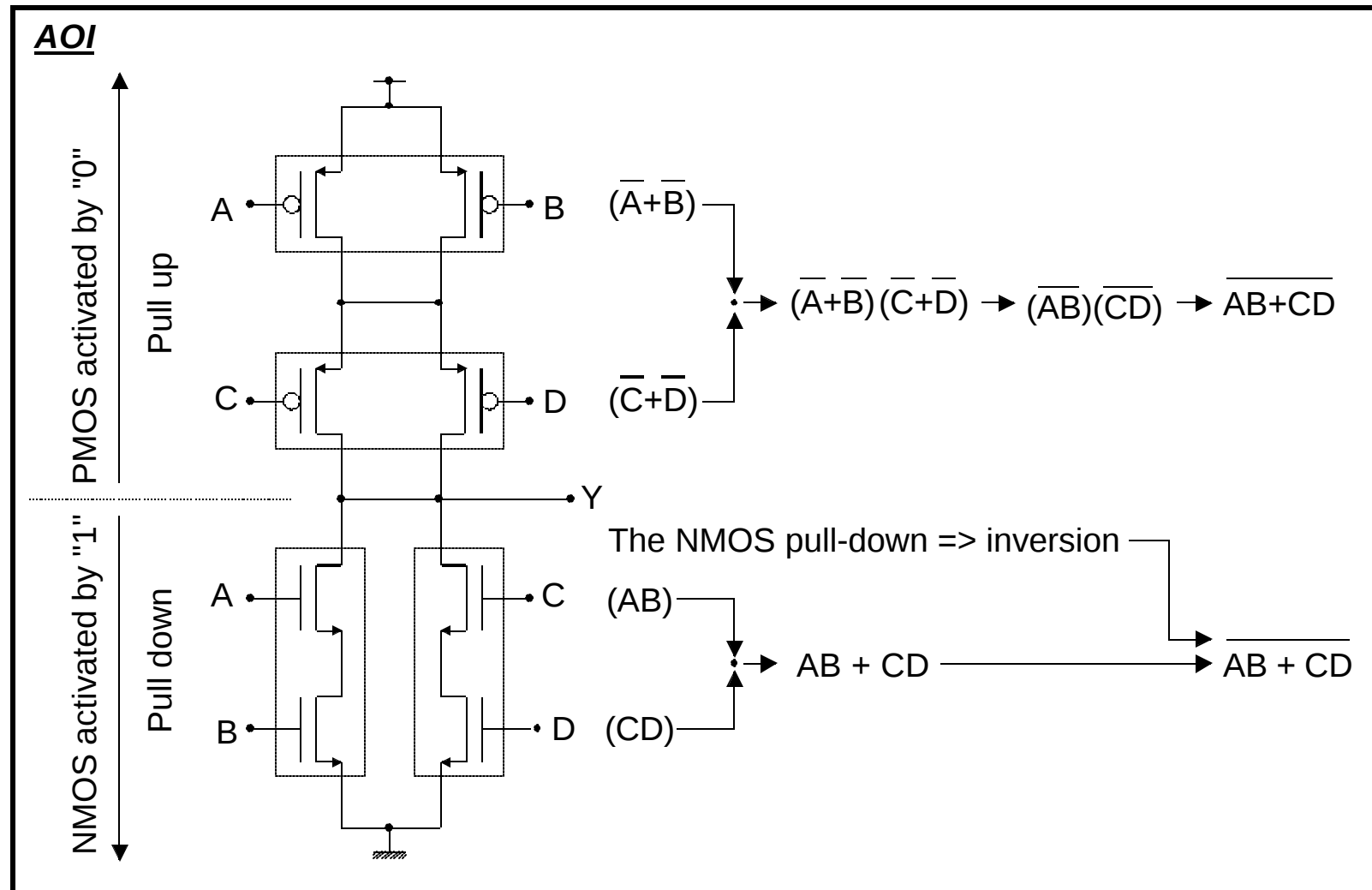


A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

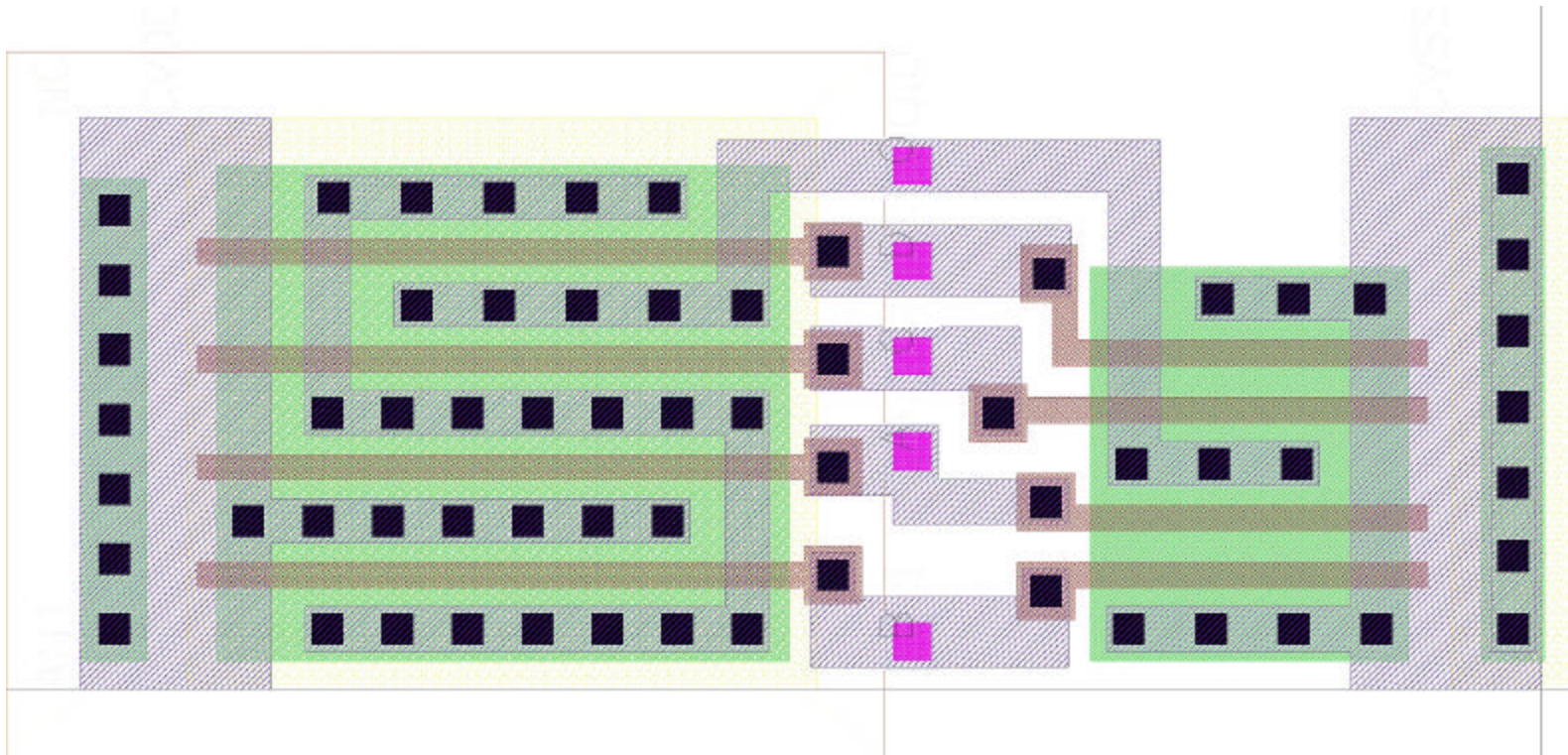
XOR



AOI 4-inputs



Complex CMOS gates: AOI



Full Adder

Adder

$$\overline{\text{CARRY}} = (A+B)C + AB$$

$$\text{SUM} = (A+B+C)\overline{\text{CARRY}} + ABC$$

