



EGC220

Class Notes

3/28/2023

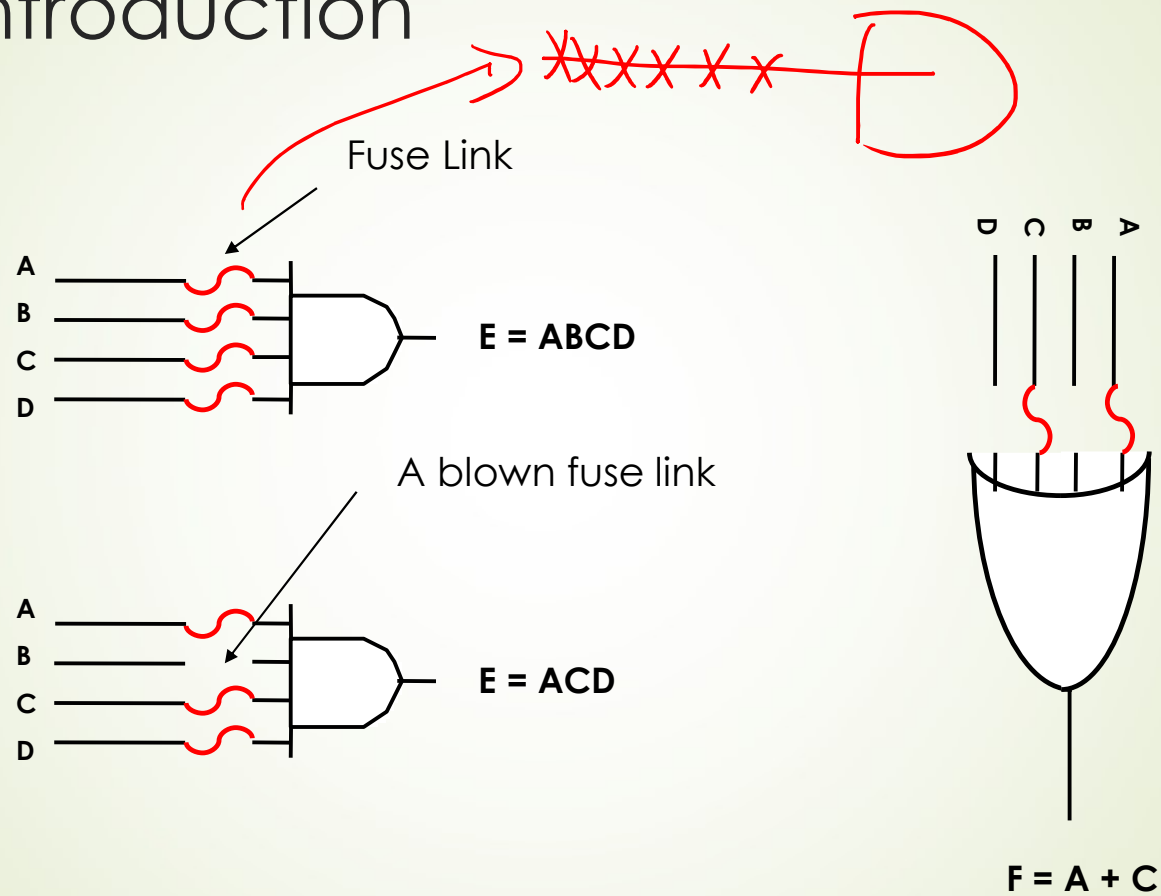


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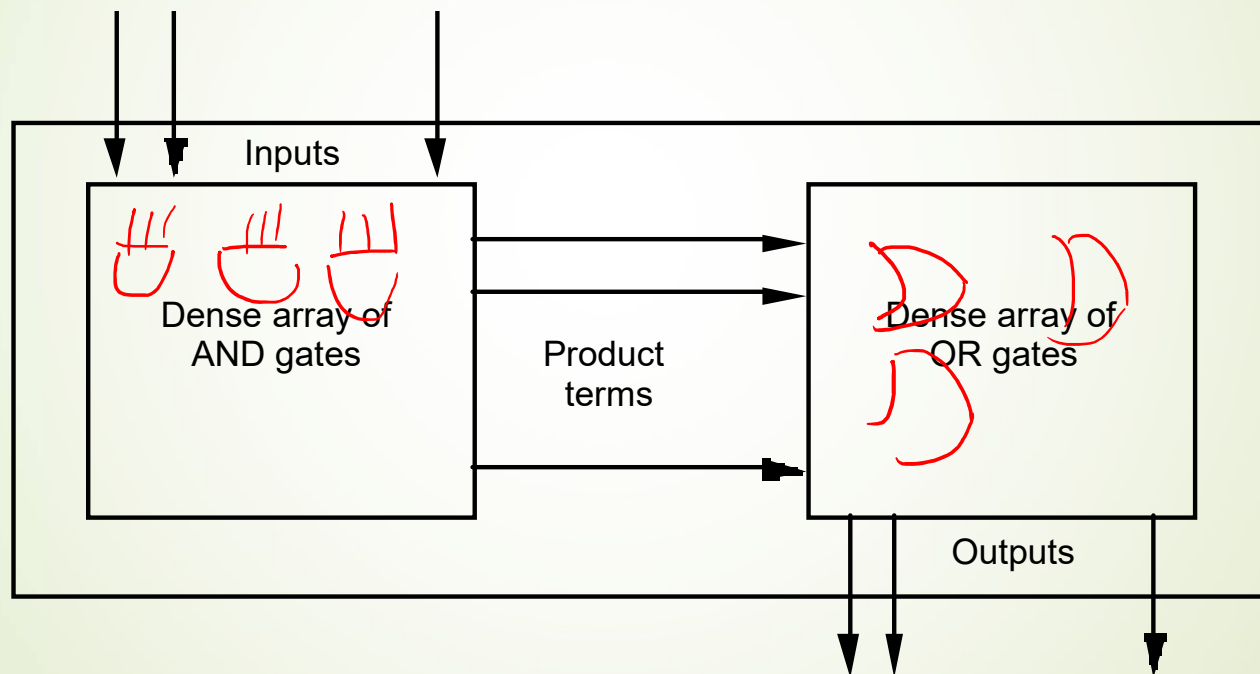
Introduction



Basic PLDs

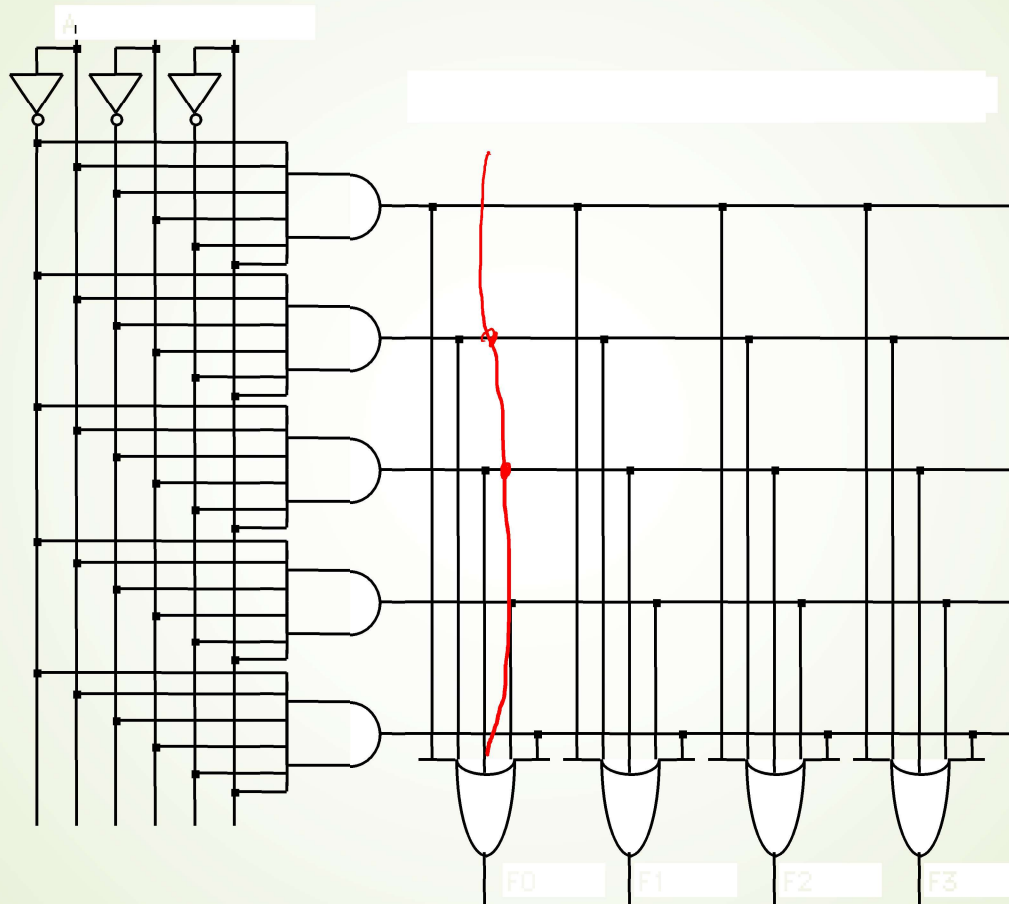
Programmable AND block followed by a programmable OR block

Programmable Array Block Diagram for Sum of Products Form



Basic PLDs

All possible connections are available before programming



Problem 1

Implement the following functions using a PLE.

$$F_1 = \sum m(0, 2, 5, 7, 8, 10, 12, 13)$$

$$F_2 = \sum m(0, 2, 4, 5, 6, 8, 10, 13, 15)$$

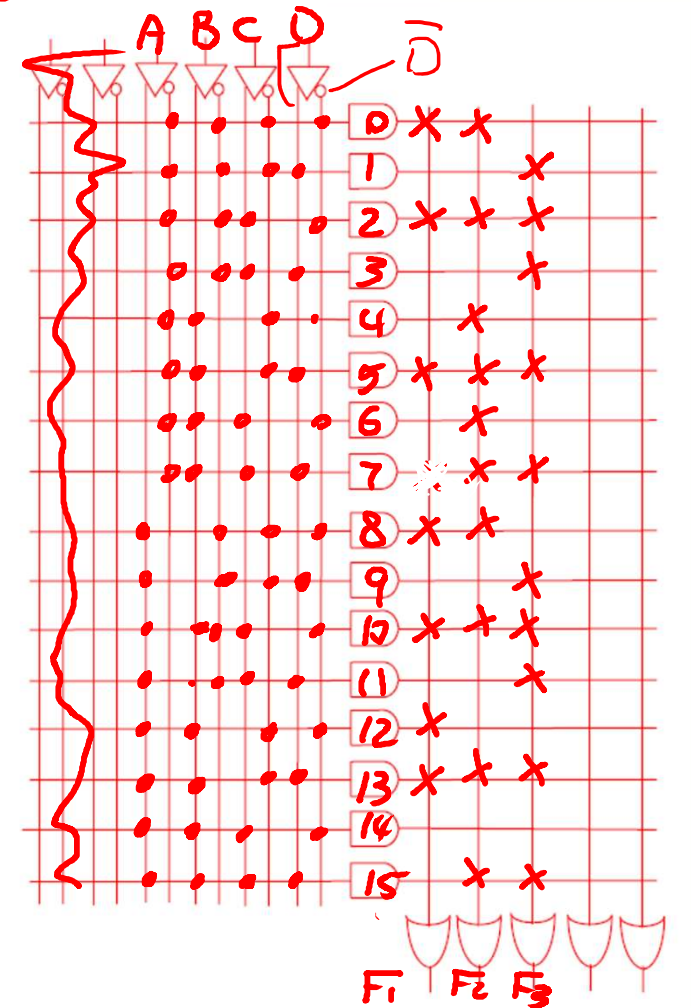
$$F_3 = \sum m(1, 2, 3, 5, 7, 9, 10, 11, 13, 15)$$

• → Fixed
X → programmable

implement the min terms

Fixed and Prog. OR

$\bar{A} \bar{B} \bar{C} \bar{D}$



Problem 2

Repeat problem 1 for a PAL. (You must simplify your answer)

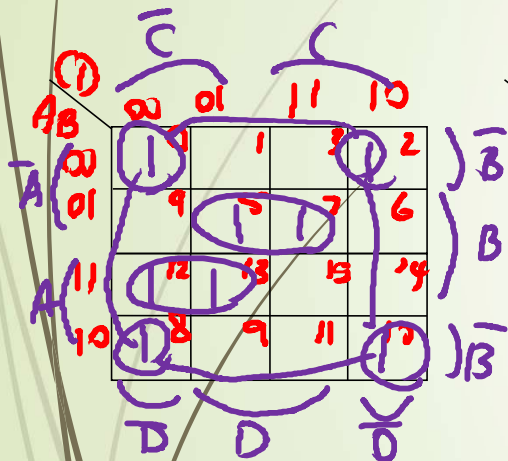
$$F_1 = \sum m(0, 2, 5, 7, 8, 10, 12, 13)$$

$$F_2 = \sum m(0, 2, 4, 5, 6, 8, 10, 13, 15)$$

$$F_3 = \sum m(1, 2, 3, 5, 7, 9, 10, 11, 13, 15)$$

AND Prog. OR Fixed

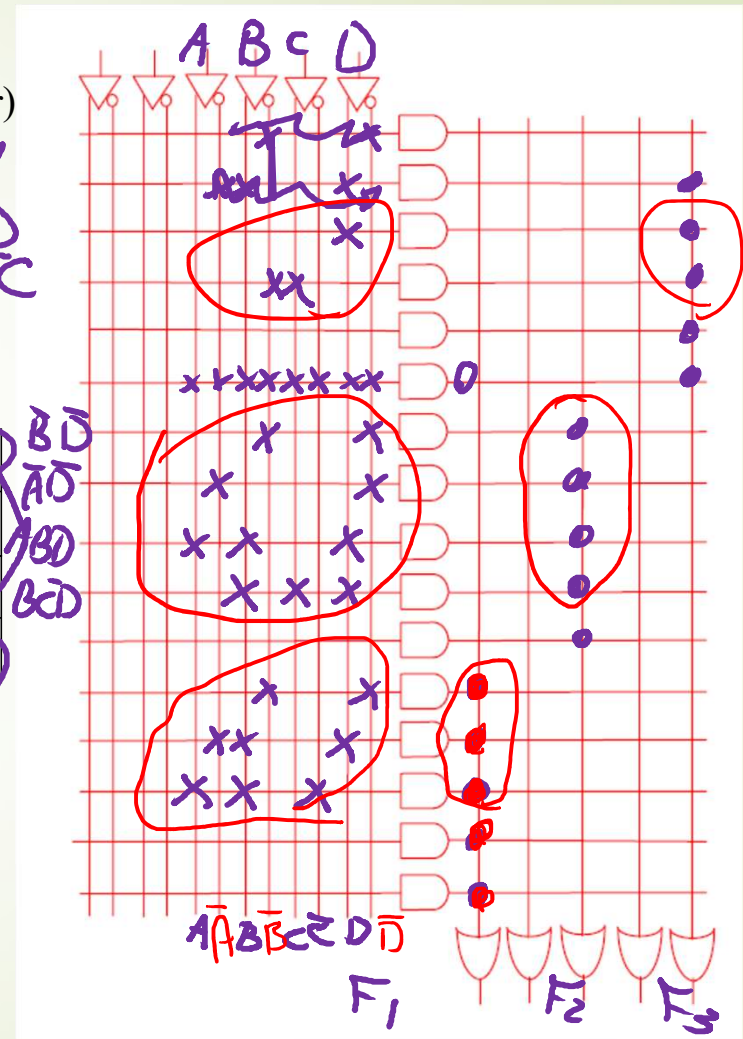
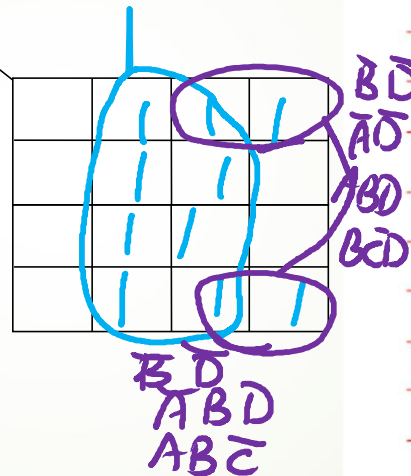
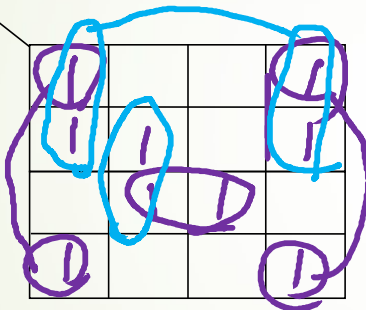
Regular



$$F_1 = \bar{B}\bar{D} + \bar{A}\bar{B}D + AB\bar{C}$$

$$F_2 = \bar{B}\bar{D} + \bar{A}\bar{D} + ABD + B\bar{C}D$$

$$F_3 = D + \bar{B}C$$

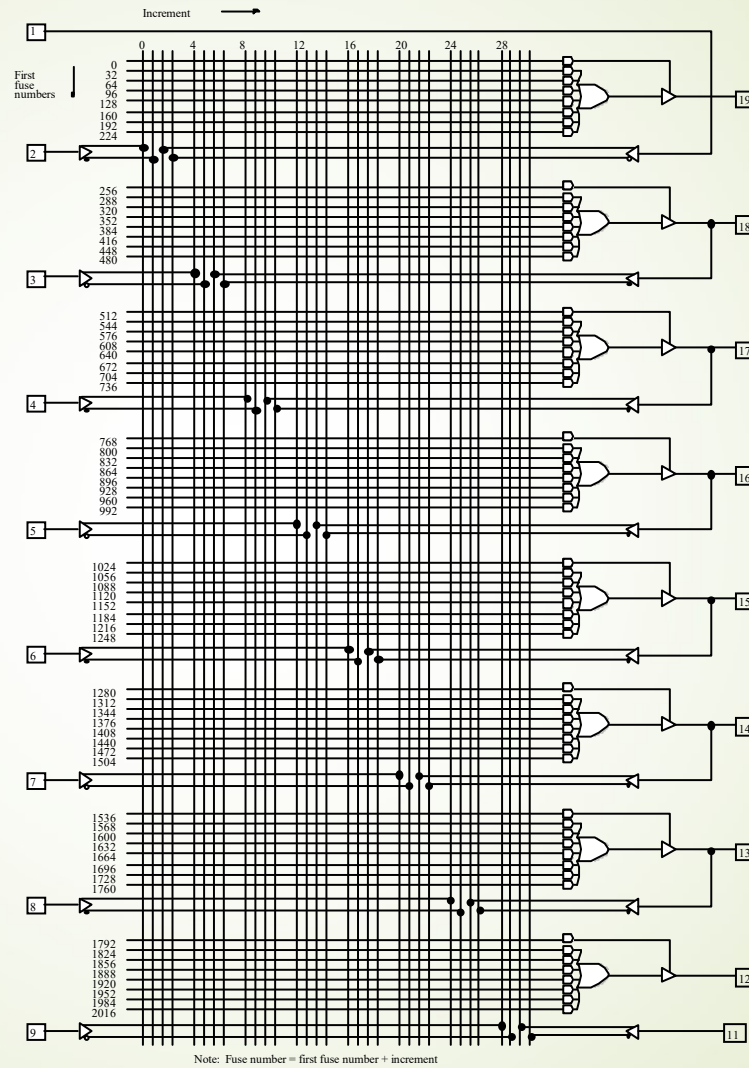


Actual PAL Device

16H8PAL:

➤ **16 inputs**

➤ **8 outputs**



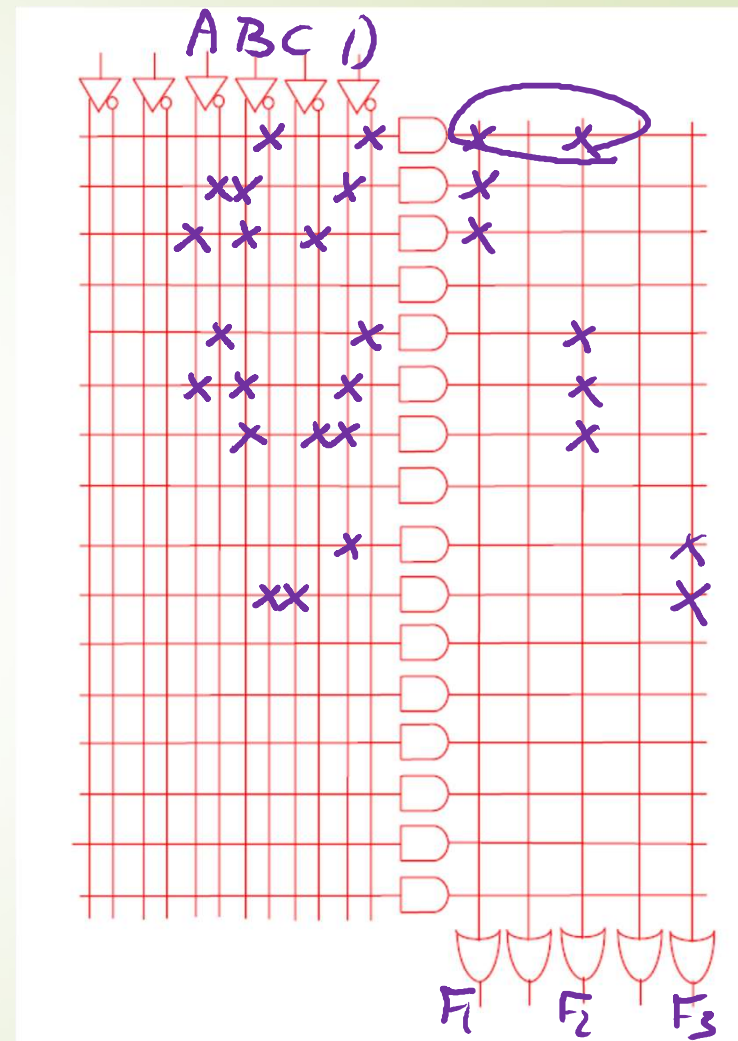
AND prog OR prog.

Problem 3

Repeat problem 1 for a PLA. (You must simplify your answer)

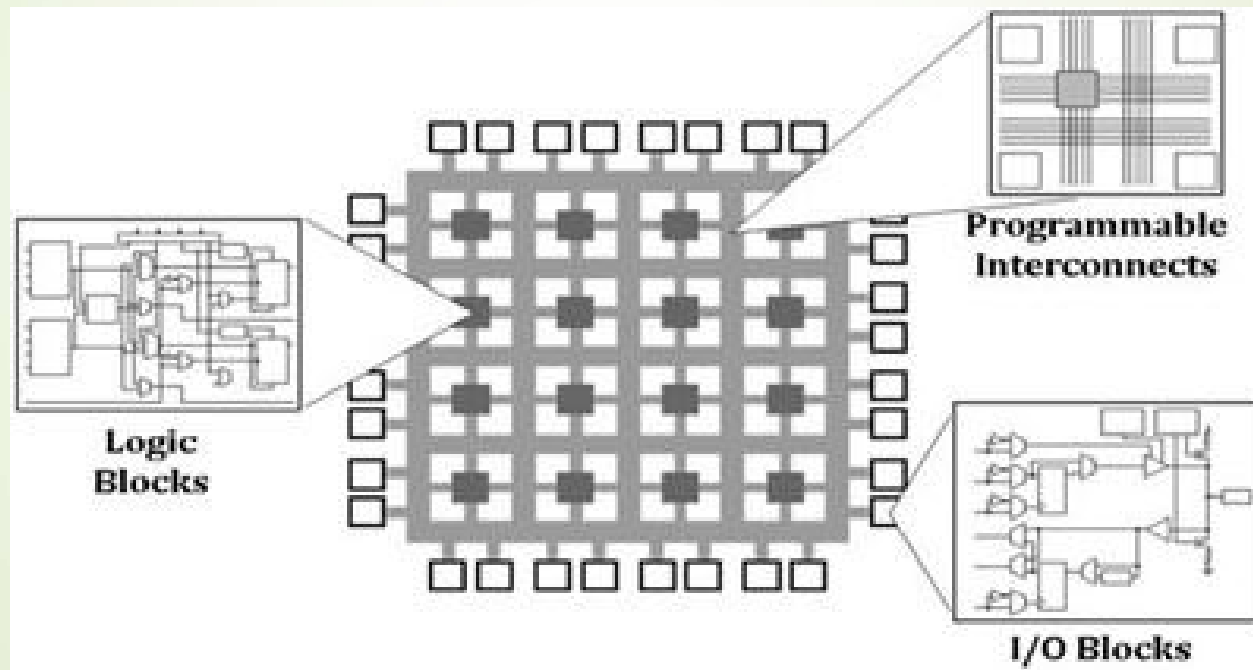
X much more
expensive
than @

$B\bar{D}$
 $\bar{A}BD$
 $AB\bar{C}$
 $\bar{A}\bar{D}$
 ABD
 $B\bar{C}D$
 $\bar{D}$
 $\bar{B}C$



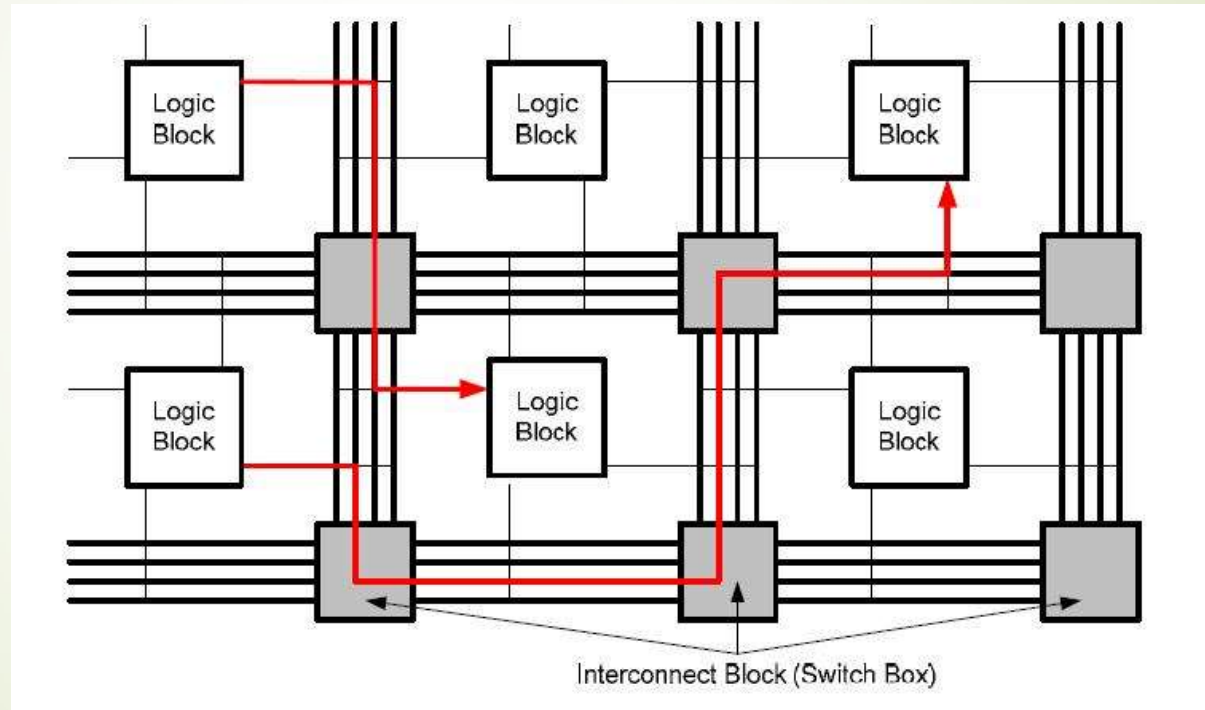
What about FPGA?

- Has millions of programmable gates organized into Logic Blocks
- Logic Blocks are interconnected using programmable switches.



What about FPGA?

- Programmable interconnects using switch matrixes
- Several types of interconnects: short distance (local), long distances across chip,



- FPGA's provide enormous design capabilities.

