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COURSE TITLE: DIGITAL SYSTEMS DESIGN WITH VHDL

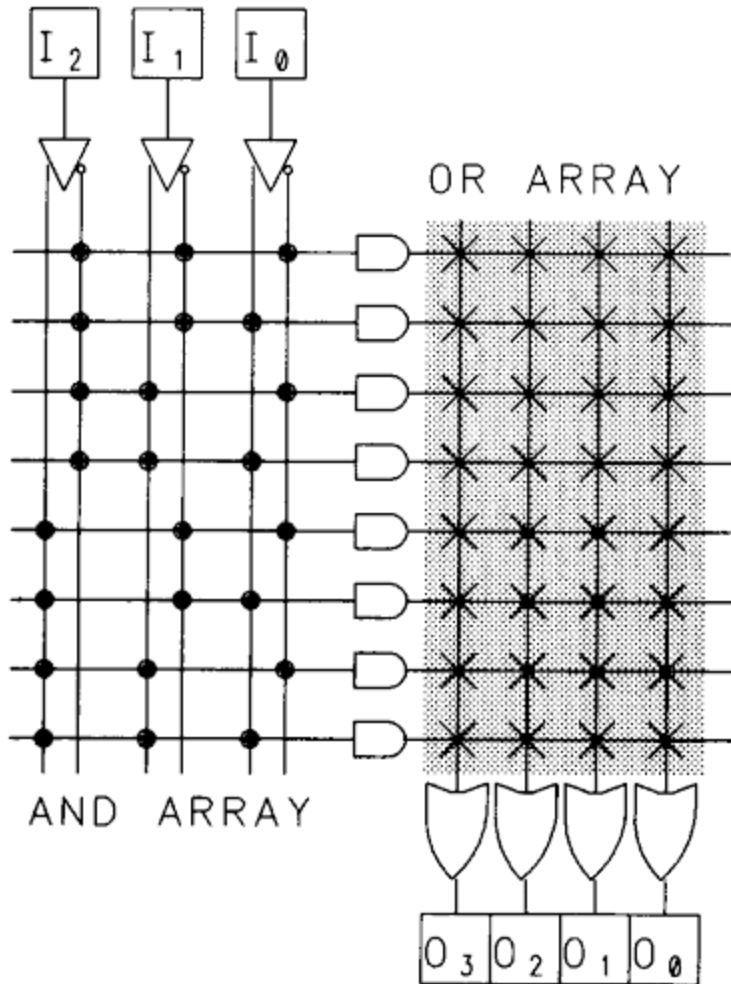
What is a PLD?

It is the short for Programmable Logic Device, a generic term for an integrated circuit that can be programmed in a laboratory to perform complex functions. A PLD consists of arrays of AND and OR gates. A system designer implements a logic design with a device programmer that blows fuses on the PLD to control gate operation. System designers can use development software that converts basic code into instructions a device programmer needs to implement a design.

PLD types can be classified into the following groups:

1. PROMs (Programmable Read Only Memory) - offer high speed and low cost for relatively small designs
2. PLAs (Programmable Logic Array) - offer flexible features for more complex designs
3. PAL/GALs (Programmable Array Logic/Generic Array Logic) - offer good flexibility and are faster and less expensive than PLAs

Example of PLD



A PLD device can consist of an array of AND gates and another array of OR gates

PAL

Programmable Array Logic (PAL) is a type of Programmable Logic Device (PLD) used to realize a particular logical function. PALs comprise of an AND gate array followed by an OR gate array as shown by Figure 1. However, it is to be noted that here only the AND gate array is programmable unlike the OR gate array which has a fixed logic. This is because here the inputs are fed to the AND gates through fuses (shown in blue), which act as programmable links.

Programmable-AND and fixed-OR structure of PALs make them less flexible from programming point of view when compared with Programmable Logic Arrays (PLAs). However due to the same reason PALs are less expensive than PLAs.

The internal structure of PAL is shown below

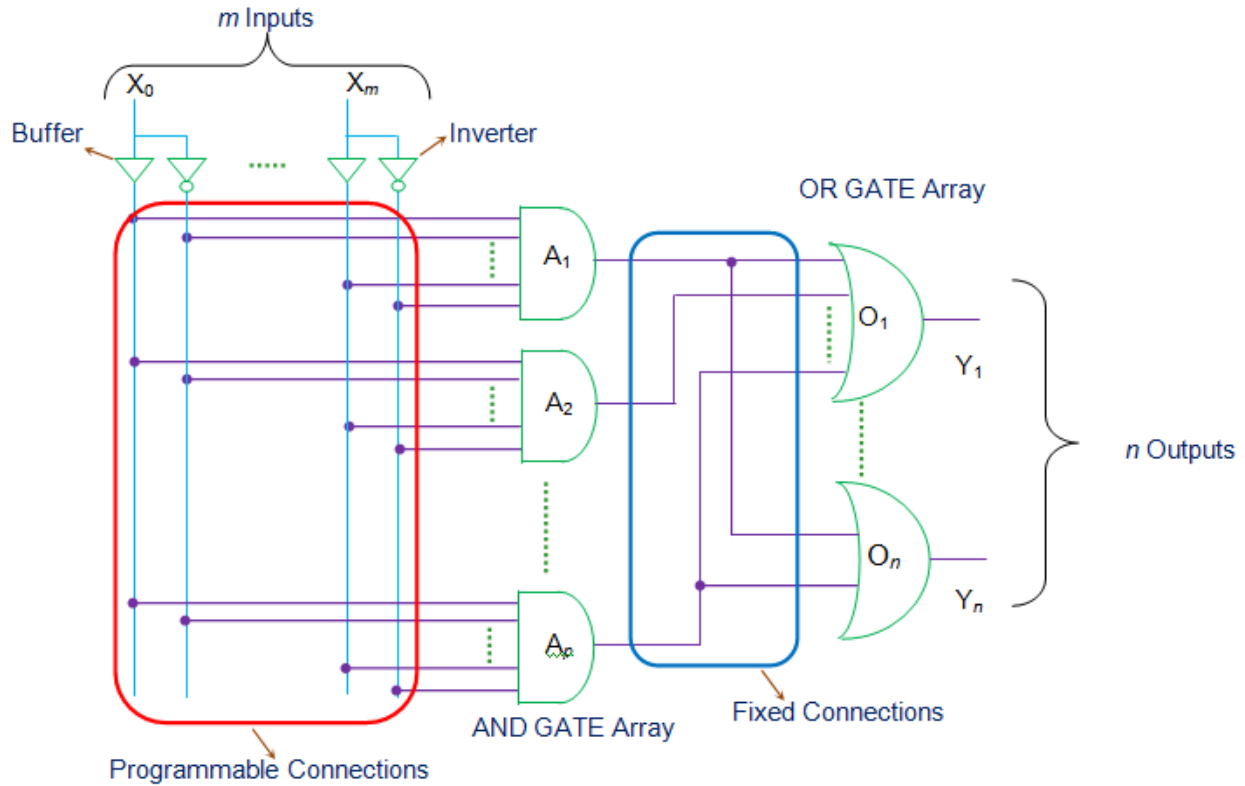


Figure 2 Internal Structure of Programmable Array Logic (PAL)

PLD architecture

Problems of using standard ICs:

Problems of using standard ICs in logic design are that they require hundreds or thousands of these ICs, considerable amount of circuit board space, a great deal of time and cost in inserting, soldering, and testing. Also require keeping a significant

inventory of ICs.

Advantages of using PLDs:

Advantages of using PLDs are less board space, faster, lower power requirements

(i.e., smaller power supplies), less costly assembly processes, higher reliability (fewer

ICs and circuit connections means easier troubleshooting), and availability of design

software.