IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 2 Issue 3, March 2015.
www.ijiset.com
ISSN 2348 – 7968

Virtual Programmable Logic Device

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Abstract

In this digital world it is very important that you must have a device which gives you expected output by consuming less time and occupying lesser space. To fulfill these condition we are designing VPLD which has the ability to work as Multiplexer, Subtractor, Adder, Counter, Flip flops and Equation parser all in one kit this will also help the students to understand the subject of Digital Logic Design as well. The project is entirely microprocessor driven.

Keywords: R ATMEGA 32, Max 232,GUI.

1. Introduction

Using advanced techniques manufacturer's can build surface of small piece of semiconductor material called as chip .These chips are used for connection purpose. Almost all LOGIC CIRCUITS are now realized with these chips. These chips may be programmed to work as different functions such as Adders, Sub tractors, Flip flops, Multiplexers and Counters etc. Such kind of chips is known as PLD (Programmable Logic Devices).

These devices are used to build digital circuits. Programmable Logic Devices consists of array of switching elements. These devices are realized as sum of product operations. Basically a programmable logic device uses PROM (Programmable Read Only Memory) Memory. PLD comes in different form such as FPGA, CPLD, PAL, and PLA

This project presents a base that is directly connected to a microcontroller that can be programmed and reprogrammed again and again with any desired logic. Hence it is a TTL compatible digital IC.As this single kit can be function for any desired logic therefore the name given as VPLD(Virtual Programmable Logic Device).

VPLD is an electronic component used to build digital circuits. Unlike a logic gate, which has a fixed function, a Programmable Logic Device has an undefined function at the time of manufacture. Before the Programmable Logic Device can be used in a circuit it must be programmed. VPLD can be used to create user defined IC with their new functionality using Equation parser. VPLD can be used as an Analyzer which will be used to monitor the inputs and outputs of complex circuitries using Digital Logic Analyzer. VPLD can be used as Designer in which the user will generate their own waveforms and that can be used to drive and external circuitries.

2. Literature Survey

Programmable logic devices (PLDs) have all but replaced special-purpose logic devices such as AND gates, flip-flops, counters, multiplexers, etc. PLDs are chips that can be programmed, and often re-programmed, to implement different logic functions. [1]

Programmable Logic Devices are very flexible, reconfigurable; the same board can be utilized in multiple system designs. These devices work at very low voltage, high speed and low power consumption.[2]

Different logic gates integrated circuits (ICs) and structured logic ICs will be required at different times for which their availability and the required number are not always guaranteed.[3]

3. Working Principal

This Project has been parted into four modules.

3.1. Equation Parser

First module, which consists of equation parser that accepts the equation from user, checks the equation for syntax errors and if found correct, the equation can be used to drive the VPLD IC that is connected to the system via parallel/serial port.E.g. an equation like

Y= (A+B). (C+/D)

ISSN 2348 – 7968

Can be entered and the hardware will start acting accordingly. One of its pin will act as output Y and the other four will act as input A, B, C and D. The software continuously displays the pin assignments.

3.2. Standard Digital IC

Second module, in which VPLD can be used to replace any standard digital IC. There is a pre-programmed list of all the digital ICs generally used in a digital laboratory like Gates, Adders, Multiplexers, Encoders, Flip-Flops, and Counters etc. All the user needs to do is point and click on the digital-IC that is to be adapted by the VPLD IC.

3.3. Digital Logic Analyzer

Third module provides a feature called as DLA (Digital Logic Analyzer). A logic analyzer displays signals in a digital circuit that are too fast to be observed by a human being and presents it to a user so that the user can more easily check correct operation of the digital system. Logic analyzers are typically used for capturing data in systems that have too many channels to be examined with an oscilloscope. The DLA module is used to monitor the circuits/board amongst which the VPLD IC is inserted. We can check the waveforms at all the input pins of the VPLD IC. Hence even the external hardware can be debugged/analyzed using the VPLD IC. This module is mainly used to trouble shoot the hardware environment in which the VPLD IC is plugged in.

3.4. Design Wave Studio

Last module, in which we provide a new feature called as Design Wave Studio (DWS). There are endless applications, in which a specific clock signals are required to drive some digital hardware. In this section we provide a GUI through which the user can design his/her own waveform or a clock signal and then fire it on to the pins of the VPLD IC at the required rate/frequency. This is a mediocre replacement for digital function generators. A function generator is a piece of electronic test equipment or software used to generate electrical waveforms. These waveforms can be either repetitive or single-shot (once only) in which case some kind of triggering source is required (internal or external). The resultant waveforms can be applied to a device that will be under test and analyzed as they progress or run through the device, confirming the proper operation of the device or pointing out a fault in it.

VPLD is a simple board which acts as a Programmable Logic Device. It looks like an IC and is capable of working like any standard digital IC such as a Logic gate, Timer, Adder, Substractor, Mux, Demux, Counter, Flip-Flop, Encoder, Decoder, Comparator etc.

In this we will be using a PC for selecting particular operation and output will be displayed on the same. At the same type the output is displayed with the help of LEDs. The MAX 232 or USB is used to interface PC with microcontroller which is compatible with TTL logic and is a logic level convertor.

4. Block Diagram

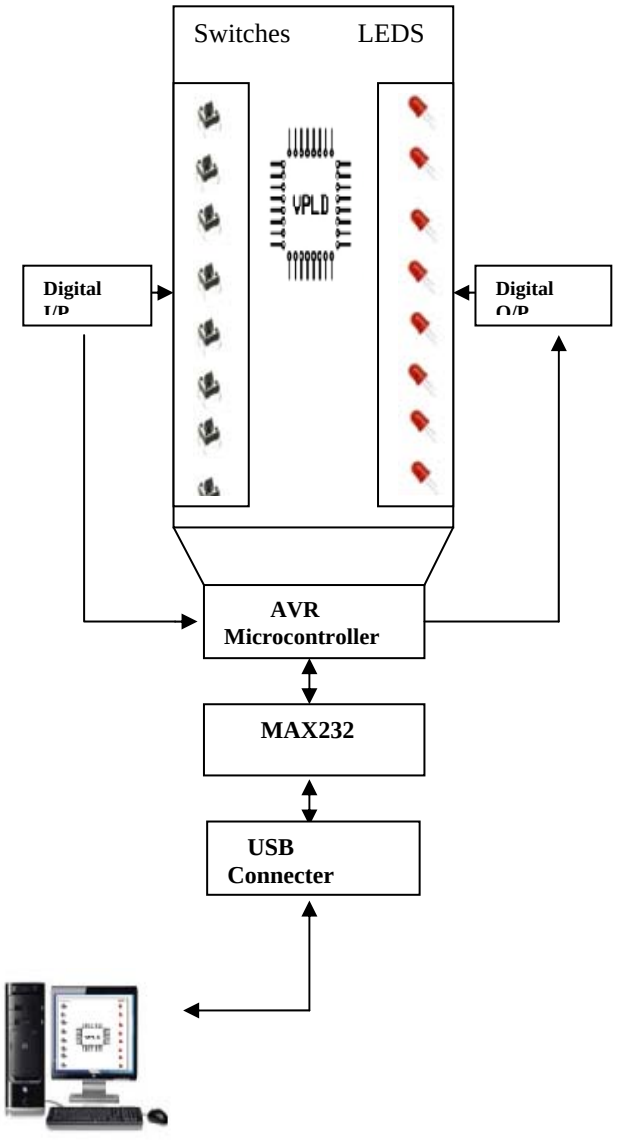

Fig.1 Block Diagram

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5. Result

5.1. MAIN MENU FORM

In the main menu there are all button . we have to select the button to perform the operation.

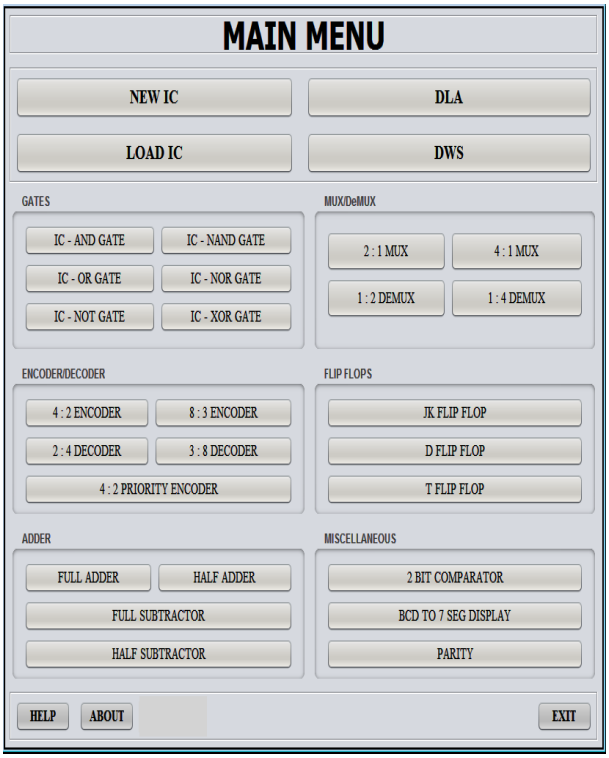

Fig.2 Menu Form

5.2. DIGITAL LOGIC ANALYZER

A logic analyzer displays signals in a digital circuit.

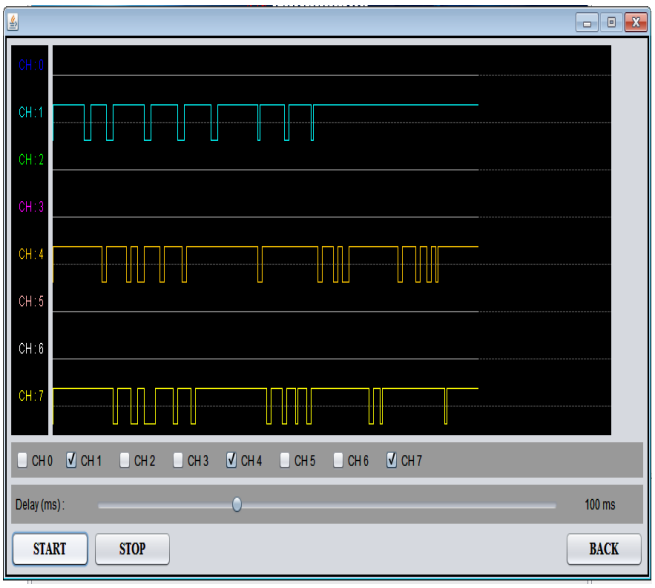

Fig.3 Digital Logic Analyzer

5.3. DESING WAVE STUDIO

In this we can design our own waveform.

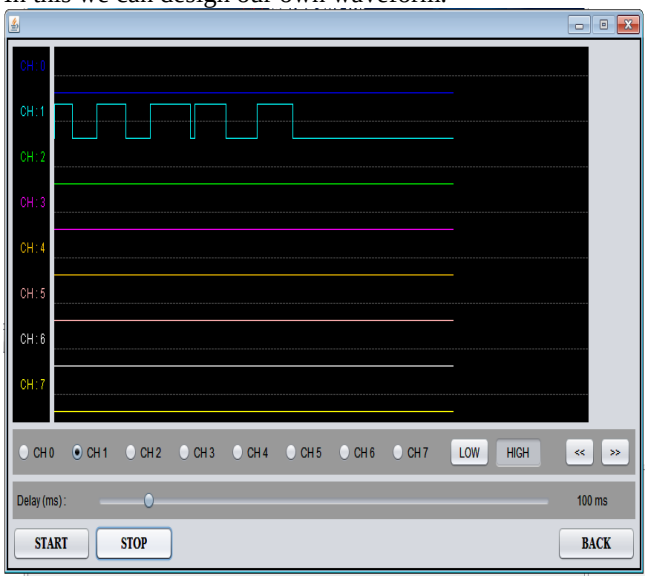

Fig.4Desing Wave Studio

4. Conclusions

Digital logic device as presented in this paper provide a very durable , robust and flexible solution and it provides a platform for various digital operations also it is useful for performing practical's in laboratory with less space requirement.

Acknowledgments

We would like to express our sincere gratitude to our Project Guide Prof.M.S.Kasar, Assistant Professor at Bharati Vidyapeeth's College Of Engineering for Women, Pune for his valuable guidance and encouragement during the course of this period. He contributed in implementing the project based on Embedded System.

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ISSN 2348 – 7968

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