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A Modular FPGA Implementation Of Reliable Pulse Generator

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Abstract: ***This paper describes an 8-channel differential pulse generator based on frequency synthesizer and I2C. It has been designed to analyse digital delay or frequency variation. The input signal for each channel is provided by a frequency synthesizer based on a external crystal oscillator the chosen input is delivered to a delayed loop controlled using inter-integrated communication controller module. An output driver is used to switch the output based on the working condition of the system***

Keywords: ***Frequency synthesizers, Inter-Integrated Circuit (I2C), Spartan 3E FPGA.***

I. INTRODUCTION

Pulse generators are mainly used in different fields of electronics and instrumentation, because of the accurate delay timing. Pulse generators available on markets have either accurate delay timing or more channels, but not existing both features. In this paper,describes a modular pulse generator with eight channels and accurate delay timing. Furthermore the input signal for each channel is provided by a frequency synthesizer based on a crystal oscillator.

I. TWO CHANNEL SECTION

The eight channel pulse generator is divided into four sections ,that is each section consists of two channels. it allows the possibility to expanding the number of channels in future. The design of this pulse generator is divided into three parts, as shown in Fig. 1.

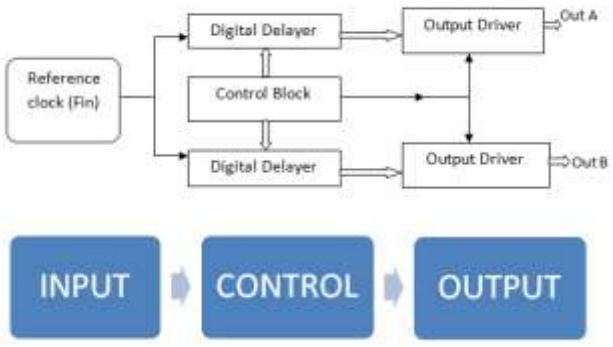


Fig. 1. Schematic of each two channel section.

Input Stage

The input signal can be chosen by a frequency synthesizer based on an external crystal oscillator. The input stage that is, the on-board frequency synthesizer is programmed as a clock divider or frequency divider. The input signal for each

channel can be provided by an on-board programmable frequency synthesizer shared by all channels.

Control Stage

The delayer is a critical part of the system because of a wide range of possible delays. The control section consists of a set of programmable digital delayer and a control block to manage the two digital delayer blocks and it provides a communication between different channels using the inter integrated communication controller module. The input is delivered to a delayer

loop controlled by a field programmable gate array which provides the desired delay. That delayed signal is fed to an output driver, which provides the output. The control block provides two pulses through the I2C bus.

Output Stage

The desired delay signal is fed to the output stage. An output driver is used to switch output based on the working condition of the system. If the system will not in working the output driver is disabled and at working condition it will enable. It is used as a trigger signal, with the working condition of the system.

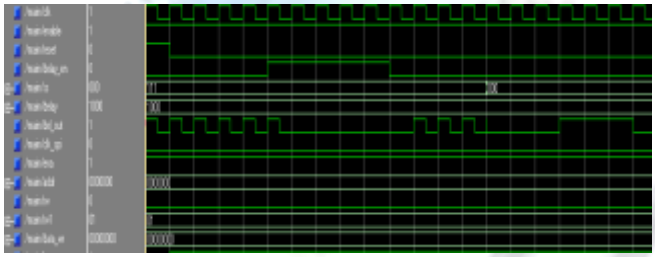
II. SYSTEM DESCRIPTION

The FPGA is the main system used in this for the delay pulse generation. The reference clock provides input signal for the delay pulse generation program and I2C buses shares information through control block to digitial delayer and output driver.

III. EXPERIMENTAL RESULTS

The experimental measurements have been used to test the effective performance of the delay pulse generator, in terms of output waveforms, and delay of different channels.

Output Waveforms



Device Utilization

Device Utilization Summary (estimated values)			
Logic Utilization	Used	Available	Utilization
Number of Slices	60	4656	1%
Number of Slice Flip Flops	56	9312	0%
Number of 4 input LUTs	116	9312	1%
Number of bonded IOBs	31	190	16%
Number of GCLKs	1	24	4%

IV. FUTURE WORK

If the number of channels can be increased also the delay timings will increase. By using other software we can adjust the amplitude, frequency and offset of the delayed pulse.

V. CONCLUSION

The frequency pulses are generated for better functioning of pulse generator with different delay time periods. An efficient multichannel pulse generator, which is low cost due to implementation on a single FPGA device, was presented. The architecture can be improved with modern techniques to be more adequate. On-board frequency synthesizer in the design can make the output pulse generation more speedier for multichannel design.

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