



### Introduction

A Digital Multiplexer, shortened to “MUX”, is a switching device that operates similarly to a multiple position switch. Normally it has not less than three inputs, namely a selection input shortened to “SEL”, and two data inputs, for instance “IN A” and “IN B”. The aim of SEL signal is to let one of the input data signals pass to the output, see Figure 1.

### Digital Multiplexer Circuit Design

As can be seen from Figure 4, a MUX can be implemented using a 3-bit LUT (look-up table). In this example, LUT0 is connected to the following three input pins: SEL (PIN2), IN\_A (PIN3), IN\_B (PIN4) and one output pin MUX\_OUT (PIN12) with Output Enable. The latter being configured as a push-pull output.

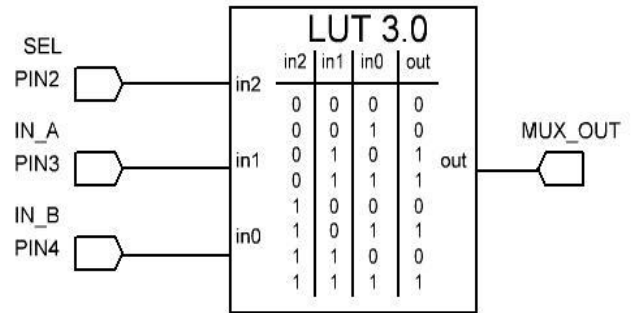


Figure 2. MUX Truth Table

Functionality waveforms of the real MUX circuit created in GreenPAK2 Designer software are shown in Figure 3, where Channel1 (yellow/top line) – PIN2 (SEL), Channel2 (light blue/2<sup>nd</sup> line) – PIN3 (IN\_A), Channel3 (magenta/3<sup>rd</sup> line) – PIN4 (IN\_B), Channel 4 (blue/bottom line) – PIN12 (MUX\_OUT). As seen from Figure 4 the real waveforms coincide with the theoretical explanation shown in Figure 1.

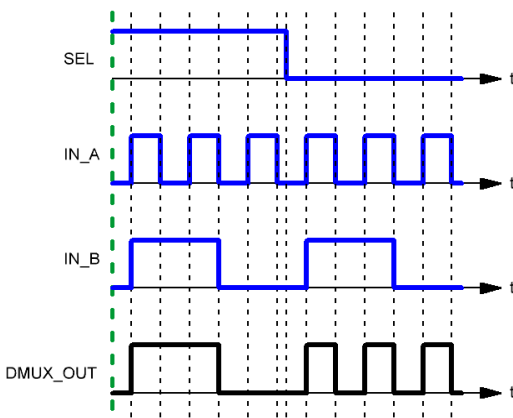


Figure 1. MUX Timing Diagrams

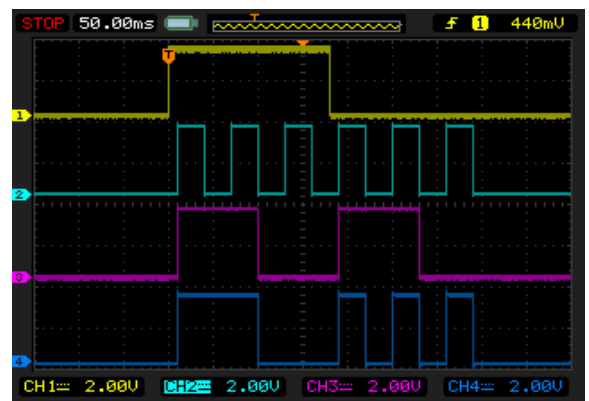


Figure 3. DMUX Functionality Waveforms

### DMUX Circuit Analysis

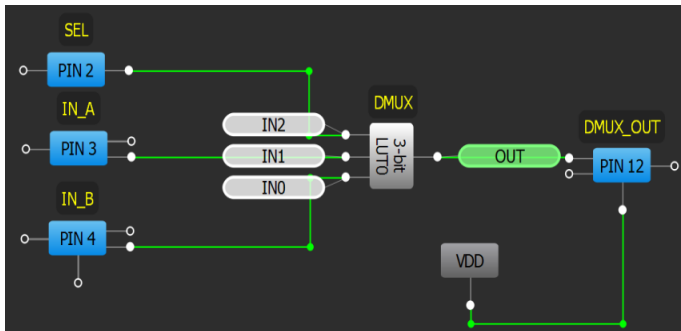
If PIN2 (SEL) is in logic HIGH state, then only IN\_B (PIN4) signal will be passed to the output through the MUX and vice versa, only IN\_A (PIN3) signal will be passed through the MUX if PIN2 (SEL) is in logic LOW state, see Figure 2.

### Conclusion

A Digital Multiplexer is a simple and very useful combinational device which helps to create systems that use different signals that have to pass through one line and many others.



*Note: for proper circuit operation, don't forget to configure input and output pins correctly. As shown in the schematic of Figure 4 all inputs are to be configured as digital input with Schmitt trigger and output as push-pull.*



**Figure 4. MUX Circuit in GreenPAK2 Designer**

### Related Files

Programming code for **GreenPAK Designer**.



### About the Author

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Background: Volodymyr graduated from Ivan Franko Lviv National University in 2012, studying at the Department of Medical and Biomedical Electronics. Presently he's working with Configurable Mixed Signal ICs (CMICs) and their application notes. Moreover, for more than 10 years his particular sphere of interest has included design, modernization and repair of everything related to electronics.

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A	Volodymyr Batig	8/19/2013	New application note

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