

# Window Comparator Along With MOD-16 Counter For Counting Based Data Line Selection Operation

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**Abstract**—Window comparator is a circuit which uses the two comparator in parallel to determine if a signal is between two reference voltages. If the input signal is outside of the window, the output is Low. If the input signal is within the window, the output is High. A MOD-16 counter has 16 states in its count sequence and used for counting operation. A 16x1 Multiplexer is also used in this design for data selection operation. In this paper, a window comparator along with mod-16 counter followed by 16x1 multiplexer is designed and output waveforms are plotted. This design can be used for two reference voltages based comparing followed by counting based data line selection applications.

## I. CIRCUIT DETAILS

The Operational amplifier also known as Op-Amp which are mainly used for mathematical operations like addition, subtraction, integration, differentiation and so on. An Op-Amp based comparator is used for comparing analogue voltage level with another reference voltage  $V_{REF}$  and produce an output signal based on the magnitudes of two input voltages. If the given analog voltage is greater than the reference voltage, the output of comparator is  $+V_{CC}$ . If the given analog voltage is lower than reference voltage, the output of comparator is  $-V_{CC}$ . A window comparator is a circuit consists of two Op-Amp in parallel which can take two reference voltages  $V_H$  and  $V_L$  and an input analog voltage and produces output based on the comparison of voltages. If the given input voltage lies between two reference voltages, then the output of comparator is 'HIGH'. Otherwise, the output of comparator is 'LOW'. This output is given to a MOD-16 counter. MOD-16 counter is also called as 4 bit counter, which have 16 states and count from '0000' to '1111'. After reaching '1111' state it reset to '0000' state. The output of comparator is given to 16x1 multiplexer. Multiplexer is a combinational circuit which has maximum of  $2n$  data inputs, ' $n$ ' selection lines and single output line. Among these data inputs only one will be connected to the output based on the select line values. So, a 16x1 mux have 16 data input lines, 4 select lines and one output line. The output of the MOD-16 counter is given as input to the 4 select lines of the multiplexer. So, based on the count of counter the corresponding data line is connected to the output line. Figure 1 shows the reference circuit diagram and Figure 2 shows the resultant waveforms.

## II. REFERENCE CIRCUIT

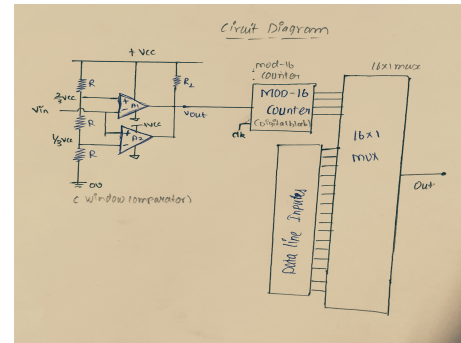


Figure 1. Circuit Diagram

## III. REFERENCE WAVEFORMS

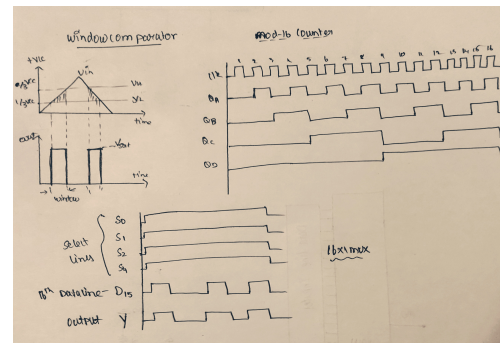


Figure 2. Reference waveforms.

## REFERENCES

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