

Window Comparator Along with MOD-16 Counter for Counting Based Data Line Selection Operation

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Abstract—A window comparator circuit, also called window detector circuit determines whether an unknown input is between two precise reference threshold voltages or not. This work presents a window comparator connected to a 4-bit binary counter. The output of counter goes to a multiplexer as selection lines to direct one of 16 data sources into a single destination. The window comparator circuit, analog part, and counter along with multiplexer, digital circuit, make a mixed signal circuit which is the goal of this project to meet. The simulation is implemented in eSim using SKY130 technology.

Keywords—Mixed signal, Window comparator, Multiplexer, Binary counter.

I. CIRCUIT DETAILS

Fig.1 shows the circuit consisting of 3 sub-circuits. sub-circuits B and C show 4-bit counter and 16×1 multiplexer respectively, and sub-circuit A is the window comparator.

In the window comparator, input signal (V_{pulse}) is compared with two references voltages V_{high} and V_{low} through two op-amps. After getting rail-to-rail outputs by passing through BUFFERS, signals are directed to a XNOR to make the final result of window comparator. The input, reference voltages and the output of window comparator is shown in Fig. 2(a).

The output of window comparator connected to the 4-bit counter, also called MOD-16 counter, counts how many times the input signal is located between two reference voltages. The reset signal and output of the counter are shown in Fig. 2(b). it is worth mentioning that counter starts counting after 0.5s, when reset becomes low.

Finally, outputs of counter go to the 16×1 multiplexer, and the multiplexer selects data among 16 incoming data as shown in sub-circuit C in Fig.3. Some pulse waves with different frequencies are considered as inputs for multiplexer. For sack of simplicity without loss of generality, some other input terminals are connected to GND. As we can see, in Fig.2(c), the final output signal with different frequencies is generated based on which input data is selected at different moment.

II. Implemented Circuit

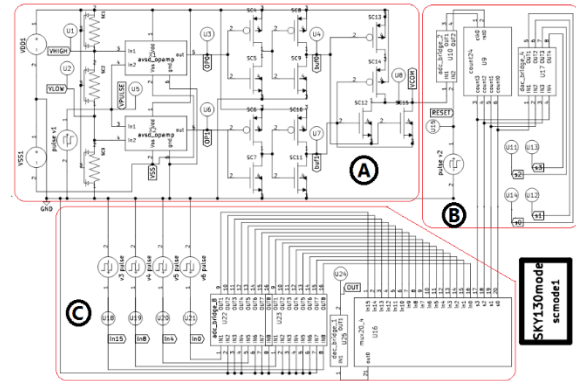


Fig.1: Implemented circuit

III. Implemented Waveforms

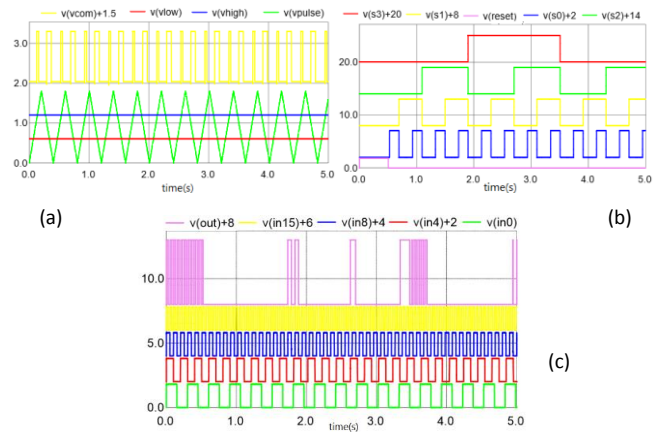


Fig.2. Implemented waveforms: (a) Window comparator, (b) 4-bit counter, (c) Multiplexer.

REFERENCES

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