

Design of JK flip flop using mixed signals

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Abstract- This electronic document is about the designing of a JK flip flop using mixed signals. Flip flops are the fundamental blocks of memory devices. There are four types of flip flops, here we are about to see the JK flip flop.

1. Reference circuit details

The JK flip flop is basically a gated SR flip-flop with the addition of a clock input circuitry that prevents the illegal or invalid output condition that can occur when both inputs S and R are equal to logic level "1". The JK flip flop functions similarly to the SR flip flop. Instead of "S" and "R," the JK flip flop bears the letters "J" and "K." In contrast to SR flip flops, which produce invalid states as outputs when both inputs are set to 1, JK flip flops do not produce invalid states even when both "J" and "K" flip flops are set to 1. This is the only difference between JK flip flops and SR flip flops.

Here, we provide the binary input to the JK flip flop by using an Analog to Digital converter at the beginning of the circuit and the output of JK flip flop will again be converted to Analog signal by using a Digital to Analog converter. In this way we can design a JK flip flop by using mixed signals.

The working of JK flip flop is same as that of SR flip flop. The difference is this time the JK flip flop has no invalid state when both the inputs are high. The JK flip flop is basically a gated SR flip flop with additional clock input which prevents the invalid state. Two AND gates are connected in the circuit as we can see from the circuit diagram and the third input to each AND gate is connected to outputs of Q and Q bar.

Truth Table

J	K	CLK	Q
0	0	↑	Q_0 (no change)
1	0	↑	1
0	1	↑	0
1	1	↑	\bar{Q}_0 (toggles)

2. Implemented circuit

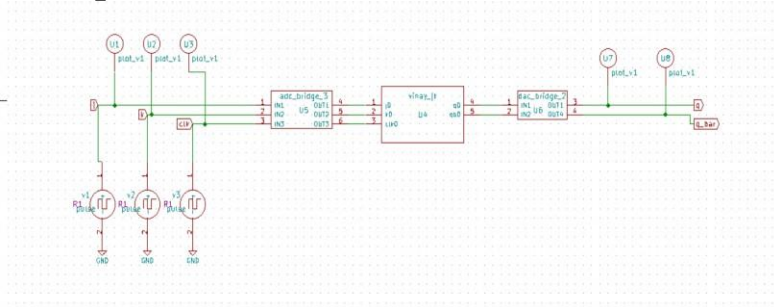


Fig-1: JK flip flop in mixed signals

3. Circuit waveforms

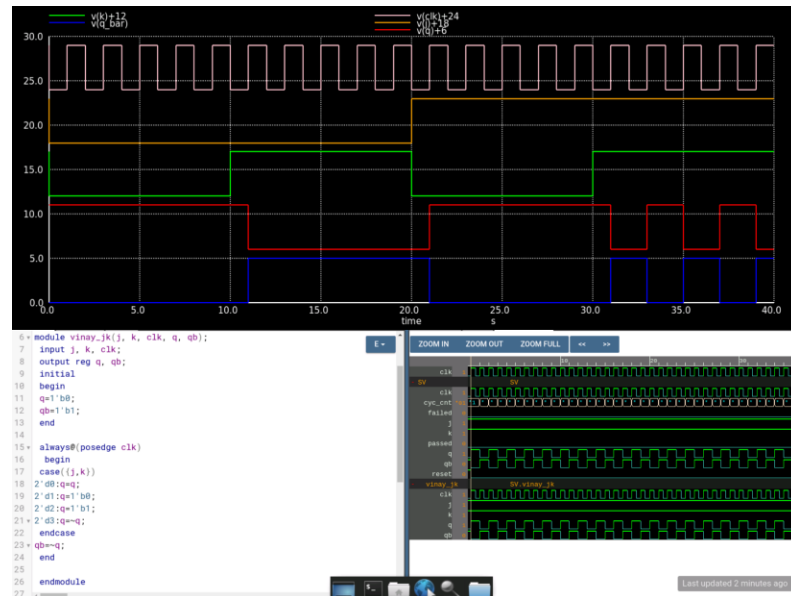


Fig-2: Simulation result waveforms

References

- [1] V.T.Phyne, Fundamentals of Digital Systems Design, NJ, Englewood Cliffs: Prentice-Hall, pp. 217-245, 1973.
- [2] J.Millman and C.C.Halkias, Integrated Electronics: Analog and Digital Circuits and Systems, New York: McGraw-Hill, pp. 627-632, 1972.