


Single-IC-based electronic circuit replaces mechanical switch

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 A simple and inexpensive electronic circuit uses a low-cost pushbutton switch to toggle the electrical power on and off. The circuit replaces a more costly and bulky push-push mechanical switch. The pushbutton switch triggers a monoshot circuit. The monoshot circuit's

output triggers a toggle flip-flop, which inverts its output state and controls power to the load.

Several implementations of the scheme are possible. **Figure 1** shows a single-IC implementation. The circuit uses two flip-flops, IC₁ and IC₂, in the same IC, CD4027B. You con-

figure IC₁ as a monoshot circuit by feeding its output back to its reset pin through an RC network. IC₁ outputs a high on the rising edge of the clock by tying its J input high and its K input low. The pushbutton switch connects between the clock input of IC₁ and ground. The switch can also connect between the clock input and the positive supply, V_{DD}. By tying IC₂'s J and K inputs high, IC₂ becomes a toggle flip-flop. The output of IC₁ clocks IC₂ and toggles its output on the rising edge of the IC₁ output.

You can understand the operation of the circuit by observing the waveform at different points of the circuit (**Figure 2**). When you press the pushbutton switch, due to debouncing, IC₁'s output goes high on the clock's rising edge. Capacitor C₁ starts charging through R₁ toward high voltage. At the same instant, IC₂ receives a rising-edge transition at its clock and toggles its output. When capacitor C₁'s voltage exceeds the threshold of the IC₁ reset pin, IC₁ resets, and its output goes low. C₁ now discharges through R₁ to low voltage. The charging and discharging rate of C₁ are equal. The duration of the monoshot circuit's output pulse handles the switch-press time and the debouncing period. Varying

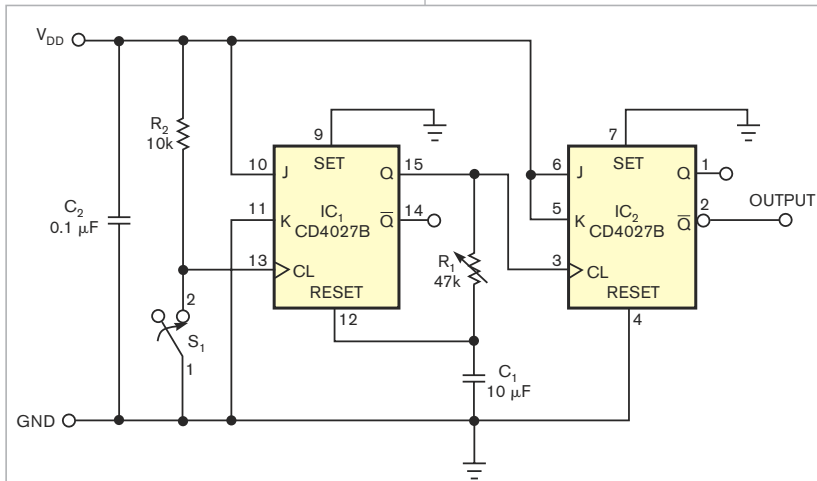


Figure 1 A pair of flip-flops configured as a monoshot and a toggle flip-flop debounce a simple, inexpensive pushbutton switch.

the value of R_1 varies the pulse period, and you can set R_1 for different types of pushbutton switches. Complementary outputs of IC_2 are available, and you can use them to drive power switches, such as transistors, MOSFETs, relays, and shutdown pins of switching regulators. The circuit operates over a supply voltage of 3 to 15V and can control power to analog and digital circuits.**EDN**

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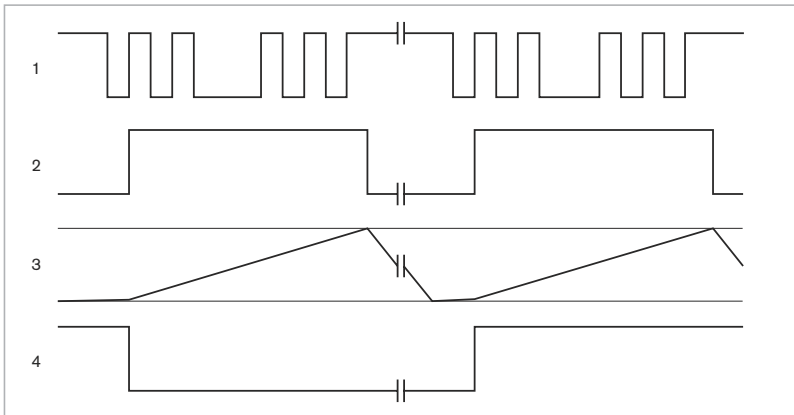


Figure 2 Trace 1 is the voltage across the clock of IC_1 , Trace 2 is the output of IC_1 , Trace 3 is the voltage on capacitor C_1 , and Trace 4 is the output of IC_2 .