IC provides versatile toggle functions

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The circuit in **Figure 1** offers not only as many as six channels in a single IC package, but also a high level of additional flexibility. The configuration of Output 1 is a "plain-vanilla" toggle. A resistive divider comprising R_1 and R_2 provides a midsupply bias to all the channels through resistors R_3, R_6, R_7, R_{10}, and R_{12}. Because the bias voltage of R_1/R_2 is within the hysteresis range of the gates, they behave as flip-flops, retaining their high or low state in a stable manner.

Debouncing capacitors C_2, C_3, C_4, and C_5 charge to the level of the output. Pushing switch S_1 inverts the output state because of the inverting action of the gate. This state remains stable because, in the first gate's circuit, for example, R_4's value is larger than that of R_3, and R_4 cannot overcome the hysteresis threshold of the gate. Only the discharge of C_2 can accomplish that task. When you release the pushbutton, C_2 fully charges after the debouncing delay, and the circuit is ready for another inversion. C_1 provides a general power-on-reset feature to all the channels. If your circuit requires only one channel, you can directly connect R_1 and R_2 to the input of the gate, omitting R_3.

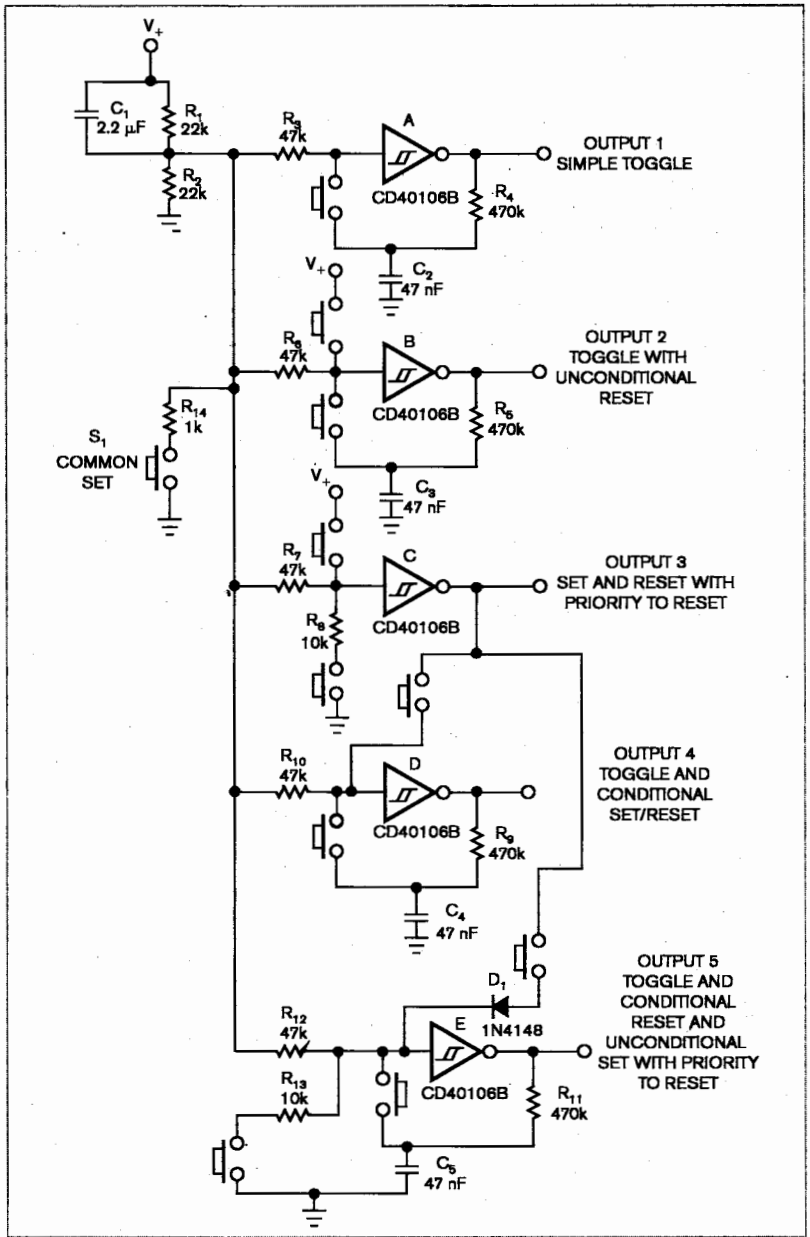

Figure 1 This circuit shows multiple Schmitt-trigger inverters functioning as a variety of set/reset toggles.

Output 2 has the same toggle function as Output 1 but also includes a direct reset. Output 3 works only in a set/reset mode; the position of R_8 determines the priority state. Output 4 also has a toggle action, but you can set or reset it to a state opposite that of Output 3. Output 5 works in a similar manner, except it allows only a conditional reset because of the position of D_1. Output 5 also includes a forced, nonpriority set. You can mix and match all these functions, providing almost unlimited versatility.

The IC in **Figure 1** is a Fairchild Semiconductor (www.fairchildsemi.com) CD4000-series circuit, suitable for supplies of 3 to 15V, but it could also be a 74AC14 or 74HC14 from NXP (www.nxp.com), for example. Any CMOS-input gate having a Schmitt-trigger action is suitable. You must take care to bias the inputs in the middle of their hysteresis range. HCMOS circuits would require an average bias of approximately 1.2V for a 5V supply, for example. **EDN**