Single switch selects one of three signals

Felix Matro, JL Audio Corp, Phoenix, AZ

This Design Idea shows how you can use a single-pole momentary-contact switch to select one of three signal sources by scrolling through three output states. The circuit in **Figure 1** comprises commonly available components from the CD4000 CMOS-logic series, along with a general-purpose NPN transistor. The total cost of the components doesn't exceed \$1. Only one of circuit's three outputs, CH_1, CH_2, or CH_3, goes low at any given time, and you can use these outputs to control analog switches, relays, or the gates of JFET switches. As long as you apply power, the

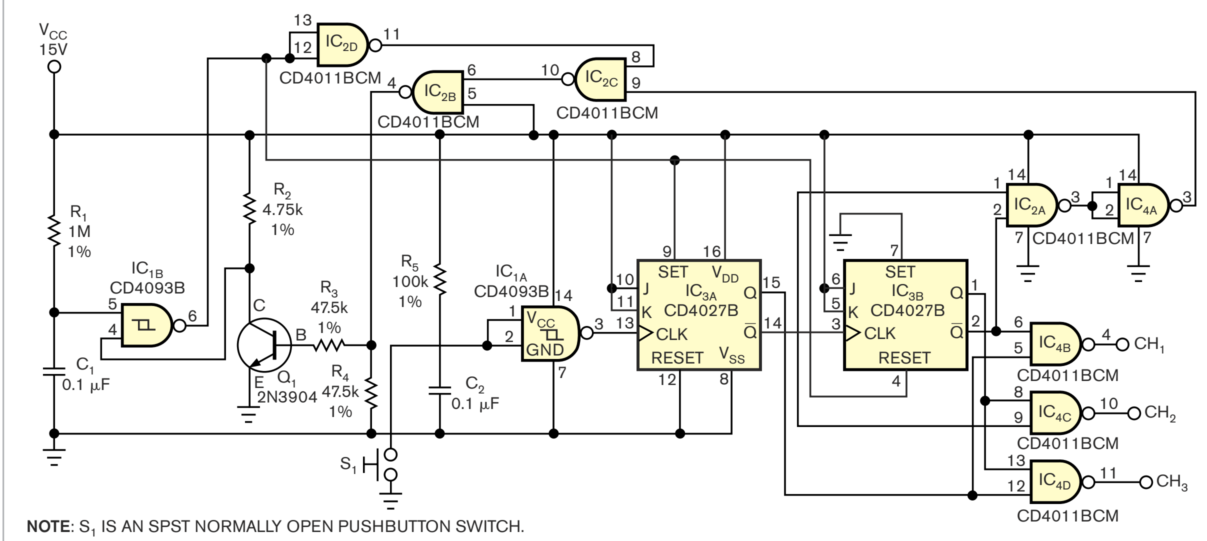

Figure 1 A handful of active and passive components form a one-of-three selector switch. Press switch S_1 once to advance to the next channel and twice more to revert to Channel 1.

selected output does not change, making the circuit a good choice for applications requiring nonvolatile operation. Quiescent-current consumption averages only about 15 μA at room temperature, 25°C, a low value even for battery-powered applications.

The heart of the circuit comprises a dual JK flip-flop, IC_3, that's configured as a 2-bit ripple counter. Without additional circuitry, the counter would allow selection of four signal sources. Upon initial application of power, a reset circuit comprising R_1, C_1, and IC_{1B} always sets the CH_1 output to a logic-low level.

When the $\overline{Q}$ outputs of IC_3, pins 2 and 14, both go to logic zeros, the feedback chain comprising IC_{2A}, IC_{2B}, IC_{2C}, and

R_5, C_2, IC_{1A}, AND NORMALLY OPEN MOMENTARY-CONTACT SWITCH S_1 CONSTITUTE A DEBOUNCED SWITCH THAT PROVIDES CLOCK PULSES FOR BOTH SECTIONS OF THE COUNTER.

IC_{4A} pulls Q_1's base to a logic-high level, which in turn pulls one input of IC_{1B} to a logic low. This action causes the counter to skip the 00 state and advances the count to the 01 state. Components R_5, C_2, IC_{1A}, and normally open momentary-contact switch S_1 constitute a debounced switch that provides clock pulses for both sections of the counter, IC_3. When a user pushes S_1, the counter advances to the 10 state, and a subsequent push advances the counter to the 11 state. A third push restarts the cycle. To summarize, IC_{4B} decodes the counter's 01 state and pulls CH_1 low, IC_{4C} decodes the counter's 10 state and pulls CH_2 low, and IC_{4D} decodes the counter's 11 state and pulls CH_3 low. The layout of the circuit should be noncritical, but use a low-leakage capacitor for C_1. Connect unused logic inputs to ground or V_{CC} as appropriate. EDN