

Three-state switch interface uses one microcontroller pin

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Human interfaces for electronic gadgets sometimes require three states for control. A single-axis joystick has states to define motions to the right, to the left, and with no motion. Similarly, a timer has control buttons that allow the timer to increment, decrement, and remain untouched.

Engineers usually create these interfaces by using two independent pushbuttons, requiring two microcontroller pins. This Design Idea presents a way to sense three states of an SPDT (single-pole/double-throw) switch with a center-off state, using only a single pin of

TABLE 1 STATUS OF THE PIN FOR VALUES OF THE PORT AND THE DDR REGISTERS

	DDR bit=0 Port bit=0	DDR bit=0 Port bit=1
Pin connects to V_{DD} through a resistor	Pin bit=1	Pin bit=1
Pin connects directly to ground	Pin bit=0	Pin bit=0
Pin connects to ground through a very-high-resistance path	Pin bit=0	Pin bit=1

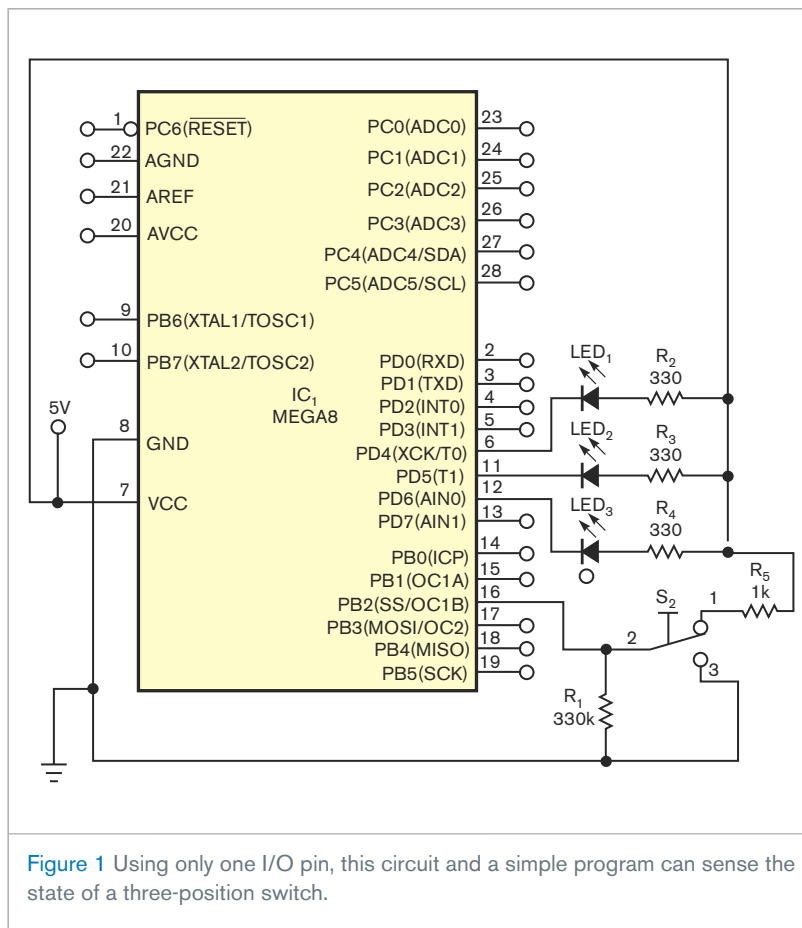


Figure 1 Using only one I/O pin, this circuit and a simple program can sense the state of a three-position switch.

Atmel's (www.atmel.com) ATmega8 microcontroller (**Reference 1** and **Figure 1**). **Listing 1**, which is available at the Web version of this Design Idea at www.edn.com/080221di1, is a simple program for the circuit.

The status of the pin of the microcontroller depends upon values of the DDR bit, the port bit, and its external connection. The microcontroller's pin connects to ground using pulldown resistor R_1 with resistance, typically, of a few hundred kilohms to impress the high-impedance state on the pin. You set the DDR register to zero. When the user toggles the switch to Position 1, the pin connects to V_{DD} through resistor R_5 , and the pin bit is one, regardless of the value of the port bit. When the user toggles the switch to Position 3, the pin is grounded, and the pin bit is zero, regardless of the value of the port bit. In the center-off state, the pin bit follows the port bit. **Table 1** summarizes the states of the port for different values of the port and the external input. **EDN**

REFERENCE

- 1 "ATmega8/ATmega8L 8-bit AVR with 8K Bytes In-System Programmable Flash," Atmel Corp, 2007, www.atmel.com/dyn/resources/prod_documents/2486S.pdf.