Microcontroller provides low-cost analog-to-digital conversion, drives seven-segment displays

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A previous Design Idea demonstrated how to use shift registers to increase a microcontroller's output capabilities (**Reference 1**). This expanded Design Idea provides low-cost analog-to-digital conversion and

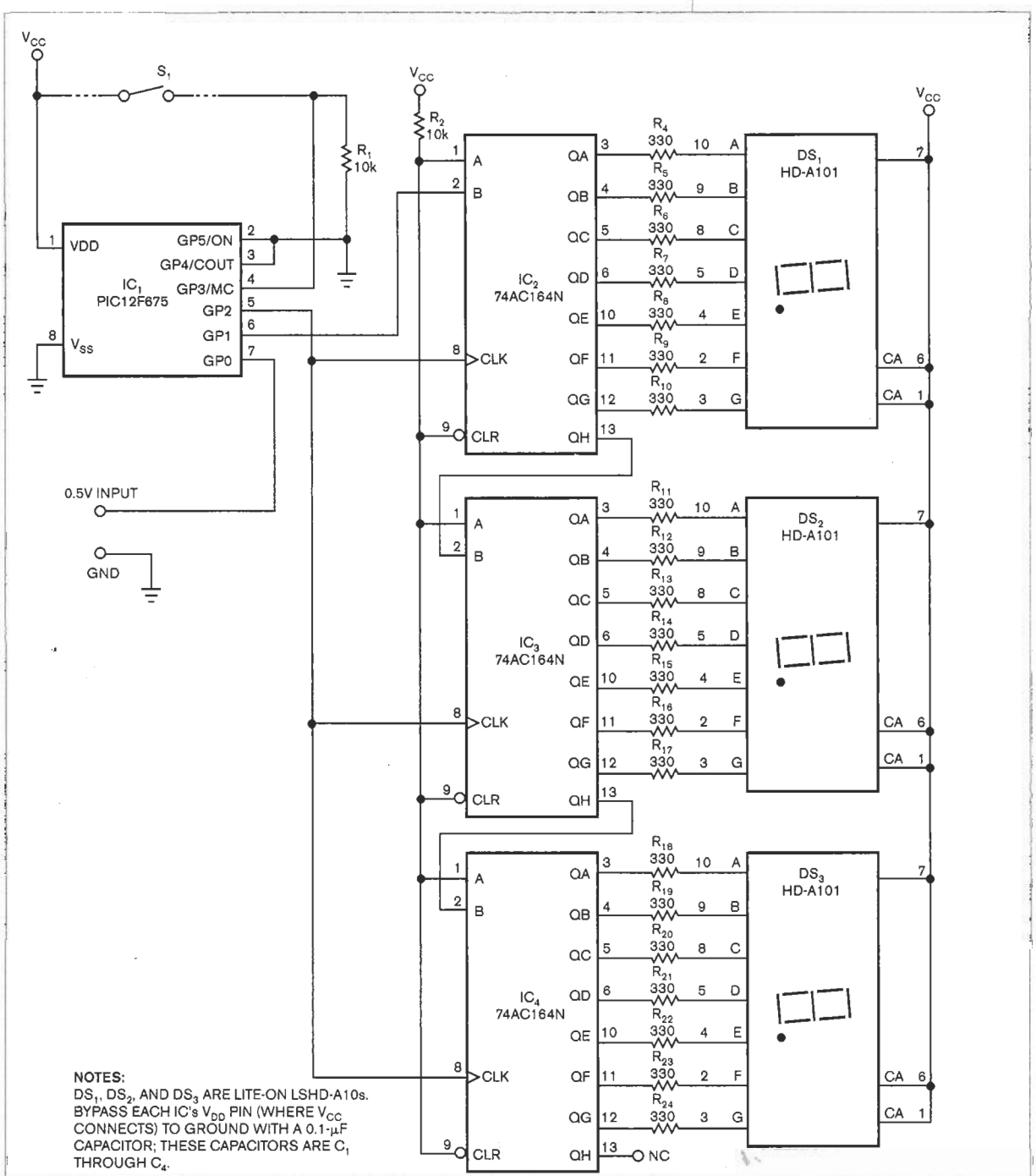

Figure 1 A low-cost microcontroller captures an analog voltage, converts it to a peak reading, and displays the results in decimal format on LED displays.

a three-digit, seven-segment display. Although applicable to other microcontrollers, the circuit in **Figure 1** uses a Microchip (www.microchip.com) PIC12F675 controller and three multiply sourced 74AC164 serial-input/parallel-output shift registers.

The circuit accepts incoming signals of 0 to 5V. The microcontroller, IC_1, performs the analog-to-digital conversion and subsequently converts the binary-voltage value to BCD (binary-coded-decimal) format. Next, the microcontroller converts the BCD values to hardware-specific seven-segment-display masks and shifts the masks to the 74AC164 registers, IC_2 through IC_4, which in turn drive the seven-segment displays.

Available for downloading from the online version of this Design Idea at www.edn.com/070510di2, **Listing 1** implements an additional function. Instead of displaying each input value as it's converted, the microcontroller operates as a peak detector. When the maximum value changes, the microcontroller updates the three-digit display. A pushbutton switch, S_1, resets the maximum value. You can modify the code to apply other functions to the input data and calculate and display the data in other formats. In addition, you can modify the interrupt-driven conversion process to accommodate different sampling rates. When you modify the sampling rate or the ISR (interrupt-service routine), ensure that the ISR completes execution within a single sample period. EDN

INSTEAD OF DISPLAYING EACH INPUT VALUE AS IT'S CONVERTED, THE MICROCONTROLLER OPERATES AS A PEAK DETECTOR.

REFERENCE

Raynus, Abel, "Squeeze extra outputs from a pin-limited microcontroller," *EDN*, Aug 4, 2005, pg 96, www.edn.com/article/CA629311.