

# 1-Wire network controls remote SPI peripherals

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Many 1-Wire-compatible peripherals are available, but, for those that lack the 1-Wire capability, the circuit in **Figure 1**, pg 80, illustrates one way to implement it. The example controls a remote LED display by the 1-Wire network through an SPI (serial-peripheral-interface)-compatible display controller.

To produce the three-wire SPI that a MAX7221 display controller requires for the  $\overline{CS}$  (chip-select), DIN (serial-data), and CLK (clock) signals, the 1-Wire network serially addresses three DS2405 1-Wire switches. The first switch directly creates  $\overline{CS}$ ; the second switch directly creates DIN; and the third switch, aided by three

exclusive-OR gates, creates CLK.

The edge detector and one-shot IC<sub>4A</sub>, IC<sub>4B</sub>, and IC<sub>4C</sub> combine the outputs of IC<sub>2</sub> and IC<sub>3</sub>—Data 1 and Data 0—to create a clock signal for the SPI. This one-shot clock-generation circuit improves the data rate by requiring only a single 1-Wire transaction per SPI bit, instead of the three transactions—data, clock low, and clock high—that would be necessary if you directly use the IC<sub>3</sub> output as a clock signal.

To transmit data to the SPI inputs, first set the output of IC<sub>1</sub> low. Then, transmit the data bits using the following rules: If the current data bit differs from the previous bit, set IC<sub>2</sub>'s Data 1

output accordingly. If the current data bit is the same as the previous bit, toggle IC<sub>3</sub>'s Data 0 output. The circuit automatically generates a clock pulse each time and requires only one 1-Wire command for each data bit sent. When data transmission is complete, send a final 1-Wire command to set the IC<sub>1</sub> output high.

This circuit allows a 1-Wire network to control a remote temperature display, but similar techniques can provide an interface to I<sup>2</sup>C (inter-integrated-circuit)-compatible devices and to other SPI peripherals, such as ADCs and DACs. You can also produce a bi-directional-data capability by adding a fourth DS2405. Note that the SPI data rate and updates to the peripheral are relatively slow, but speed is not an issue for many remote-monitoring applications. **EDN**

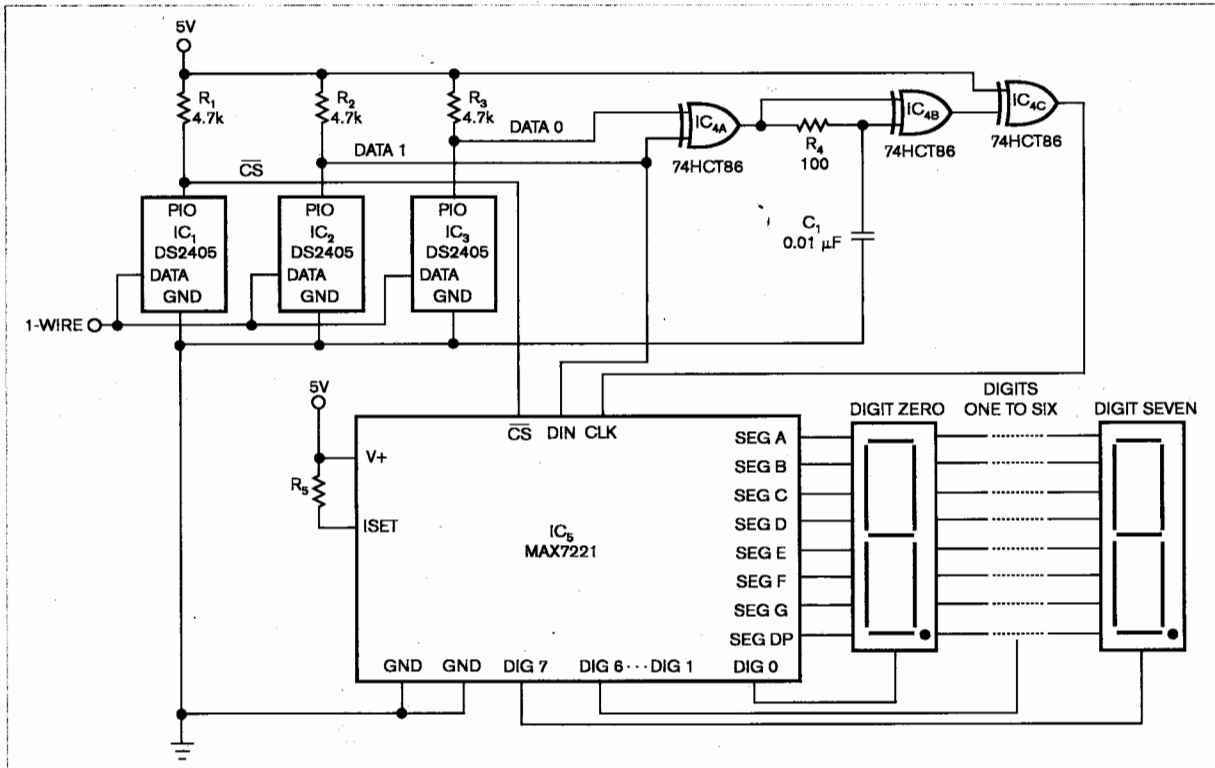


Figure 1 Three 1-Wire switches—IC<sub>1</sub>, IC<sub>2</sub>, IC<sub>3</sub>; three XOR gates, IC<sub>4</sub>; and the associated components enable a 1-Wire network to control this display through the SPI peripheral IC<sub>5</sub>.

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