

Extend Ratings of One-Wire Switches

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One-wire switches such as the DS2405 from Maxim Integrated Products allow designers to control remote loads through the versatile one-wire network. The load can be connected to the open-drain switch directly, or indirectly through a relay. By monitoring voltage at its PIO pin, the DS2405 also lets designers read back the state of the load.

The PIO pin of that device is limited to 6 V or 4 mA, which restricts the type of load or relay it can drive. Other devices with higher ratings can solve the problem for some applications. Or, designers can use a relay for loads that exceed switch ratings, especially for applications that feature high current or high voltages such as 120 Vac (Fig. 1).

On the other hand, a discrete-component circuit such as Fig. 2 may be more practical and cost effective. Q1 acts as an open-collector switch connected to the load. However, the state of the load cannot be read because Q1's base-emitter voltage limits the voltage swing at the PIO pin.

The circuit in Fig. 3 solves that problem. R1 and R2 form a voltage divider that provides an adequate signal swing at the PIO pin. Diode D1 limits the PIO-pin voltage to a safe level, and transistor Q2 provides an additional logic inversion

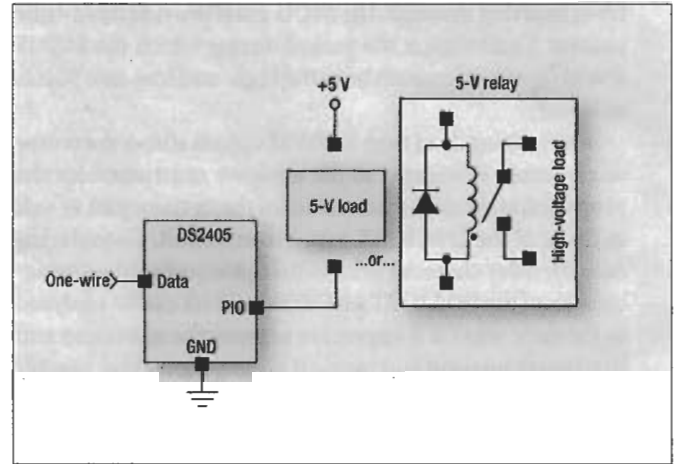


Fig. 1. The addition of a relay allows a one-wire switch (DS2405) to control loads with voltages or current levels that exceed the ratings of the chip's PIO pin.

tion that makes the state of the DS2405 internal pull-down correspond to the state of the load. The PIO pin is off by default, so Q2 is included for convenience and safety.

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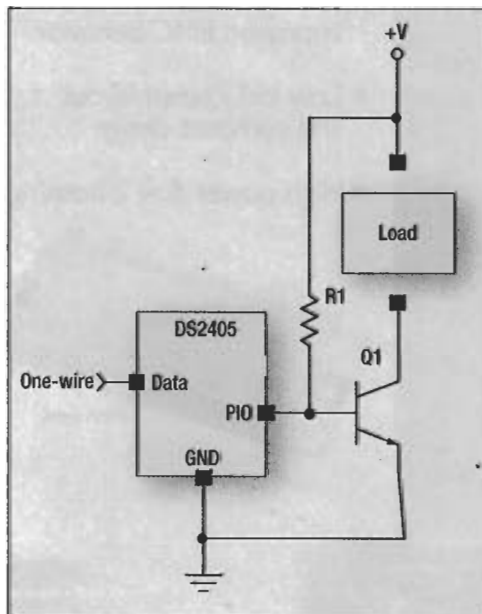


Fig. 2. Using a one-wire switch to drive an external transistor can be an inexpensive way to control a high-voltage load.

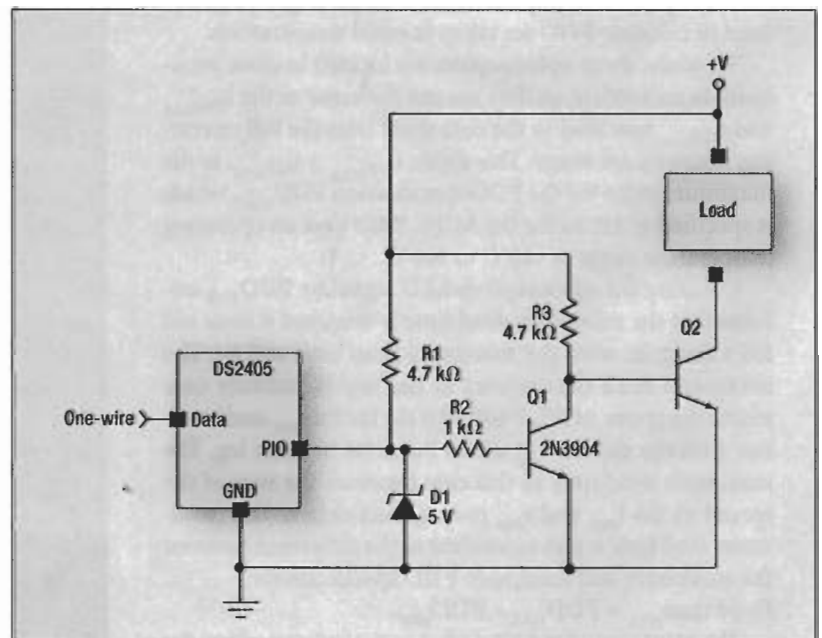


Fig. 3. This circuit allows a one-wire switch to drive a high-voltage load while monitoring the status of the load.