High-voltage circuit breaker protects to 26V

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Wide use of the Universal Serial Bus (USB) has led to a selection of overcurrent-protection circuits for supply rails of 2.7 to 5.5V, but few products are available for voltages higher than that range. The circuit breaker in **Figure 1** operates on supply voltages to 26V and trips at a programmed current threshold.

IC_1 is a high-side current-sense amplifier that monitors supply current via the voltage across R_2 and generates a proportional but smaller current at the OUT terminal as follows:

$$I_{OUT} = \frac{R_2 \times I_{TRIP}}{100}.$$

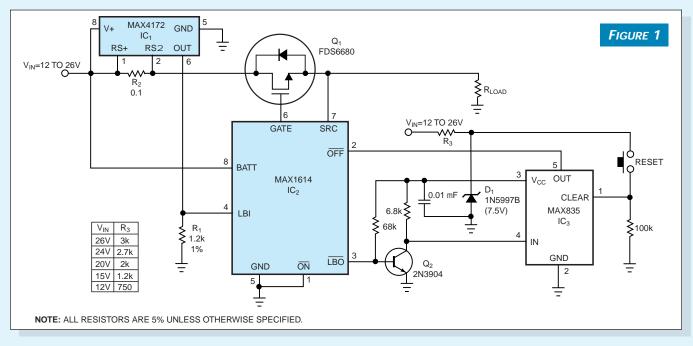R_1 and R_2 determine the trip current according to the equation,

$$R_1 = \frac{120}{R_2 \times I_{TRIP}}.$$

The value of R_1 in **Figure 1** sets the trip current at 1A, but values to 10A are acceptable. Supply current at the trip level produces a voltage across R_1 that triggers the low-battery comparator in IC_2, a high-side, n-channel MOSFET driver. The comparator output ($\overline{LBO}$) drives Q_2 to saturation, causing the latched output of IC_3, a micropower voltage monitor, to go low. Applied to IC_2's Pin 2, this signal disconnects
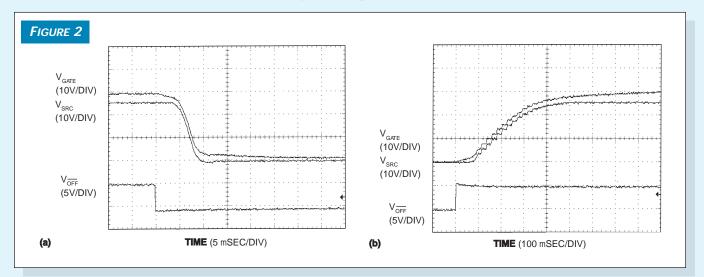
the power by turning off Q_1.

Power remains off until you unlatch IC_2 by depressing the reset button. You may also have to push the button following initial power-up to ensure the correct power-up state. For supply voltages of 12V and higher, choose R_3 according to the table in the **Figure 1**. For supply voltage that is less than 12V, D_1 and R_3 are unnecessary. The signal delay from IC_3 to the load via IC_2 and Q_1 has a turn-off time of approximately 7 msec **(Figure 2a)** and a turn-on time of approximately 400 msec **(Figure 2b)** (DI #2252)

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FIGURE 1

NOTE: ALL RESISTORS ARE 5% UNLESS OTHERWISE SPECIFIED.

This circuit provides overcurrent protection for supply-rail voltages to 26V.

FIGURE 2

With Figure 1's load-current trip threshold set at 1A, the load voltage, V_{SRC} (middle waveform), turns off (a) and on (b) in approximately 7 and 400 msec, respectively, under the control of the signal at IC_2's V_{OFF} pin.