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## APPLICATION NOTE 265 Circuit Breaker Handles Voltages to 76V

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Abstract: A current-sense amplifier, comparator, external CMOS switch, and an external transistor can be used to create a circuit breaker.

The simplicity of low-side current monitoring can mask the advantages of a high-side approach. You can monitor load currents in a power supply, a motor driver, or another power circuit on either the high or the low side (ground). However, you should not let the ease of low-side monitoring cause you either to overlook its dangers *or* the advantages of a high-side approach.

Various fault conditions can bypass the low-side monitor, thereby subjecting the load to dangerous and undetected stresses. However, a high-side monitor connected directly to the power source can detect any downstream failure and trigger the appropriate corrective action. Traditionally, such high-side monitors required a precision op amp, a boost power supply to accommodate the op amp's limited common-mode range, and some precision resistors. Now, the MAX4080 IC can sense high-side currents in the presence of common-mode voltages as high as 76V (**Figure 1**).

In this application circuit the MAX4080,  $IC_1$ , provides a ground-referenced voltage-source output proportional to the high-side current of interest. This output voltage is proportional to the voltage across an external sense resistor multiplied by five.



Figure 1. A current sense amplifier, comparator, and a few external components form a low-cost circuit breaker.

IC<sub>1</sub>, IC<sub>2</sub>, and a few external parts form a low-cost circuit breaker. R<sub>SENSE</sub> senses load currents, and Q<sub>1</sub> controls the currents. The design accepts inputs of 4.5V to 76V. The initial application of V<sub>IN</sub> and V<sub>DD</sub> places the breaker in its trip state. Pressing S<sub>1</sub> resets the breaker and connects power to the load and IC<sub>1</sub>, thereby activating Q<sub>1</sub>. When the voltage across R<sub>SENSE</sub> is multiplied by five and exceeds 1.2V, then IC<sub>2</sub> outputs a low signal on C<sub>OUT</sub> which turns off Q<sub>2</sub> and Q<sub>1</sub>. Press S<sub>1</sub> to reset the breaker.

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MAX4172	Low-Cost, Precision, High-Side Current-Sense Amplifier	Free Samples	
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