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APPLICATION NOTE 4543

Precision Circuit Monitors Negative-Supply Thresholds

By: Kevin Bilke, Applications Engineer
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Abstract: Using an IC (MAX971) that includes an open-drain comparator and a precision 1% voltage reference, this circuit monitors the magnitude of a negative supply voltage and provides a digital warning of fault conditions. To monitor multiple negative voltages, use the MAX974, which includes four comparators.

A similar version of this article appeared in the February 8, 2008 issue of *Portable Design* magazine.

A simple but accurate circuit (**Figure 1**) monitors the magnitude of a negative supply voltage. This capability is useful in multi-rail systems, particularly if the negative rail serves as the precision bias voltage for a GaAs device. The IC (**MAX971**) includes an open-drain comparator and a precision 1% voltage reference. Its trigger threshold is set by the value of external resistor R4. For convenience, all other resistors have the value 1MΩ.

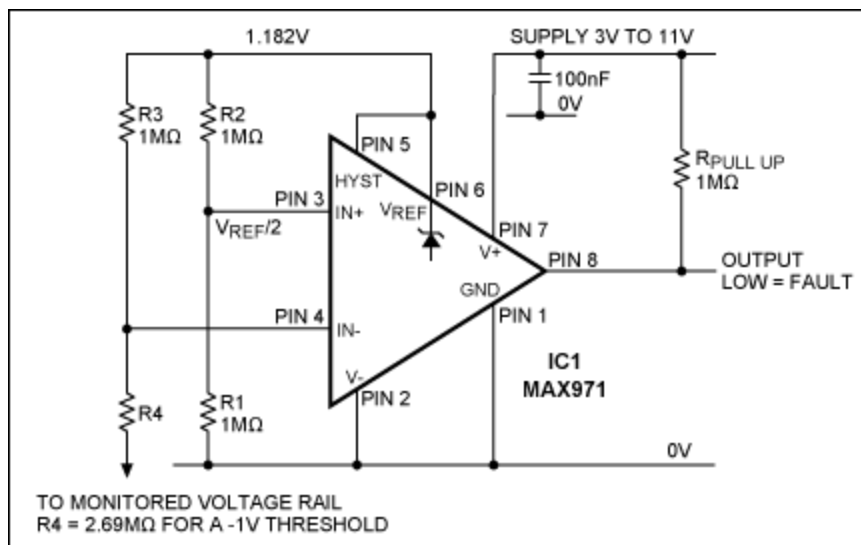


Figure 1. The output of this negative-voltage monitor goes low when the monitored negative voltage is above (more negative than) the threshold set by R4.

Resistors R1 and R2 divide the reference voltage, providing a trip point of $V_{ref}/2$ for the comparator. R3 and R4 sample the negative voltage, and IC1 compares that sample to the trip-point voltage. $R4 = 1M\Omega + 2(1M\Omega \times V_{NEG}/1.182V)$, where V_{NEG} is the magnitude of the voltage being monitored (ignoring the minus sign). The circuit output goes low in response to a fault condition—i.e., when the magnitude of the monitored voltage drops below the set threshold. To ensure an overall accuracy better than 2%, all resistors should have 1% tolerance.

For monitoring more than one negative voltage, choose the [MAX974](#), which includes four open-drain comparators with a precision 1% reference. Feed the output of R1 and R2 to all the comparators, add an R3/R4 pair for each monitored voltage, and calculate each R4 to yield a trip point for the corresponding voltage. All the open-drain outputs can be connected together.

Related Parts

MAX971	Ultra-Low-Power, Open-Drain, Single/Dual-Supply Comparators	Free Samples
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More Information

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