

Keywords: high-side current-sense amplifiers, npn transistors, maximum operating voltage

APPLICATION NOTE 4517

Extend Range of Current-Sense Amplifiers

Nov 29, 2010

Abstract: Using a transistor as shown, you can double the allowed voltage limit on a current-sense amplifier by stacking two such amplifiers one upon the other. The voltage signal from the bottom amplifier then represents current as the voltage across the sense resistor, times the product of the gains of the two amplifiers.

A similar version of this article appeared in the May 1, 2008 issue of *Power Electronics Technology* magazine.

High-side current-sense amplifiers are relatively inexpensive devices that sense current at voltages well above the level at which the current-sense signal is processed. One (among several) limits to the application of these devices is the maximum allowed voltage difference between the current-sense resistor (connected to the inputs of the current sense amplifier) and common (ground) for the data-acquisition circuits. Even for new-generation current-sense amplifiers, this limit is about 75V.

The circuit of **Figure 1** lets you double that limit, using two current-sense amplifiers stacked one upon the other, and a single-transistor voltage-distribution scheme. The resulting voltage gain—from the differential input of the top amplifier (where the current-sense resistor is connected) to the output of the combined circuits (labeled Output on the bottom amplifier)—is the product of the amplifier gains (each $A_V = 5$) for a total of 25.

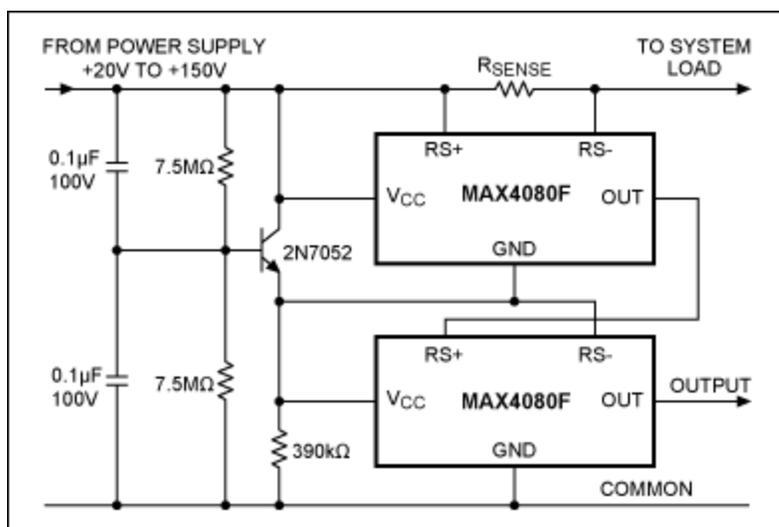


Figure 1. This circuit doubles the supply voltage at which current can be sensed.

Figures 2 and 3 illustrate circuit performance over the range of differential input voltage, and the range of supply voltage. More information about the [MAX4080F](#) and a complete data sheet can be found at www.maximintegrated.com.

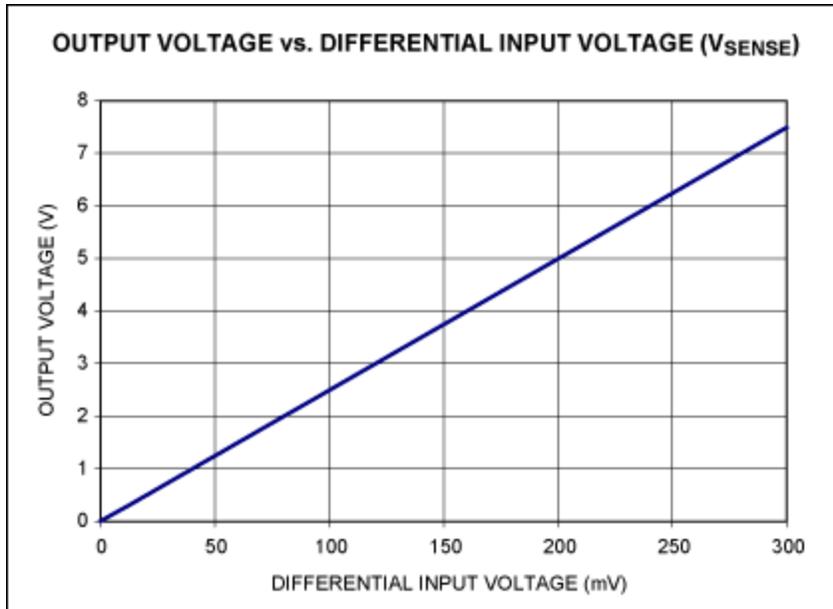


Figure 2. In Figure 1, the output vs. differential input voltage is linear.

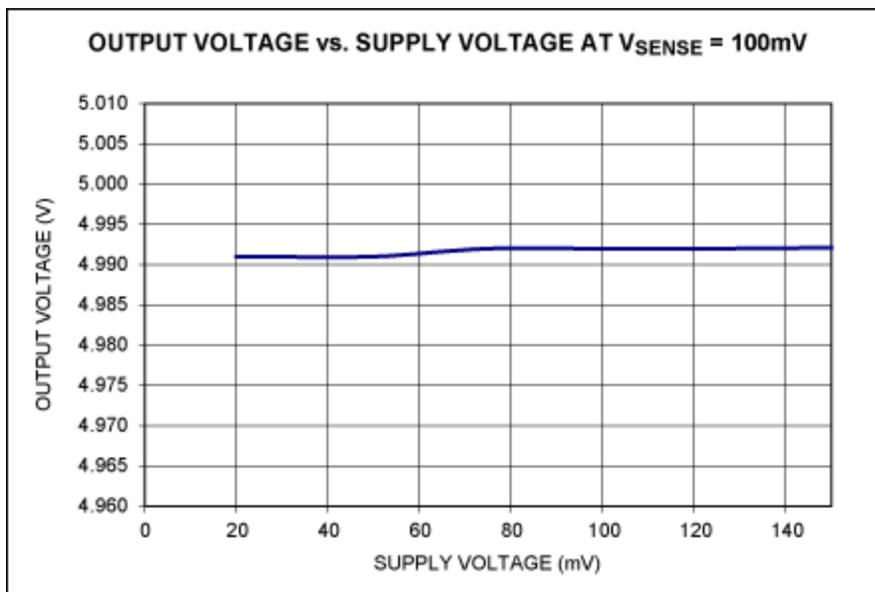


Figure 3. Output for the Figure 1 circuit is relatively unaffected by changes in the supply voltage.

Related Parts

[MAX4080](#)

76V, High-Side, Current-Sense Amplifiers with Voltage Output

[Free Samples](#)

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