Keywords: analog-digital converter, ADC, voltage monitor, reference voltage, reference input, ADC reference, resistor divider

APPLICATION NOTE 3746

Simple Power Monitor

Mar 13, 2006

Abstract: This circuit allows an A/D converter to monitor a system supply voltage by connecting the supply directly to the ADC's reference input.

This design idea appeared in the April 28, 2005 edition of *EDN* magazine.

Systems in which an analog-digital converter (ADC) monitors the supply voltage must contend with the condition in which the ADC reference is usually lower than the supply voltage (**Figure 1**). An external resistor-divider can pull the supply voltage within the ADC's range, but even 0.1% resistors introduce an error that may be objectionable in certain applications.

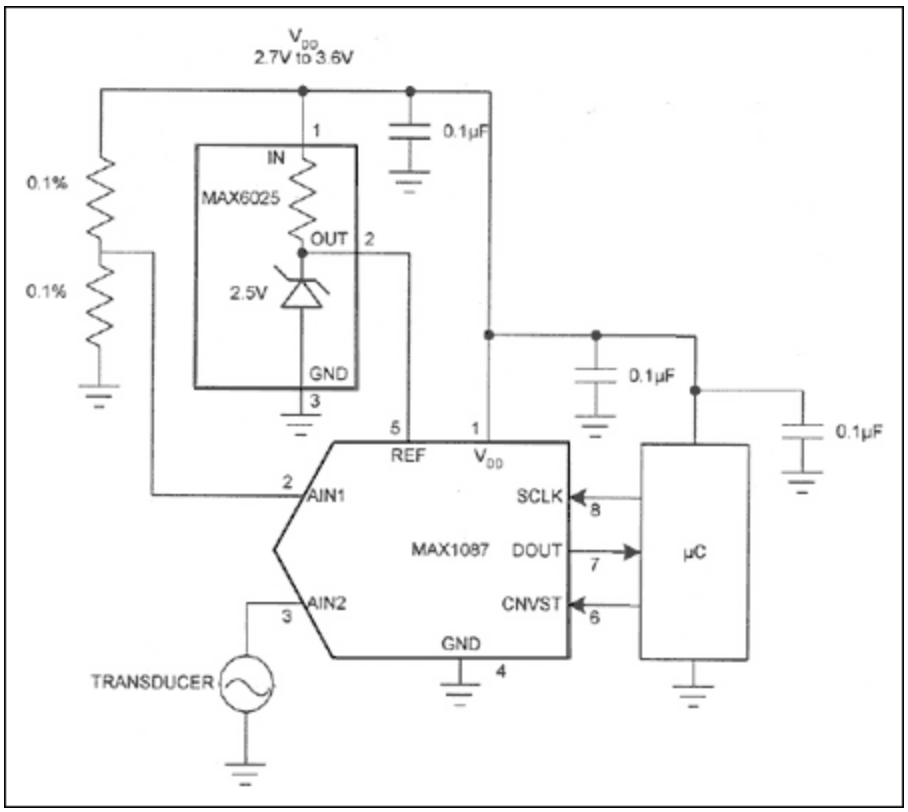

Figure 1. A supply-monitoring circuit like the one shown here usually requires that the ADC input be lower than the reference voltage. Consequently the circuit must include a resistive divider (and

associated error) at the ADC input.

One solution to the ADC reference voltage problem is simply to eliminate the divider (**Figure 2**). You can relate the reference to the supply voltage by connecting the supply voltage as a reference, and the reference (2.500V for the MAX6025A) to an input. As Figure 2 shows for the MAX1087, the ADC must be capable of accepting an external reference as high as the supply voltage. The other channels are now measured as a ratio to the supply voltage instead of the reference, but software can correct that problem.

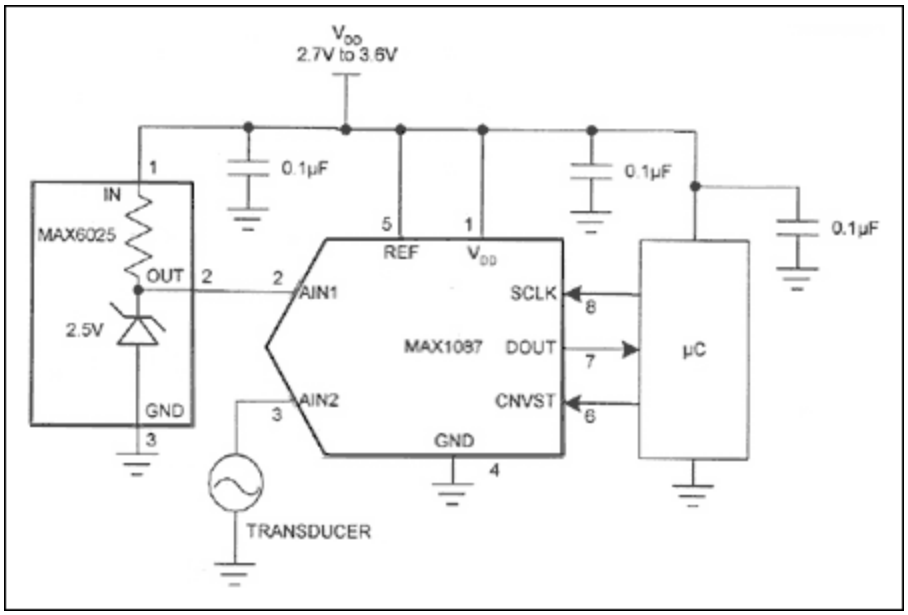

Figure 2. The connections shown enable this ADC (which allows V_{IN} to be as high as the reference) to monitor supply voltage without the divider included in Figure 1.

Because the supply rail serves as a reference, any noise on the rail disturbs all channels. You may, therefore, need to add a local lowpass filter to quiet the supply voltage in noisy environments.

Related Parts		
MAX1087	150ksps, 10-Bit, 2-Channel Single-Ended, and 1-Channel True-Differential ADCs in SOT23 and TDFN	Free Samples
MAX6025	Precision, Low-Power, Low-Dropout, SOT23-3 Voltage References	Free Samples

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