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## APPLICATION NOTE 3092

# Alternate DS2740U Application Circuit with Reduced Current Measurement Offset Error

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*Abstract: The DS2740 has a slight positive offset bias in its current measurement A/D, caused by sharing one of its inputs with device ground. Using an alternate circuit, this offset error can be removed by eliminating the input filter of the A/D.*

## Introduction

The recommended circuit in the DS2740 data sheet includes an input filter for the A/D (formed by the capacitor on IS1/IS2 and two internal 10k resistors) but also specifies a average offset error of +1 LSB caused by sharing one sense line with device ground through  $V_{SS}$ . This paper describes an alternate circuit that removes the positive offset error at expense of the input filter.

## Application Circuit

The circuit shown in **Figure 1** is identical to the data sheet application circuit except for the following changes: 1) The filter capacitor between IS1 and IS2 is no longer present, 2) IS1 and IS2 are now connected directly across the sense resistor, and 3) SNS is left open. The resulting circuit allows the DS2740U to measure current through  $R_{SNS}$  without the normal offset bias introduced by the device's own active current flowing out  $V_{SS}$ . The resulting current measurement offset range becomes -5 LSBs to +3 LSBs (-1  $\pm$ 4 LSBs) instead of the normal datasheet specification -3 LSBs to +5 LSBs (+1  $\pm$ 4 LSBs).

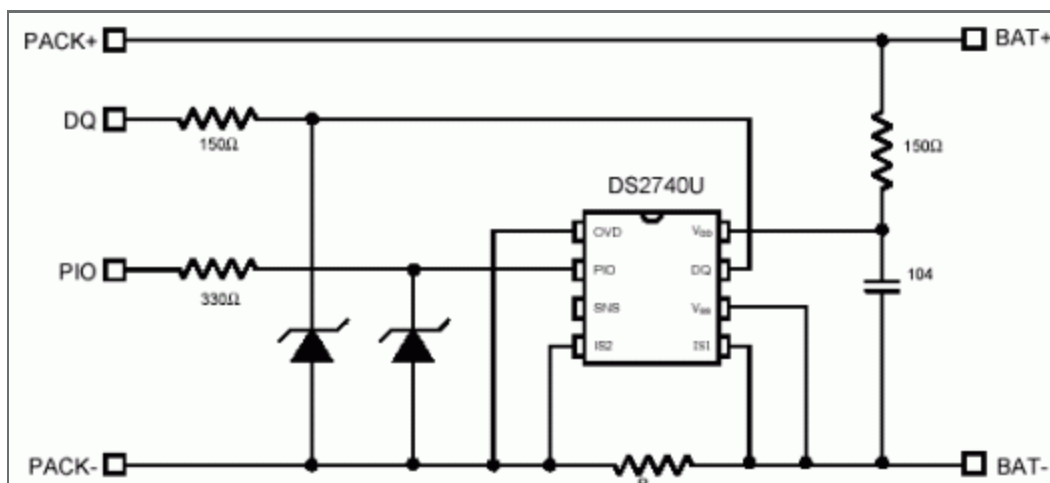


Figure 1. Alternate Circuit with IS1 and IS2 Connected to the Sense Resistor, SNS Open.

Given the standard  $0.020\Omega$  sense resistor -1 LSB is roughly equivalent to the active current of the DS2740U making the alternate circuit more accurate by an average of 2 LSBs or  $\sim 1.9\text{mAH}$  per day. The tradeoff for decreased offset error is the loss of the IS1/IS2 filter. This will not affect most applications. Applications with repeated current spikes larger than the dynamic range of the A/D (102mV) should evaluate whether gain accuracy is decreased when the filter is removed.

## Summary

Offset error of the DS2740U can be reduced by an average of 2 LSBs (1.9mAH per day with a  $0.020\Omega$  sense) by connecting IS1 and IS2 directly to the sense resistor. The loss of the input filter will have no impact in most applications. High current applications should be evaluated to determine if the filter could be removed without affecting accuracy.

### Related Parts

[DS2740](#)

High-Precision Coulomb Counter

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