

## Solving Sensor Offset Problems with TC7106

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### INTRODUCTION

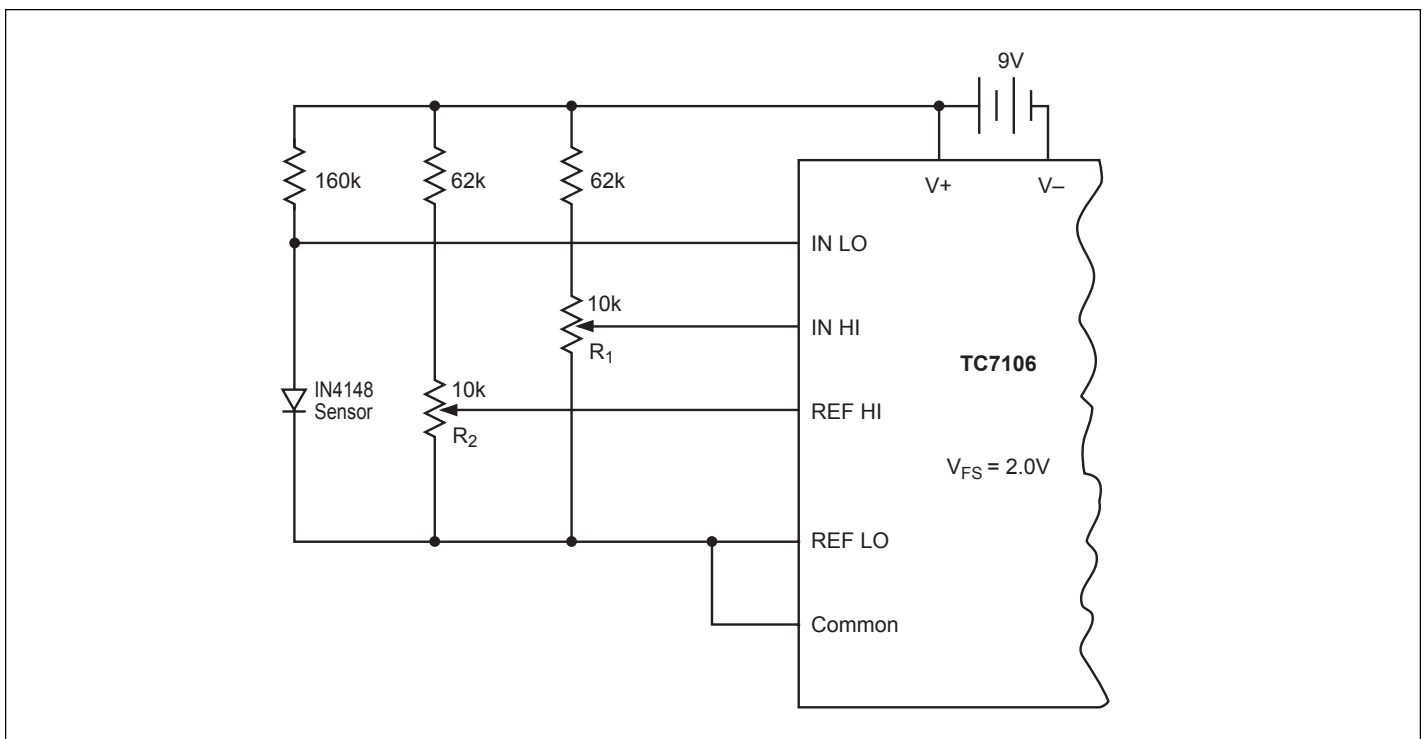
Design engineers sometimes have to interface the TC7106 and similar ADCs to “non-ideal” sensors. A very common problem is that the sensor often does not give a “zero” output where the design wants a zero reading.

One example of a “non-ideal” sensor is a diode used as a temperature sensor. The diode typically changes  $-2\text{mV}$  per degree Celsius, but the change is from the diode’s forward voltage of  $600\text{mV}$  or so. In order for the display to read “000” at  $0.0$  degrees, an offset must be provided.

The differential inputs of the TC7106 yield an easy solution to the offset problem. Figure 1 shows a simple thermometer with a diode sensor. Because the diode voltage decreases as temperature increases, IN LO is connected to the diode temperature sensor. The IN HI input is connected to a trimpot which is used to cancel the diode’s forward voltage.

The offset problem gets a little more difficult, however, if a sensor requires a negative offset. The easiest way, shown in Figure 2, is to use a LM285-1.2 reference. This will provide an offset of up to  $-1.20\text{V}$ . The only “trick” to this circuit is that resistor R1 must source enough current for the LM285-1.2 plus a few extra microamps for the COMMON input.

Figure 2 also demonstrates the utility of the TC7106 families’ differential reference. The effective reference voltage is simply the difference between the REF HI and REF LO inputs. In this way, the same LM285-1.2 can be used to produce both input offset and reference voltages.



**FIGURE 1:** Positive offset.

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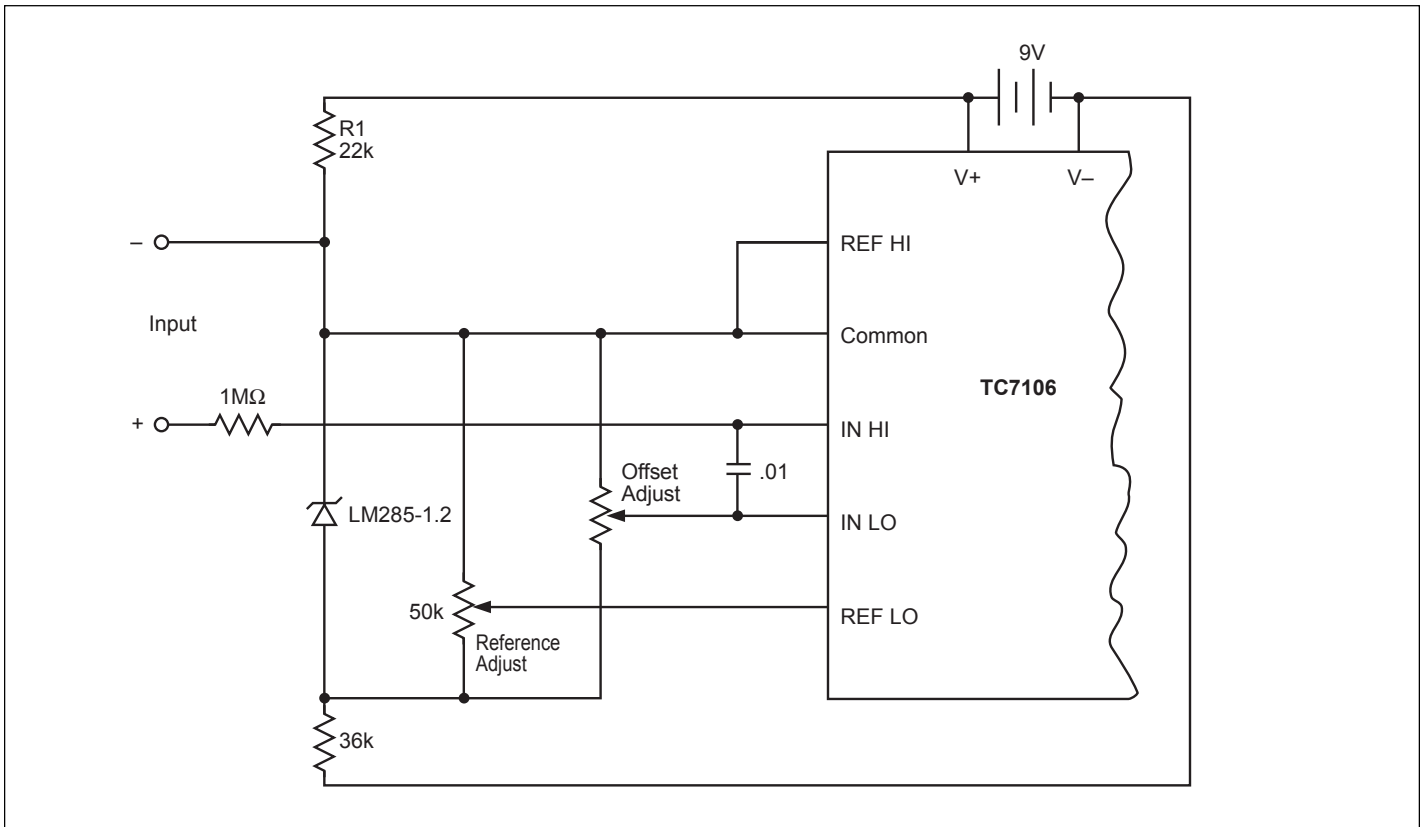


FIGURE 2: Negative offset.

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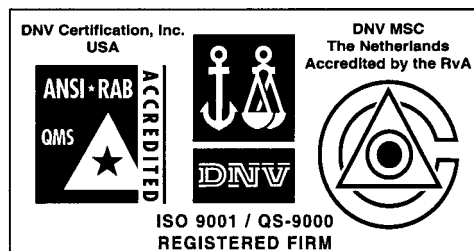
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