Evaluation of the Honeywell CSLA1CD Current Sensor

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Introduction:

The CSLA1CD is a Hall-effect based current sensor for measuring both DC and AC currents in a power system. It consists of an open iron core with a 1/8" air gap, in which the Hall effect device is placed. Rudimentary signal conditioning is also provided on the module. Figure 1 shows the device.

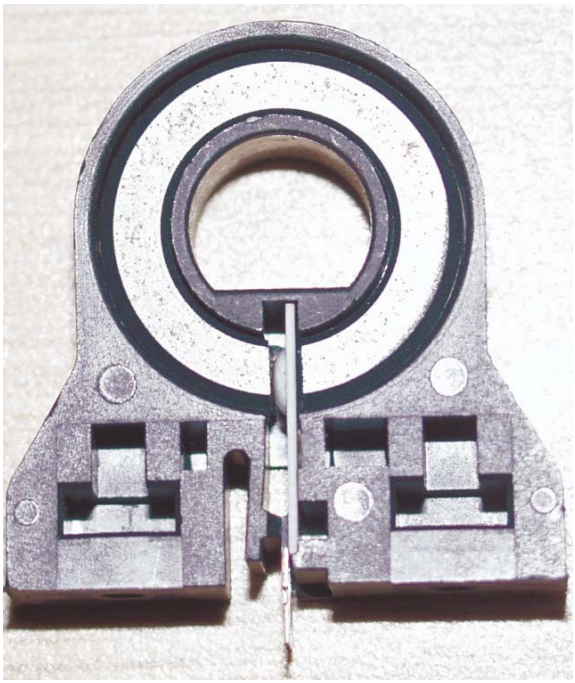

Figure 1: CSLA1CD Current Sensing Module

Test Circuit Setup:

The current sensing module was connected into the test circuit of Figure 2. A variable-voltage isolated 60 Hz AC source was coupled to a 1 Ohm power resistor through the CSLA1CD current sensing module. The output of the module (internally an emitter follower) was biased through R1, an external 2.2 k resistor (arbitrarily chosen, no data given from the manufacturer.) Three turns of sense wire were used. (This again was arbitrarily chosen.)

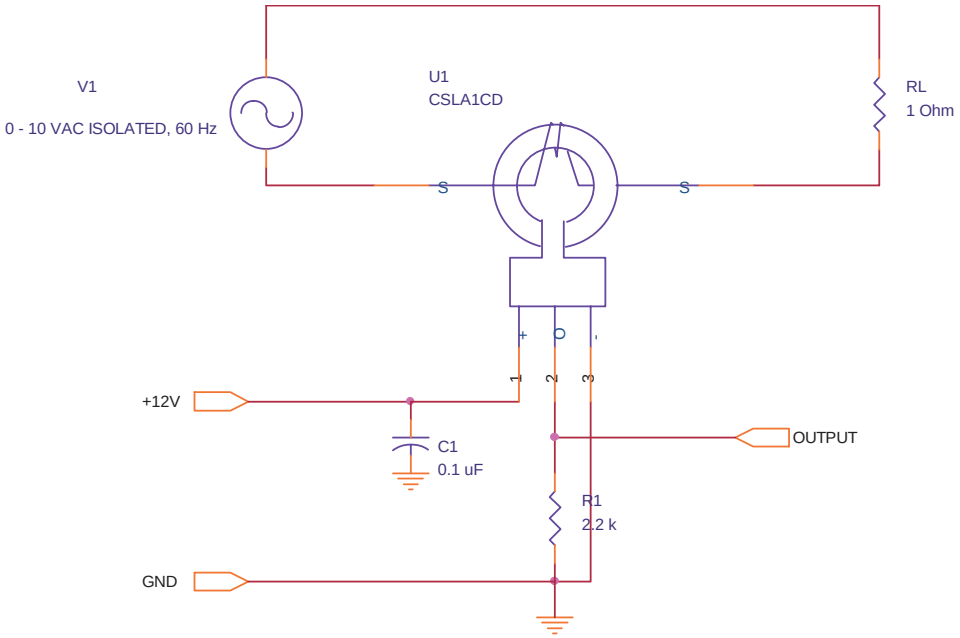

Figure 2: Test Circuit for Current Sensor Module

Figure 3 shows the basic setup as prototyped:

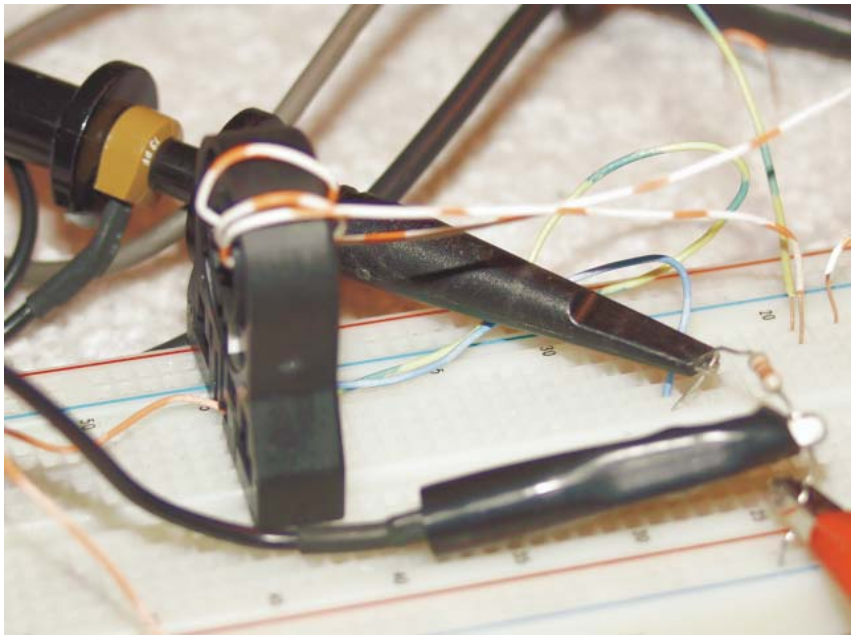

Figure 3: Prototype Circuit

Observations:

1. The output pin ("O") rode at a DC level of VCC/2 as expected.

2. The current sensing sensitivity varied with VCC. Higher VCC produced more output deflection for a fixed input current.

3. With the configuration shown, and VCC=12V, the current sensing sensitivity was:

$$K = \frac{\partial Vo}{\partial Is} \approx \frac{200mVpk}{1Apk} \approx \underline{\underline{0.2V/A}}$$

Since there were 3 turns of sense wire, the fundamental device sensitivity at VCC=12V could be estimated at:

$$K_0 \approx K/3T \approx 0.06\bar{6}V/A-T$$

Note that the provided data sheet specifies a sensitivity of 0.0496 V/A-T +/- 5.8. The sample device is out of this range -- however, only a rough measurement was made based on scope signal deflections. Figure 4 shows the oscilloscope display.

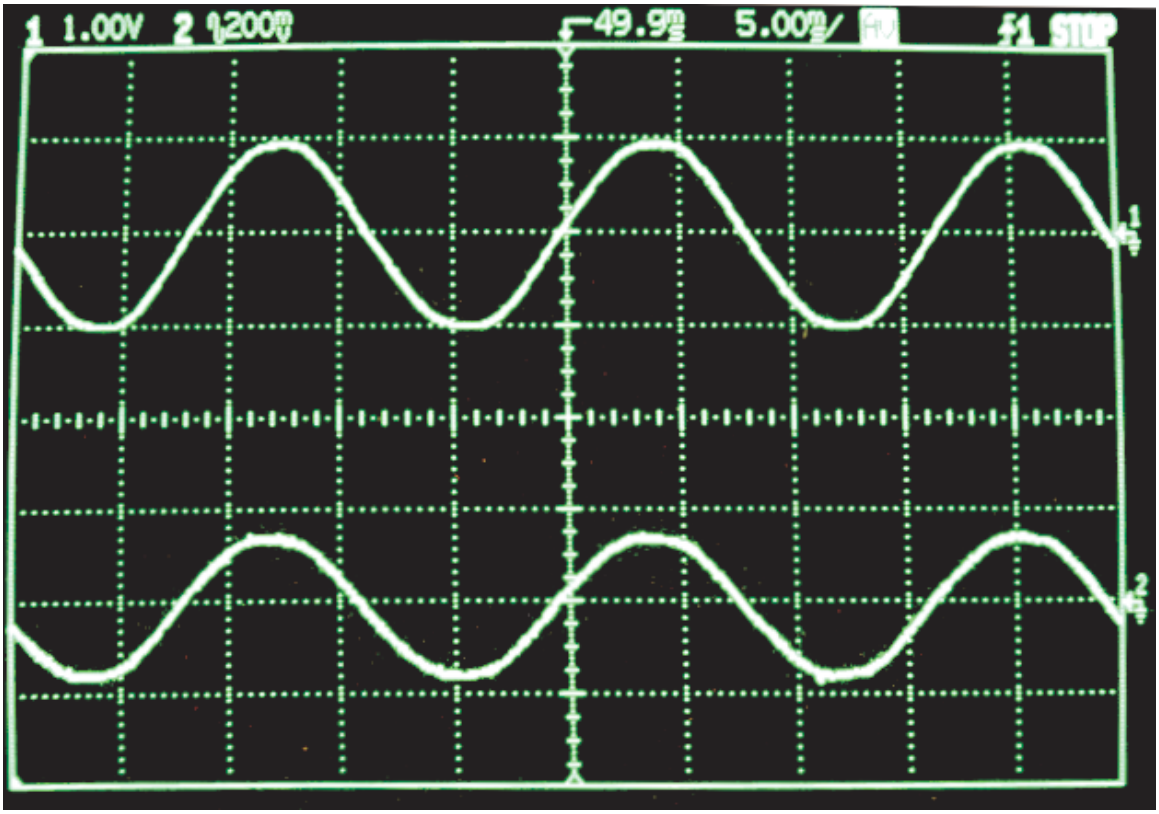

Figure 4: Oscilloscope Display. Ch1 = V_{RL} (1 A/division); Ch2 = V_{OUTPUT} (200 mV/div, AC coupled)