

Illustration 2: IS-3

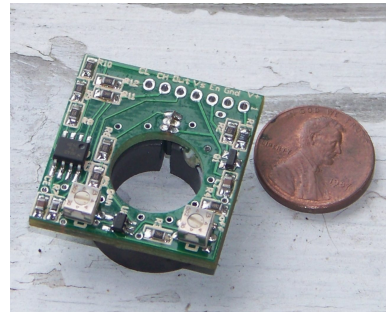


Illustration 1: IS-4

Hall Effect Isolated Current Sensor

P/N IS-3-80A 80amps ¼ " opening

P/N IS-3-160A 160amps ¼ " opening

P/N IS-4-80A 80amps ½ opening with Trim Pots

Features:

- Linear Sensing Bipolar DC and AC current
- Isolated (sensing wire passes thru 1/4" opening)
- Bandwidth 30khz response time 10usec
- Open circuit(see attached full schematic)
- Dual comparator on board to trigger over positive or negative current
- small size (.90" x .82" ¼ " opening IS-3) (1.22" x 1.16" ½ opening IS-4)
- Low cost
- +5volt operation (4.5v to 5.5v operating range)
- Low power consumption ~6mA
- Shut down mode
- On board reconfigurable OPAMP gain&offset
- Output RC filter
- IS-4 has trim potentiometers to trim gain and offset

Applications:

- Measuring high currents without loss
- Over Current protection
- Motor current control

Specifications

Parameter	IS-3-80A	IS-3-160A	IS-4-80A
Operating Voltage	4.5V to 5.5v	4.5V to 5.5v	4.5V to 5.5v
Power Supply Current	6 mA typical	6 mA typical	6 mA typical
Measurement Range	+/-100 Amps Max	+/- 200 Amps Max	+/- 100 Amps Max
Over Current Response Time	~10us	~10us	~10us
Bandwidth	30khz	30khz	30khz
DC Offset (with no applied field current)	75mv(MAX) 25mV(typical)	75mv(MAX) 25mV(typical)	+/- 5mV (adjustable with potentiometer)
Sensitivity	23 mV/Amp typical	12 mV/Amp typical	25 mV/Amp (calibrated) (adjustable with potentiometer)
Output Center Voltage	½ Supply - ~25mV	½ Supply - ~25mV	½ Supply - ~25mV
Inductance	~30nh	~30nh	~30nh
Gain Temperature Drift -10C to 70C	20mV MAX *1	20mV MAX *1	20mV MAX *1
Offset Temperature Drift -10C to 70C	25mV MAX *1	25mV MAX *1	25mV MAX *1
Hysteresis Offset (After 100Amp Pulse)	20mv Max *1	20mv Max *1	20mv Max *1
Linearity	<3% *2	<3% *2	<3% *2
Output Swing	Rail to Rail	Rail to Rail	Rail to Rail
Chopping Noise	30mv PkPk	30mv PkPk	30mv PkPk

*1 Values needed to remeasured for new improved core material. Offset and Gain appear stable over temperature.

*2 Linearity appears to be better than 1%.

Input/Output Pins:

Pin	Name	Function
1(top)	Vc	DC power supply input voltage (5v)
2	Gnd	Unit ground input
3	En	Shutdown/Enable digital input pin Shutdown when high, pull low to enable

		Normal operation when high onboard 100k pull-up to 5v
4	Vs	5v shutdown output When En(Pin 3) is low =5v When En is high or open =0v
5	Out	Analog output (~2.5v nominal)Out
6	CH	High side comparator output Goes low when current above limit High when below current Open drain(collector output) can be tied to CL
7	CL	Low side comparator output Goes low when current below negative limit High when below negative current Open drain(collector output) can be tied to CH

Description

The devicecraft hall effect sensor is a low cost current sensor useful for many applications. The device consists of a special core, hall effect sensor, shutdown switch, OPAMP, dual comparator, and miscellaneous capacitors and resistors. The circuit schematic is attached to the data sheet allowing for user customization and simulation.

The standard device is set to have a center voltage of 1 half the supply voltage minus ~25mv for resistor and switch losses. Depending on the direction of current the output voltage will rise or fall with increasing current. To reverse the polarity simply pass the wire through the in opposite direction. The device can be configured to be unipolar by adjusting the offset and increasing the OPAMP gain to x2. The device can also be set as a overcurrent trigger by adjusting the offset voltage and setting the OPAMP gain to a large value or feedback resistor left open.

The device can also be configured for increased sensitivity. The sensitivity can be increased by increasing the gain of the OPAMP. Keep in mind, increasing the gain of the OPAMP will also multiply and any offset voltages. The device can also be made more sensitive by passing the sense wire though the loop multiple times. The output voltage will be linear multiple with the number of turns.

Shutdown

The devicecraft hall effect sensor has a shutdown or disable feature. The shutdown is controlled with the Enable line (pin 3). To enable the unit the Enable line must be pulled low, to ground. To disable the unit the Enable line is left open or pulled to the power supply rail. There is a on board 100k ohm pull-up resistor to the supply rail allowing the unit to be disabled by opening the enable line. Tying the line to ground will permanently enable the unit. There is a ground via close to the EN pin for permanent ON operation. During shutdown the unit will draw 0 mA from the power supply line, allowing use in low power systems. The shut down line can also be used to sample the current and shutdown when not in use.

Output Filter

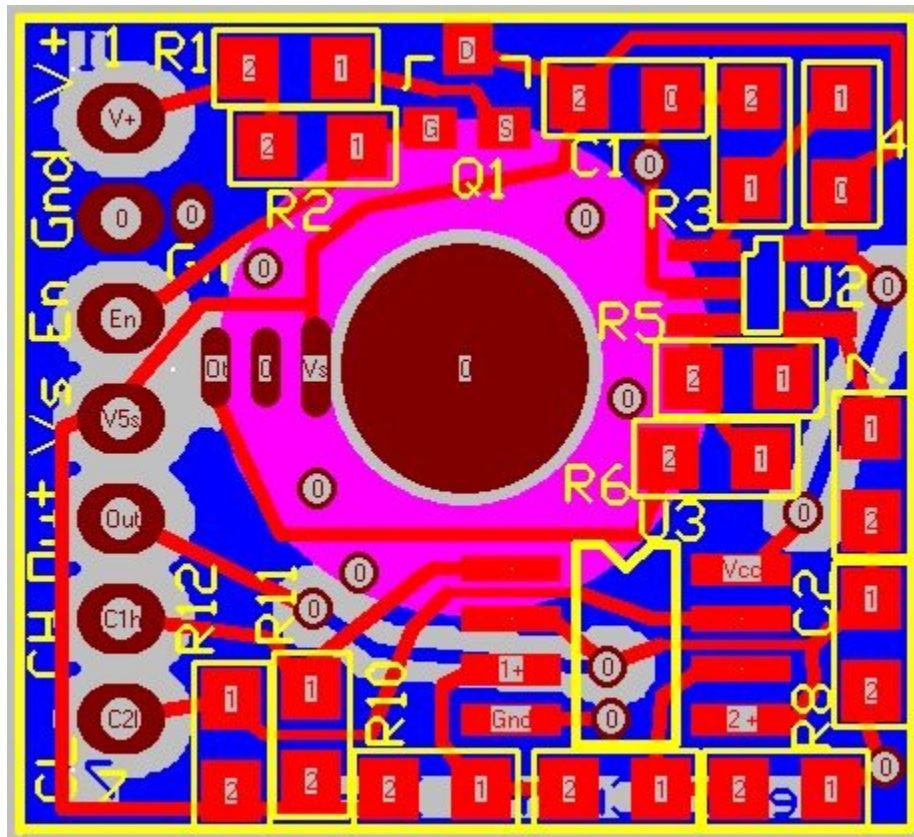
The devicecraft hall effect sensor has a output filter. The output filter can be seen on the schematic. The output filter consist of the R7 C2 combination. The output filter helps isolated the output of the OPAMP from transients, filters the output, and provides short circuit protection.

The filter can be modified. The noise from the Hall Effect sensor can be reduced further by decreasing the bandwidth. The user may also desire to decrease the bandwidth to delay the response time for any over current condition. The filter bandwidth is reduce by increasing either C2 or R7.

Comparator Outputs

The IS-3 hall effect current sense module features a on board dual comparator. The dual comparator can be used to trigger a over current condition. The output of the filtered analog signal is applied to a 20k/100k/20k window comparator. The 20k/100k/20k combination set the high trigger point to 4.28v equivalent to 78 Amps for the IS-3. The low side will trigger at .714v equivalent to triggering at -78 Amps. The output of the comparators can be tied together to allow for one pin to sense either over current situation. The 20k/100k/20k can be modified to trigger at any trip point.

The comparator output are open collector/open drain. The pullup resistor on the comparator outputs is currently two 50k ohm 1% resistors. Both output can be tied together to trigger on either both +/- trip points. A large capacitor tied to ground will create a long rise time. The time constant of the rise time will be $50k \cdot C_{load}$. A 10uf Capacitor will produce a .5sec time constant. The time constant will be cut in half for both comparator output resistor tied in parallel. For low ESR capacitors, a resistor should be placed in series to reduce the comparator pull down current.



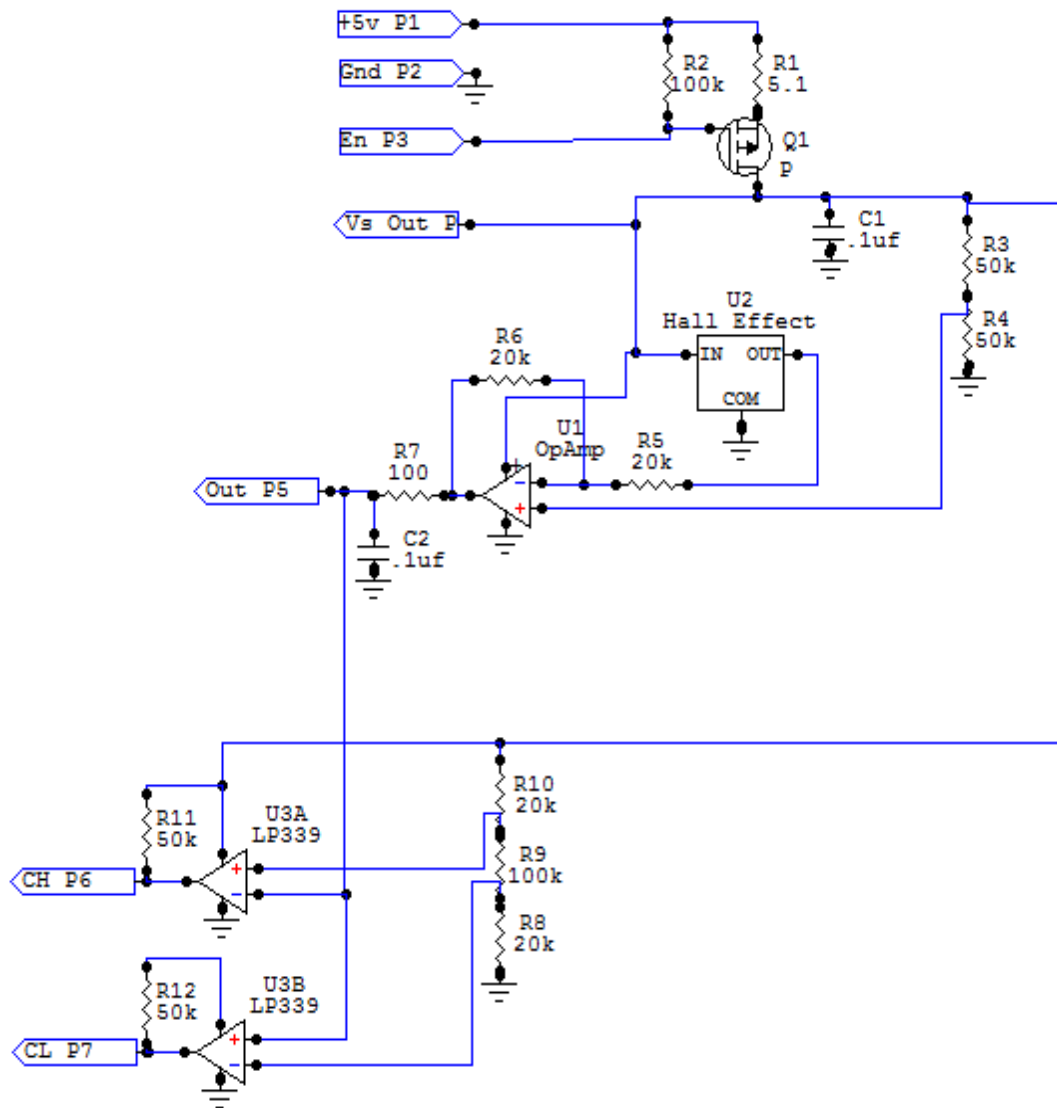


Illustration 3: IS-3 Current Schematic (subject to change)

IS-4 trim potentiometers at R6 and R3/R4