HCD-4

High Current Driver
Peripheral Board

Technical Manual

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WARRANTY:

BiPOM Electronics warrants HCD-4 for a period of 1 year. If the board becomes defective during this period, BiPOM will at its option, replace or repair the board. This warranty is voided if the product is subjected to physical abuse or operated outside stated electrical limits. BiPOM Electronics will not be responsible for damage to any external devices connected to HCD-4. BiPOM Electronics disclaims all warranties express or implied warranties of merchantability and fitness for a particular purpose. In no event shall BiPOM Electronics be liable for any indirect, special, incidental or consequential damages in connection with or arising from the use of this product. BiPOM Electronics' liability is limited to the purchase price of this product.

1. Overview

HCD-4 is a 4-channel high current driver peripheral board for the MINI-MAX series of micro-controller boards. It offers complete control and drive for 4 open drain MOSFET's that can supply up to 10 Amperes each. HCD-4 also has servo motor connectors for connecting up to 4 radio control style servo motors.

2. Specifications

- 4 open drain MOSFET outputs, 10A each, brought to screw terminal blocks
- Maximum combined current on all channels: 20A
- 4 servo motor connectors, industry standard 3-pin connector for each servo
- 20-pin Expansion Connector (X10) interface to a variety of micro-controller boards
- I2C port for interfacing to sensors, displays
- Push button
- Dimensions are 2.35 X 2.40 inches (5.97 X 6.10 centimeters)
- Mounting holes of 0.125 inches (3.18 millimeters) are on four corners
- -40° to +85° C operating and storage temperature range

3. Theory of Operation

High current outputs are controlled by 4 Fairchild FDS5672 N Channel MOSFET's. The load connected to the drain of each MOSFET is powered by a high logic level at the input of that MOSFET. MOSFET powers the load by pulling one side of the load to ground. Other side of the load is permanently connected to the load's power supply. This power supply is external and should be provided by the user depending on the load. For example, to power a 12 Volt fan, this can be a 12 Volt external adapter.

MOSFET's are driven by a 74HCU04 inverter which inverts the logic level. Microcontroller ports are connected to SW1, SW2, SW3 and SW4 points. When the microcontroller port pin is logic low, the corresponding MOSFET is activated and the load is powered. Since MINI-MAX boards and many other microcontroller systems have pull-up resistors on port pins (or internal weak pull-up resistor upon power-up), this approach is a safe way to control the MOSFET's. In other words, the MOSFET's will not be turned on accidentally when the microcontroller is resetting and beginning to run the user program.

Series resistors between the inverter output and the MOSFET gates help isolate the low voltage microcontroller and inverter section from the MOSFET section which may have higher voltages, in case MOSFET's are damaged.

Schottky Diodes connected to drains of MOSFET's serve as freewheeling diodes and continue to pass current when inductive loads are switched off to prevent high voltages due to inductive switching.

CAUTION: HCD-4 is NOT designed to drive AC loads. Do NOT try to connect 110VAC or 220VAC loads to HCD-4 as this will damage the board and anything else connected to it and may cause injury.

4. Expansion Connector

The 16 control pins and 5 Volt power supply pins are available on the 20-pin connector (X29) for interfacing to a variety of micro-controller boards. HCD-4 board can be connected to a host board either as a piggyback daughter-board using standoffs or can be placed away from the host board using a 20-wire ribbon cable (Part #: EXPCABLE-6). Table 1 shows the pin assignments for the connector.

Expansion Connector (X29)

Signal	Pin	Pin	Signal
P3.0	20	19	P3.1
P3.2	18	17	P3.3
P3.4	16	15	P3.5
P3.6	14	13	P3.7
P1.0	12	11	P1.1
P1.2	10	9	P1.3
P1.4	8	7	P1.5
P1.6	6	5	P1.7
Not Connected	4	3	GND
VCC (+5V)	2	1	Not Connected

Table 1

5. External load connection

Figure 1 shows how to connect a load to the board.

Positive side of external power supply to drive the load should be connected to one side of the load as shown. Negative (ground) side of external power supply should be connected to ground (-) terminal of X12 on the HCD-4 board. External power supply should have sufficient power to drive the load.

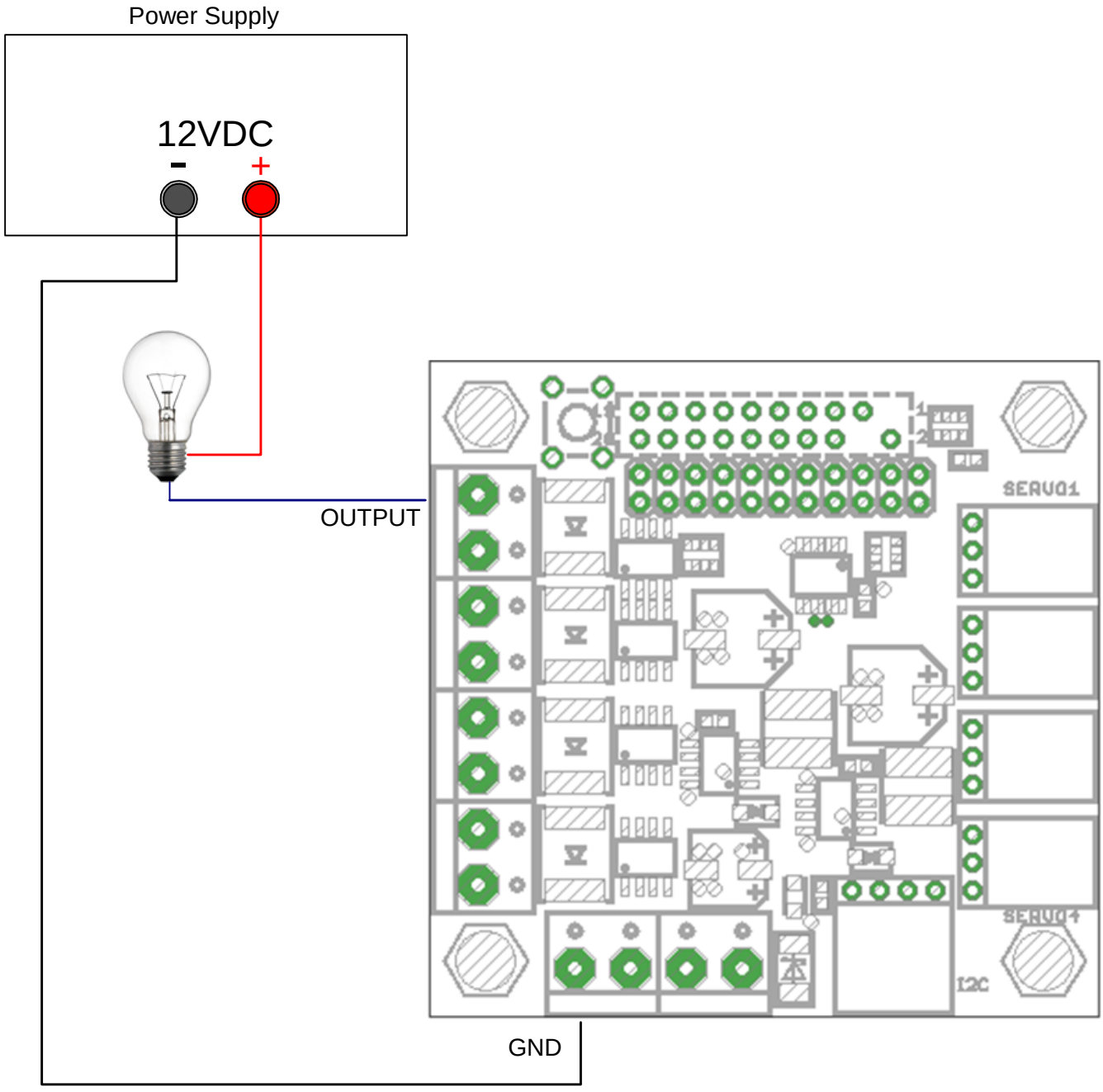

Figure 1

Figure 2 shows the equivalent circuit of Figure 1 connections.

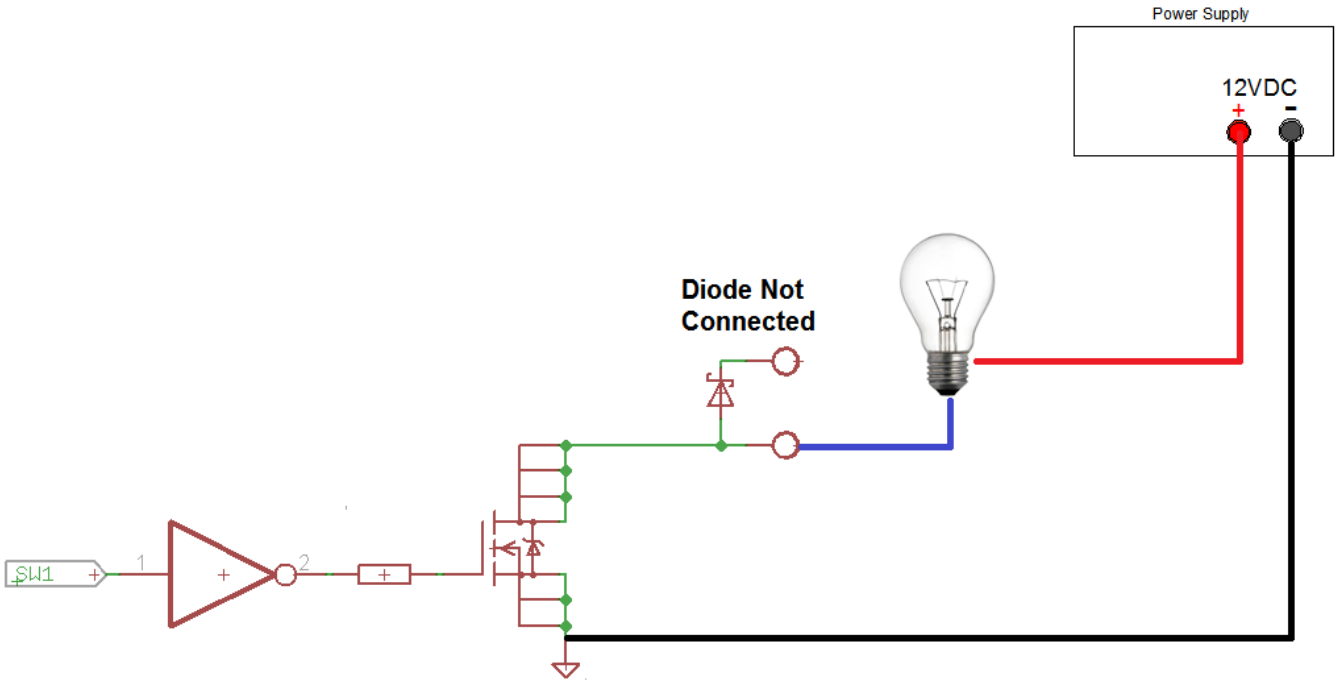

Figure 2

Figure 3 shows how to connect multiple loads to the board:

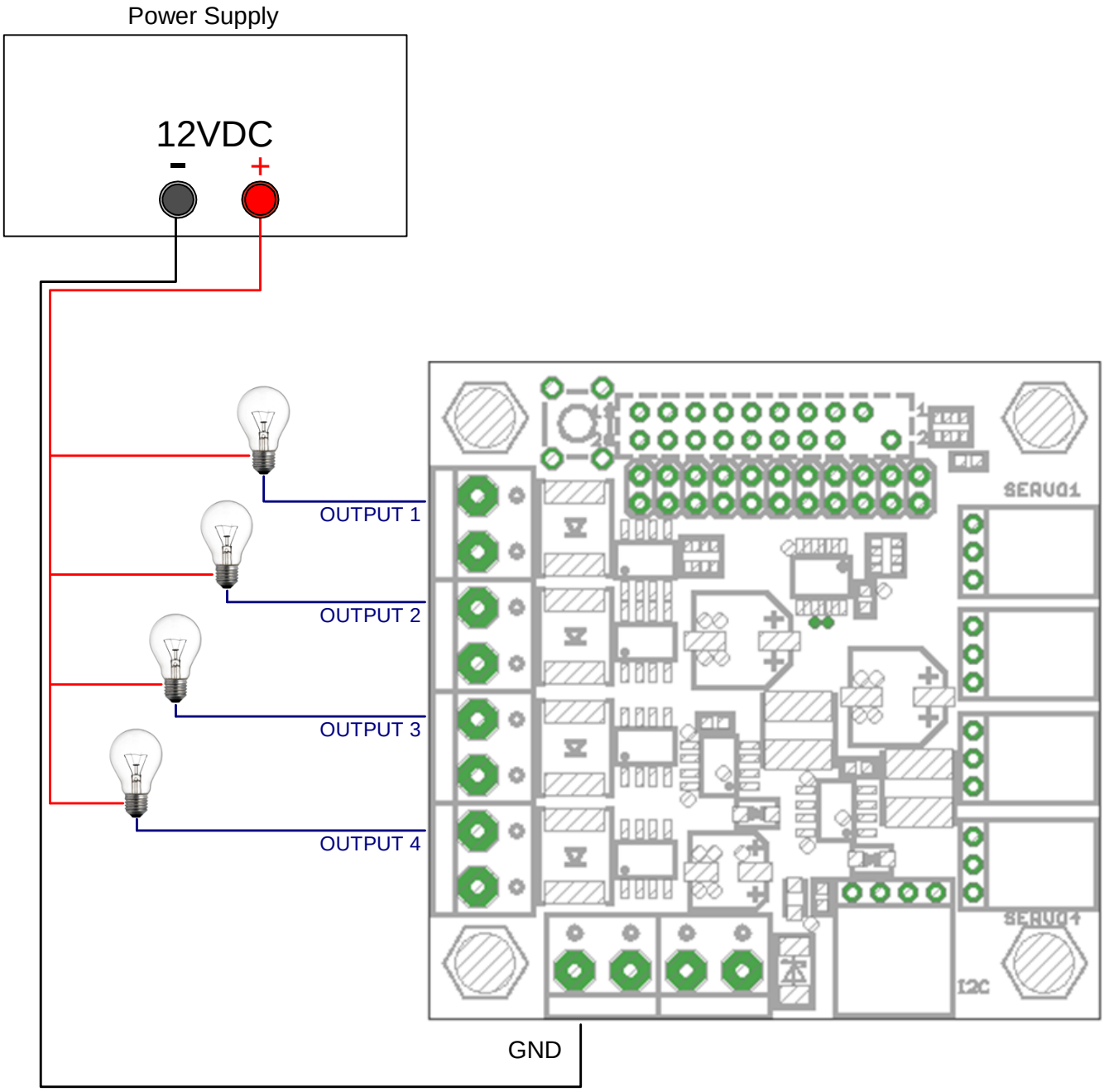

Figure 3

Figure 4 shows how to connect an inductive load to the board. Note that the protective diode MUST be connected to avoid damage to the HCD-4 board or the power supply due to high voltages generated when the inductive load is suddenly switched on and off.

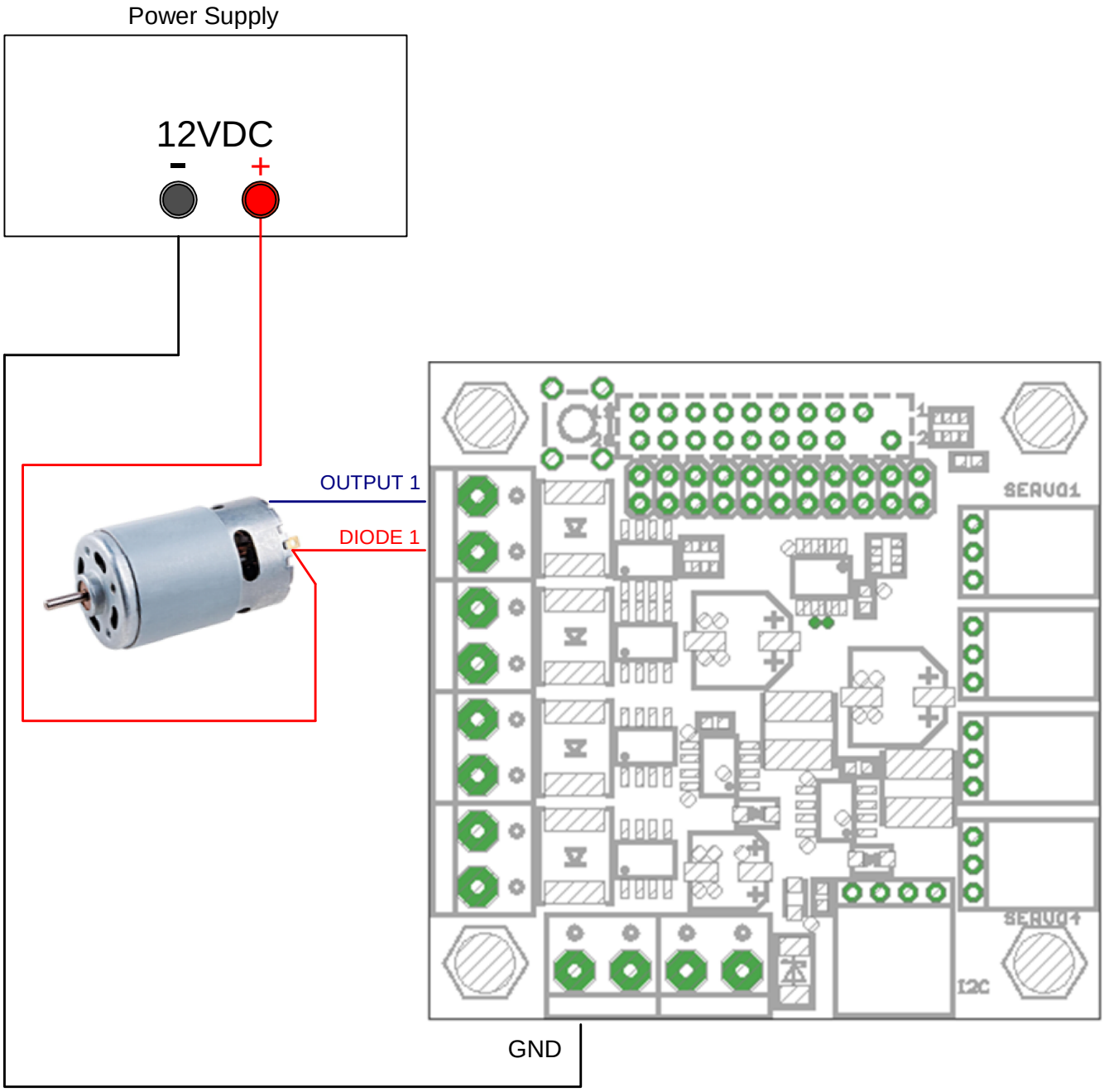

Figure 4

Figure 5 shows the equivalent circuit of Figure 4 connections.

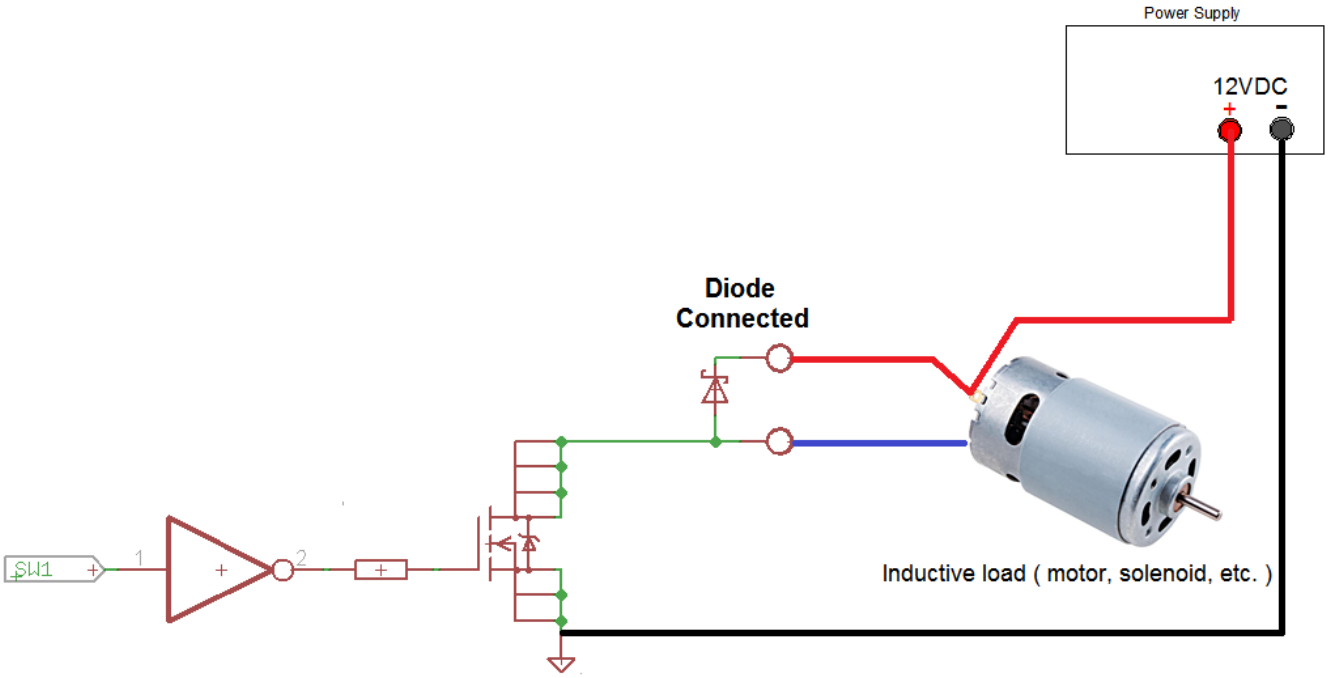

Figure 5

Figure 6 shows how to connect servo motors to HCD-4. Servo motors typically have a 3-pin connector. Middle wire is red (supply voltage to servo). One side is ground and other side is signal.

CAUTION: Check the servo manufacturer's wiring diagram to avoid damage to HCD-4 or to servo motor.

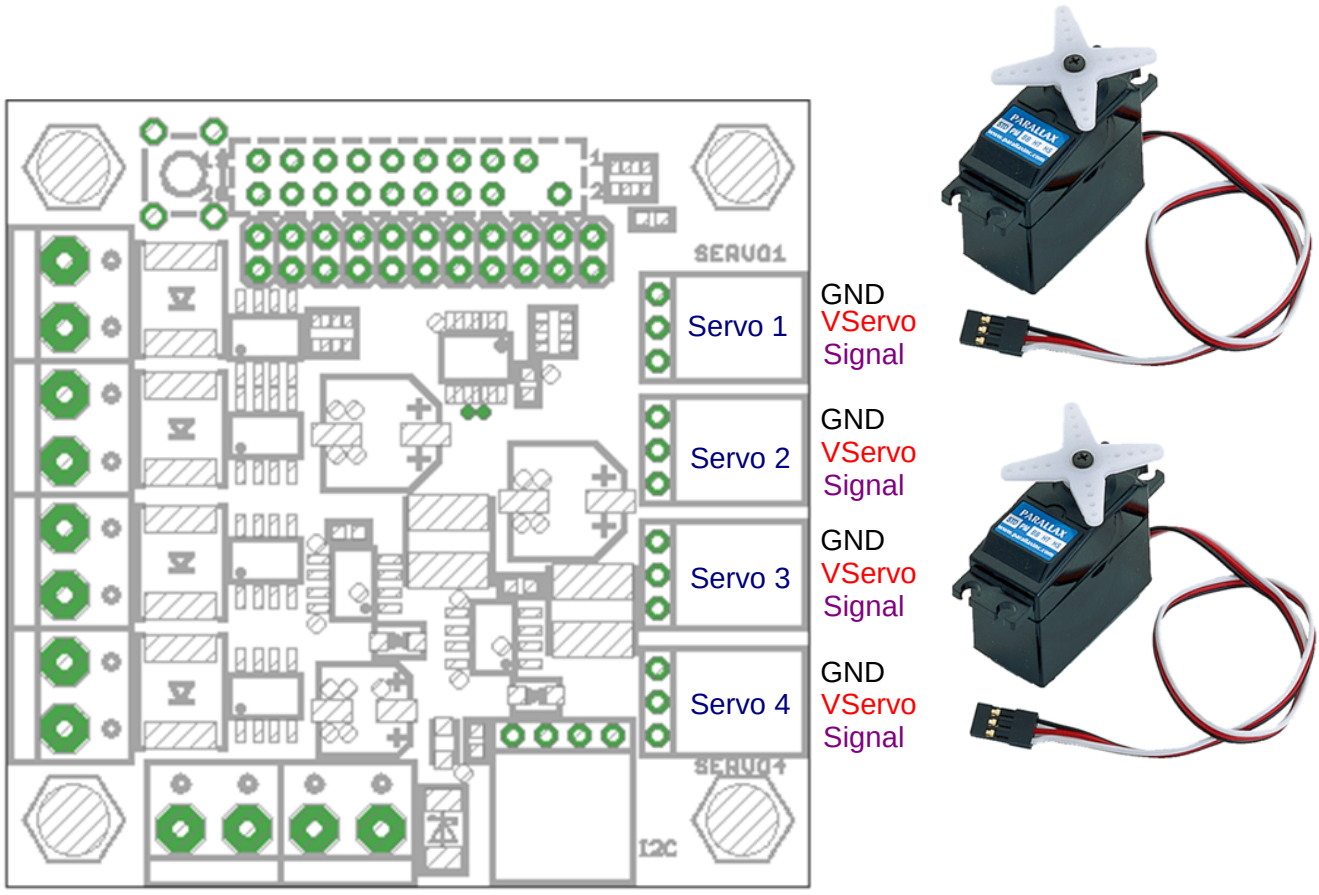

Figure 6

6. Board Layout

Figure 7 shows positions of major components, connectors and terminals on the HCD-4 board.

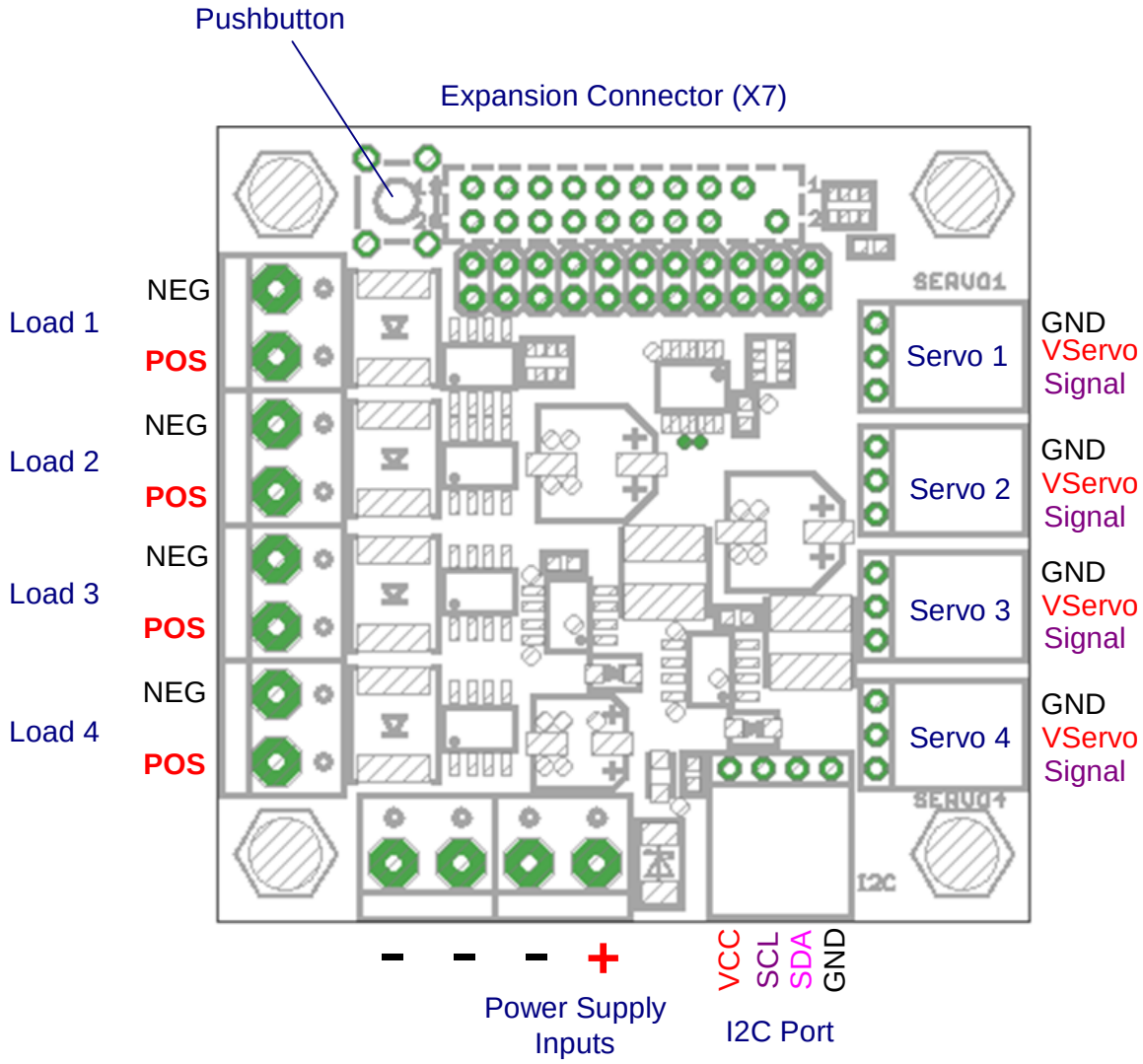

Figure 7

7. Schematics