DCMC20 (DC Motor Controller 20A

Tak Auyeung, Ph.D.

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1 Design Objectives

This is a dual H-bridge controller board that is self sufficient for closed loop DC motor control and driving. The primary objective is to be able to drive two windshield wiper motors, each at 24A stall current at 12V.

2 Parts

- Digikey IPS0151-ND is used as a protected low-side driver. $3.36 each at 25.
- Digikey IPS5451-ND is used as a protected high-side driver. $4.00 each at 25.
- Digikey MBR2535CT-1-ND is used as flyback diode. $1.18 each at 25.
- Digikey ATMEGA8-16AI-ND is used as main controller. $4.4 each at 25.
- custom made heat sink
- switching voltage regulator, sufficient for 500mA load
- connectors for 2 DC motors
- connectors for 2 quadrature encoders
- power connector
- programming header
- external VCC (5V) connector to power other boards
- Digikey ATF750C-15SC-ND for combinartorial logic

3 CPLD Program

The MCU provides three pins for each motor: EN (enable), C0 (control 0) and C1 (control 1). Observing the values of C1..C0, the combinartorial logic performs different functions: 00: high-low, 10: low-high, 01: low-low (brake) and 11: unused.

The IPS5451 has an active input, as does te IPS0151.

This means

$\texttt{HIGNEN0} = \texttt{EN} \wedge (\neg \texttt{C0}) \wedge (\neg \texttt{C1})$
$\texttt{HIGNEN1} = \texttt{EN} \wedge (\neg \texttt{C0}) \wedge \texttt{C1})$
$\texttt{LOWEN0} = \texttt{HIGHEN1} \vee (\texttt{EN} \wedge \texttt{C0} \wedge (\neg \texttt{C1}))$
$\texttt{LOWEN1} = \texttt{HIGHEN0} \vee (\texttt{EN} \wedge \texttt{C0} \wedge (\neg \texttt{C1}))$