Power Bridge Concept1

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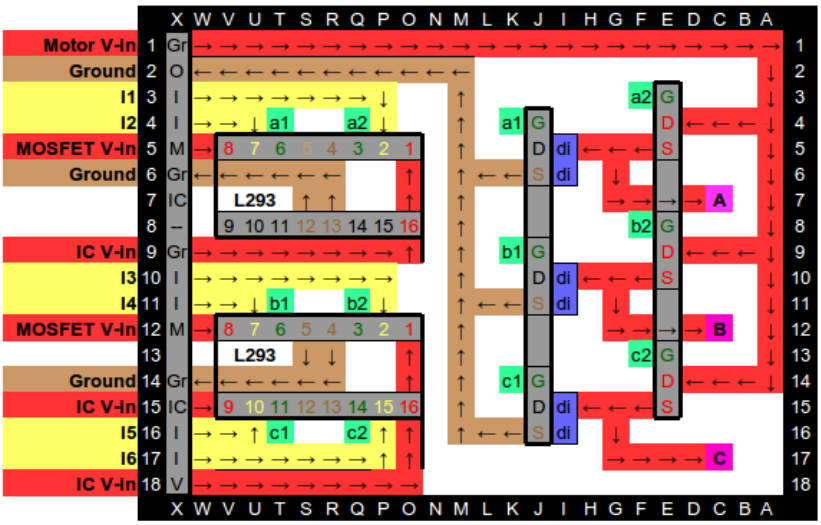
1 Power Bridge Schematic



2 Truth Table

Output			MOSFET Bridge						Input					
A	B	C	gHA	gHB	gHC	gLA	gLB	gLC	1	2	3	4	5	6
High	Low	Null	1	0	0	0	1	0	1	0	0	1	0	0
High	Null	Low	1	0	0	0	0	1	1	0	0	0	1	0
Low	High	Null	0	1	0	1	0	0	0	1	1	0	0	0
Null	High	Low	0	1	0	0	0	1	0	0	1	0	1	0
Low	Null	High	0	0	1	1	0	0	0	1	0	0	1	0
Null	Low	High	0	0	1	0	1	0	0	0	0	1	1	0

3 Testing

3.1 Method

The power bridge was connected to a *Freetronics Etherten* microcontroller (MCU) via a *breadboard*. The input signals to the power bridge were connected to the PWM outlets of the MCU – pins 11, 10, 9, 6, 4 and 3. The power bridge MOSFET and IC power buses should be connected to a 5V supply, whilst the motor power bus can be connected to a larger supply (the test used primarily 12V, and then eventually 30V).

The remaining digital pin outlets were connected to a 1602A LCD display. This was setup so that it showed the phase output readings (A, B and C). Note that negative values will be unsigned in the display.

Other readings can be obtained from a multimeter.

Uploading various programs to the MCU allows control over the power bridge outputs. This can also be done without the MCU, but would require manual reconnection of input circuitry.

3.2 Discussion of Results

1. Peak phase output voltage reached approximately 12V when the motor bus was running at 30V (40%)
2. The high-side MOSFET connection for phase B was found to be weak and may need further soldering (done)
3. Phases that should be *null* have floating values between (rougly) 200 mV – 20 mV; may need resitive loads before the MOSFETs to prevent floating signals.
4. The phase output to motor bus voltage ratio is less than 1, and can be as low as 0.2; need to further investigate how to increase this ratio.
5. Pushing the MOSFET deeper into the header appears to increase the phase output (although this is not recommended as it may lead to burns!). The MOSFET eventually burned out – possibly due to a large sudden increase in current/voltage (12V to 30V). This may be the primary issue as to why the current ratio is so low – that is, the MOSFETs are not actually entirely in contact with the buses. Thus a better connection method may need to be sought.

4 Final Remarks

We may need to investigate whether the low-side phase should or should not have a negative voltage reading. A small number of tests had readings of exactly, and steadily, 0.0 V for their low side – however this was difficult to duplicate in subsequent tests.

A second concept should look into fitting diodes, and snubber protection circuits that will prevent any jump discontinuities in voltage or current.

Additionally, the second concept would be looking into designing/finding more suitable gate drivers as the L293 are designed for H-bridges not Half H-Bridges.