

ABSTRACT

To control the operation and power driven to each motor in the cane, TI's DRV8839 is to serve as an H-Bridge driver IC in the system. One H-bridge IC can bi-directionally control one motor's operation. Proper application of logic inputs regulates control of the output, supplied to the motor. All possible Input Pin combinations are applied to the DRV8839 evaluation board. Output signals are analyzed for verification of operation.

THEORY

Two output signals are produced by each H-bridge IC. The output signals are to be applied to a DC motor, as depicted below:

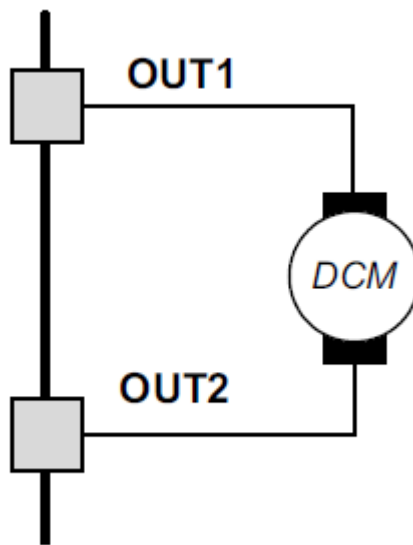


Figure 1. H-Bridge Single DC Motor Connection

And motor operation is controlled as follows:

EN1	EN2	IN1	IN2	OUT1	OUT2	MOTOR OPERATION
0	X	X	X	Z	See ⁽¹⁾	Off (coast)
X	0	X	X	See ⁽²⁾	Z	Off (coast)
1	1	0	0	L	L	Brake
1	1	0	1	L	H	Reverse
1	1	1	0	H	L	Forward
1	1	1	1	H	H	Brake

(1) State depends on EN2 and IN2, but does not affect motor operation because OUT1 is tri-stated.

(2) State depends on EN1 and IN1, but does not affect motor operation because OUT2 is tri-stated.

Table 1. Logic Chart for Motor Operation Control

Brake conditions correspond to *OUT1* and *OUT2* outputting voltages at the same levels (*voltage differential* = $V_{diff} = 0$). Forward corresponds to *OUT1* being high and *OUT2* being low ($V_{diff} \geq 0$). Reverse corresponds to *OUT1* being low and *OUT2* being high ($V_{diff} \leq 0$).

$$V_{diff} = V_{OUT1} - V_{OUT2} \tag{1}$$

RESULTS

IN1	IN2	OUT1 (V)	OUT2 (V)	Vdiff (V)
L	L	0.15	0.155	-0.005
L	H	0.151	4.99	-4.839
H	L	4.99	0.151	4.839
H	H	4.99	4.99	0

Table 2. Results of H-Bridge Testing

CONCLUSION

Applying Equation 1 to acquire the differential voltage that is to be applied to the DC Motor and the principles outlined in the Theory portion, the results found in Table 2 is deemed satisfactory, and in congruence with the expected results outlined in Table 1. The SmartCane application of the DRV8839 is shown in the schematic below:

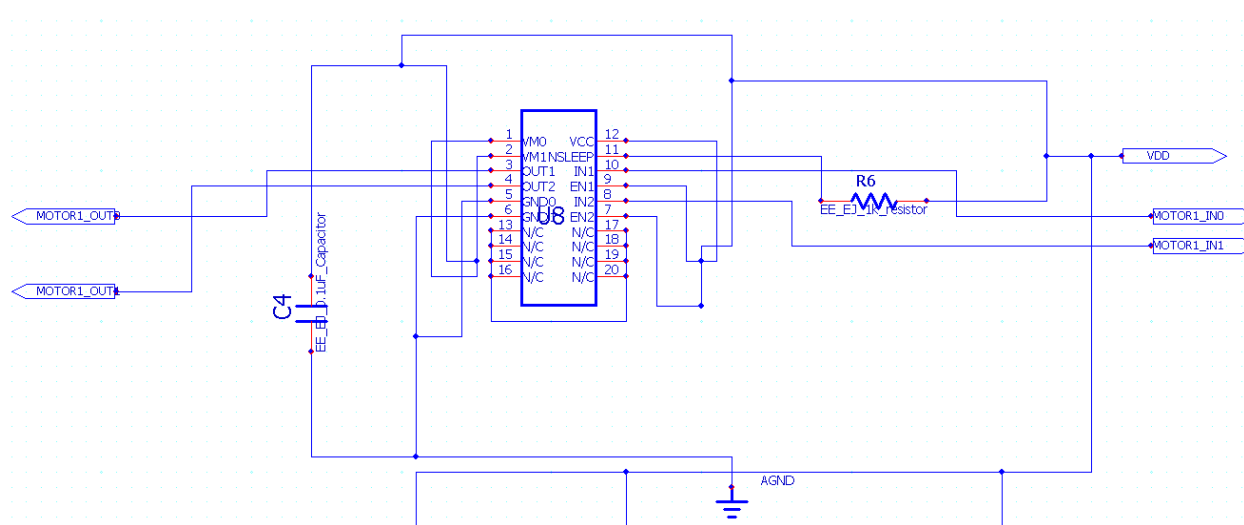


Figure 2. Schematic Drawing of DRV8839 circuit used in PCB design

Key Hardware Used:

DRV8839 Evaluation Module: <http://www.ti.com/tool/DRV8839EVM>