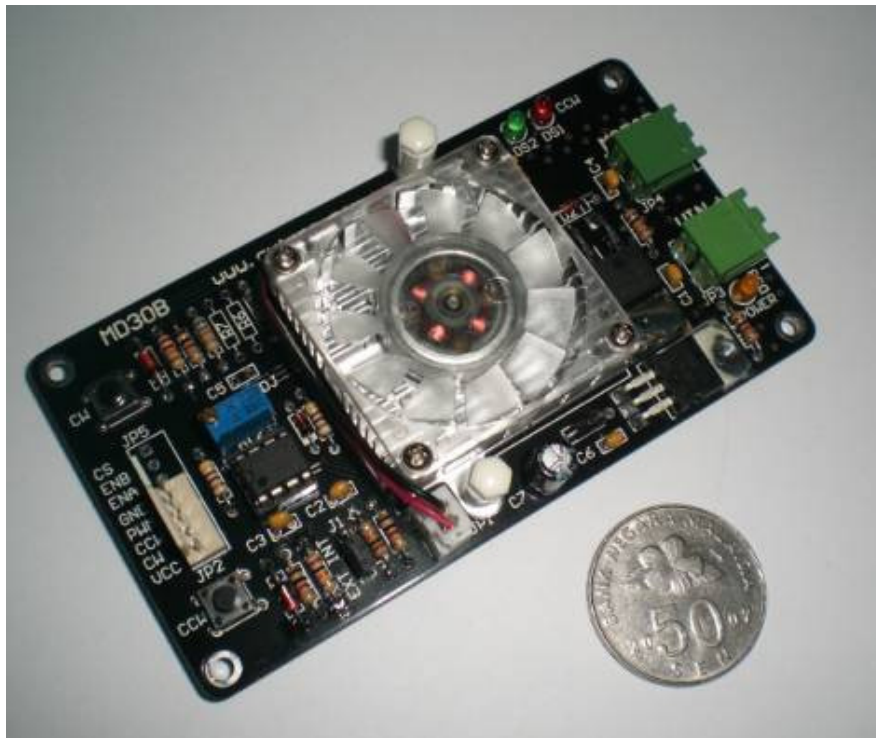




## **MD30B**

# **Enhanced 30A Motor Driver**



## **User's Manual**

**V1.1**

**March 2011**

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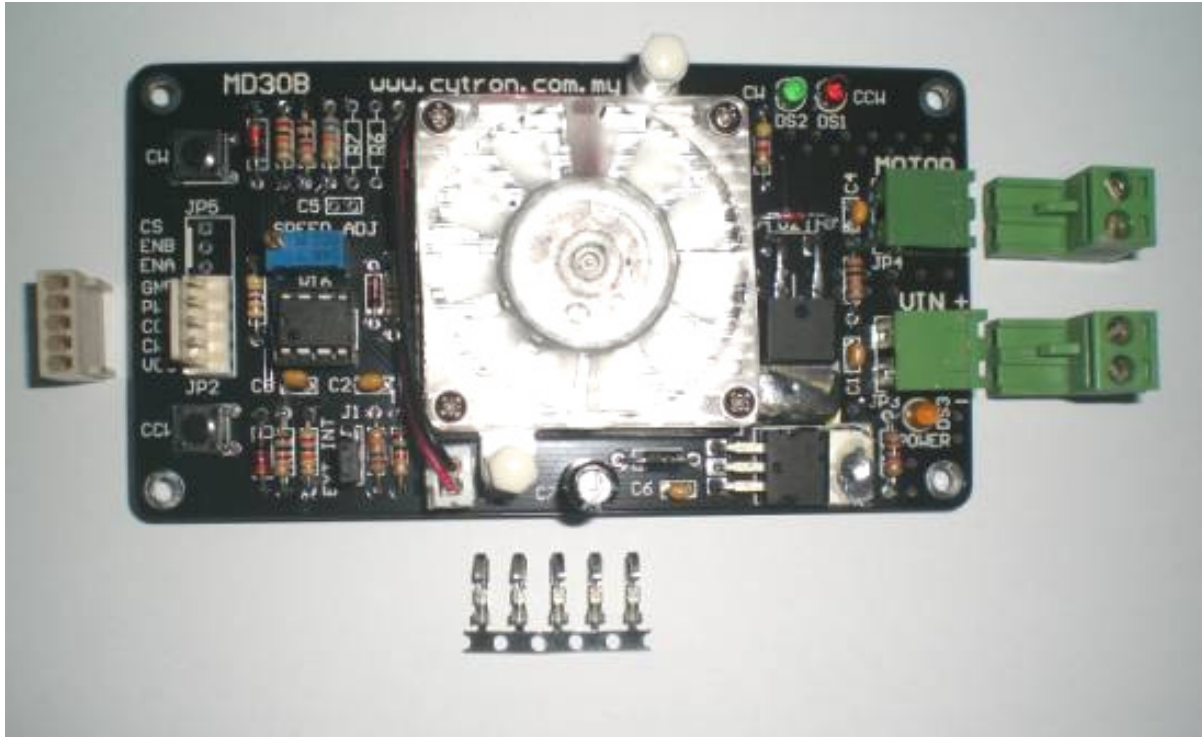
## 1. INTRODUCTION AND OVERVIEW

MD30B is the enhanced version of MD30A. It offer low cost and easy to use brush motor driver capable of driving up to 30-Ampere peak motor current. Added with extra LED status indicators and better protection, it become more user friendly and more reliable. MD30B is a full bridge motor driver intended for wide range of robotics and automotive applications. The board incorporates most of the components needed for typical applications. With minimum interface the board is ready for plug and play. Simply connect the power source; this driver is ready to drive high current motor. It has been designed with capabilities and features as below:

- Industrial grade PCB with heavy copper material for high current applications.
- Each component is soldered properly and tested.
- Support up to **30A** peak.
- 5V logic level inputs.
- PWM speed control up to 10KHz
- Bi-directional control for 1 motor.
- Over voltage clamp.
- Thermal Shut Down.
- Linear current limiter.
- 2 on-board push buttons for testing.
- Onboard PWM generation
- Heat sink with fan for fast thermal release.
- 2 LEDs as output indicator.
- 1 LED as  $V_{IN}$  indicator.
- Pluggable connector for more user friendly design.
- Backward compatible with MD30A.
- **Dimension:** 11.2cm x 6 cm

## 2. PACKING LIST

Please check the parts and components according to the packing list. If there are any parts missing, please contact us at [sales@cytron.com.my](mailto:sales@cytron.com.my) immediately.



1. 1 x MD30B board:
  - a. 1 x High ampere H-bridge driver
  - b. 1 x heat sink with fan
  - c. Other electronic components soldered on board
2. 5 x 2510 iron pin
3. 1 x 2510 5 ways connector
4. 2 x Pluggable Terminal block

### 3. PRODUCT SPECIFICATION AND LIMITATIONS

#### Pin Function Description

Label	Definition	Function
V <sub>IN</sub>	Battery Input	Power source for motor. It can be as low as 10V and as high as 30V. The pluggable terminal block offer simple and fast wiring to power source. However, please do not mistakenly plug the power source to MOTOR port, MD30B will burn and warranty is void.
MOTOR	Motor Terminal	Terminal for motor connection. The pluggable terminal block offer simple and fast wiring to power source. However, please do not mistakenly plug the power source to MOTOR port, MD30B will burn and warranty is void.
V <sub>cc</sub>	Operating supply	Optional input for driver logic operation. The range is from 5V to 12V
CW	Clock Wise	Voltage controller input pin with hysteresis, CMOS compatible. These two pins control the state of the bridge in normal operation according to the truth table (stop, brake, clockwise and counterclockwise). Both these pins are pull up internally to onboard regulated +12V. Thus by default the motor is brake to V <sub>IN</sub> .
CCW	Counter Clock Wise	
PWM	Pulse Width Modulation	Voltage controlled input pin with hysteresis, CMOS compatible. Gates of Low-Side FETS get modulated by the PWM signal during their ON phase allowing speed control of the motor.
Gnd	Ground	Logic ground signal. Internally connected together with V <sub>IN</sub> 's ground

NOTE: MD30B has 3 more pins which are CS, ENB and ENA intended for manufacturing test point only. Please do not connect or short these pins.

#### Absolute Maximum Rating

Symbol	Parameter	Value	Unit
V <sub>IN</sub>	Motor supply voltage	30	V
V <sub>cc</sub>	Operating voltage	12	V
I <sub>max</sub>	Maximum Output Current (continuous)	20	A
I <sub>R</sub>	Reserve Output Current (continuous)	20	A
I <sub>in</sub>	Logic Input current (CW/CCW)	+/- 10	mA
I <sub>pw</sub>	PWM Input Current	+/- 10	mA
T <sub>j</sub>	Junction Operating Temperature	Internally Limited	°C
T <sub>c</sub>	Case Operating Temperature	-40 to 150	°C
T <sub>STG</sub>	Storage Temperature	-55 to 150	°C

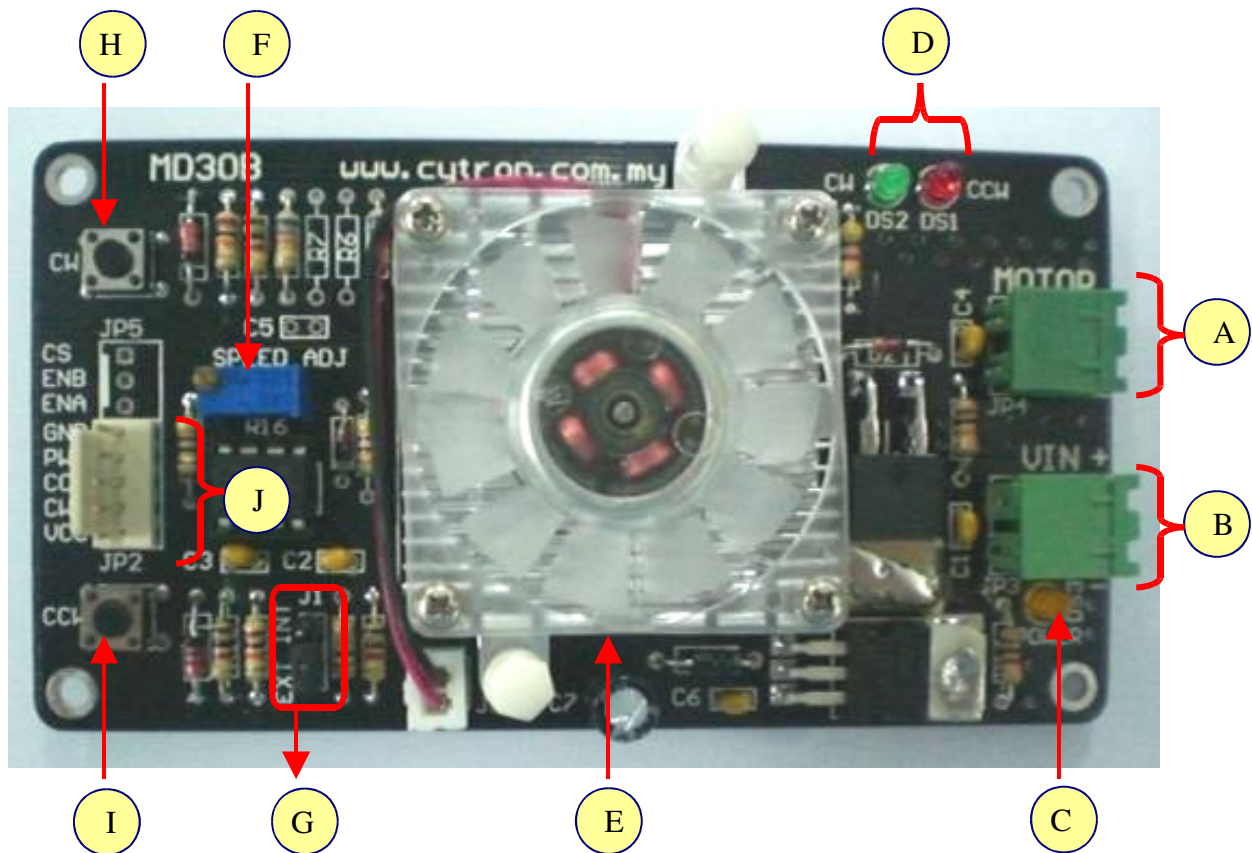
Electrical Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V <sub>IN</sub>	Motor supply voltage		10		30	V
V <sub>cc</sub>	Operating supply voltage		5		12	V
f	PWM frequency		0		10	KHz
V <sub>ov</sub>	Overvoltage shut-down		36	43		V
I <sub>LIM</sub>	Current Limitation		30	45		A
T <sub>TSD</sub>	Thermal shut-down temperature		150	170	220	°C
T <sub>TR</sub>	Thermal Reset temperature		135			°C
V <sub>pwl</sub>	PWM low level voltage				1.5	V
I <sub>pwl</sub>	Low level PWM pin current	V <sub>pw</sub> = 1.5V	1			mA
V <sub>pwh</sub>	PWM high level voltage		3.25			V
I <sub>pwh</sub>	High level PWM pin current	V <sub>pw</sub> = 3.25V			3	mA
V <sub>CW/CCWL</sub>	CW input low level voltage				1.5	V
I <sub>CW/CCWL</sub>	CW input low current	V <sub>CW/CCW</sub> = 1.5V	1			mA
V <sub>CW/CCWH</sub>	CW input high level voltage		3.25		5.1	V
I <sub>CW/CCWH</sub>	CW input high current	V <sub>CW/CCW</sub> = 3.25V			3	mA

Truth Table in Normal Operating Condition

CW	CCW	Motor(+)	Motor(-)	Comment
1	1	H	H	Brake to Vin
1	0	H	L	Clockwise
0	1	L	H	Counter Clockwise
0	0	L	L	Brake to Gnd

#### 4. BOARD LAYOUT



Label	Function
<b>A</b>	Connector for motor.
<b>B</b>	Connector for power supply.
<b>C</b>	On board power supply indicator LED. It is yellow color.
<b>D</b>	On board motor output indicator LED. It is green and red color.
<b>E</b>	Fan heat sink.
<b>F</b>	Multi-turn variable resistor for adjusting motor speed (Internal PWM mode).
<b>G</b>	Internal or External PWM mode selection jumper.
<b>H</b>	Push button for CW operation.
<b>I</b>	Push button for CCW operation.
<b>J</b>	5 ways header pin for external control connection.



A – Connector for motor.

B – Connector for power supply.

C – Power supply indicator LED. It is yellow in color. Once power is inserted to the board, this LED will turn ON.

D – These are a pair of small LED, red and green in color. Green LED indicates CW operation while red LED indicates CCW operation. If CW switch is pushed, motor will rotate clockwise and green LED will turn ON else if CCW switch is pushed, motor will rotate counter clockwise and the red LED will turn ON.

E – Fan heat sink is for IC fast thermal release.

F – Multi-turn variable resistor for adjusting motor speed. Only use in Internal PWM mode. Adjusting the multi-turn variable resistor will increase or decrease the motor speed. Nothing will happen if External PWM mode is selected.

G – Internal or External PWM selection jumper. The jumper has 3 pins. If user intended to use Internal PWM mode, shorted pin 1 and 2 while for External PWM mode, shorted pin 2 and 3.

H – Push button for CW. Press and hold this push button will result in motor turn in clockwise direction.

I – Push button for CCW. Press and hold this push button will result in motor turn in counterclockwise direction.

J – 5 ways header pin for external connections to microcontroller. Please refer to hardware installation for detail connection.

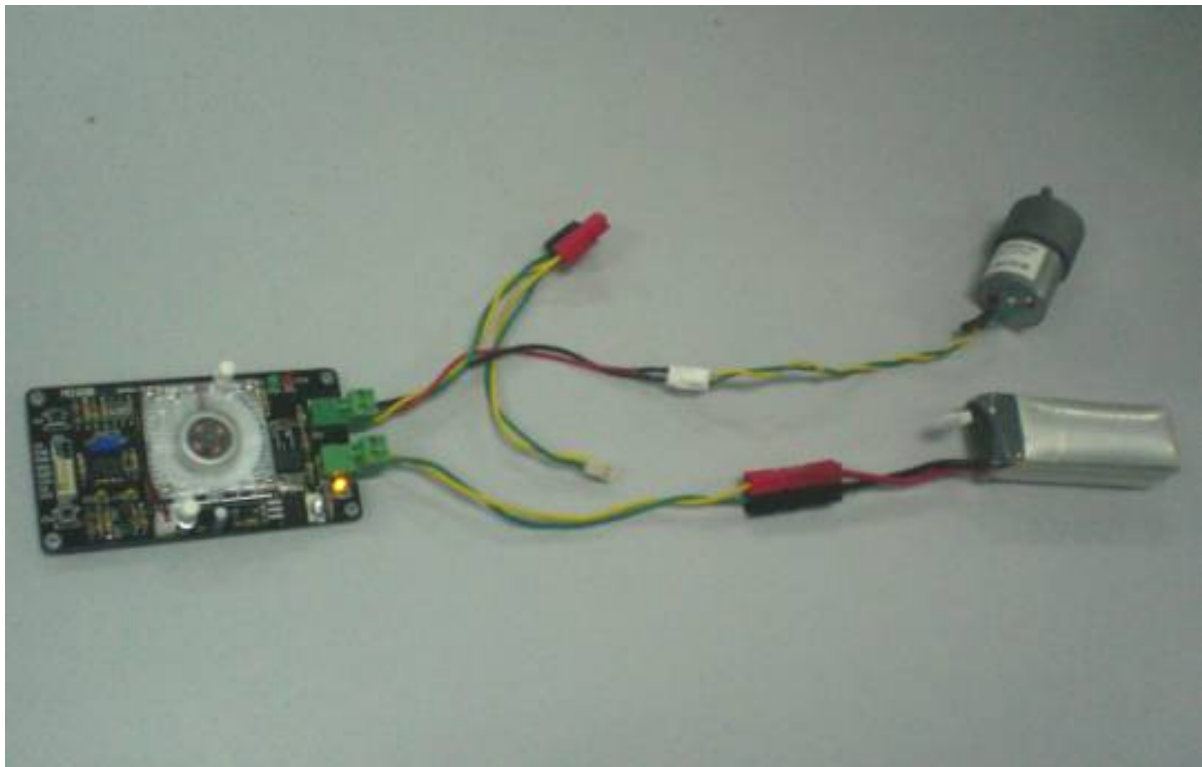


## 5. INSTALLATION (HARDWARE)

### 5.1 Connecting Battery and Motor

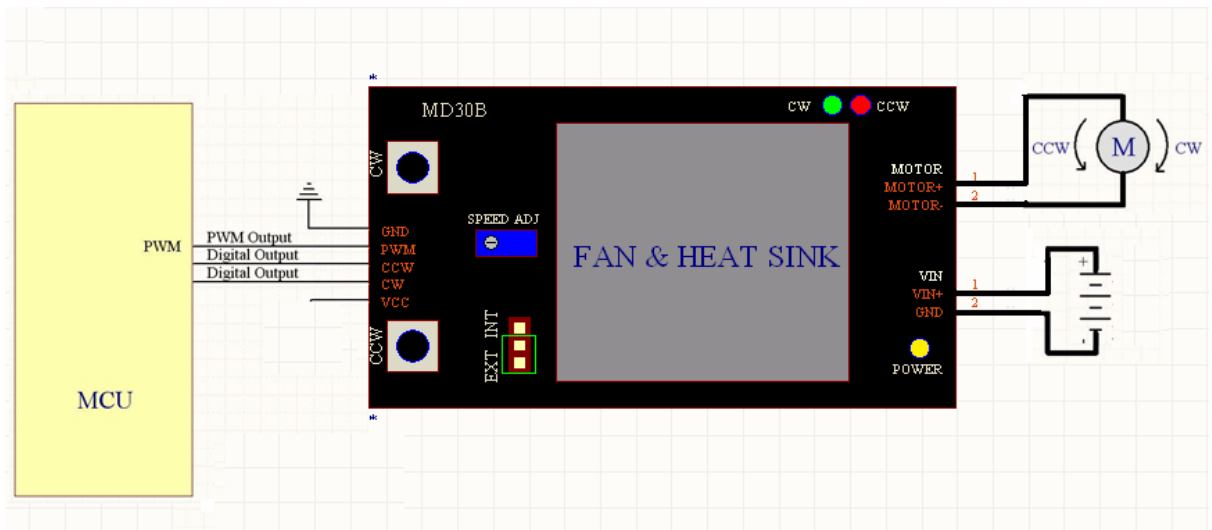
In a typical application, the motor power supply (battery) should be soldered directly to PCB. However, user may choose to use pluggable terminal block to connect to the battery's cable. Same applied to motor terminal. The control pin come with connector and is ready for user to interface with wire.

CW and CCW pin control the activation and direction of the motor, while the PWM pin turns the motor on or off for speed control. CW and CCW are internally pull-up to onboard regulated +12V, thus using a switch or relay can pull these 2 pins to low logic to drive the motor. Of course, user can always use the on board switches for manual activation.



## 5.2 Connecting to Microcontroller

Typical Application Circuit for DC to 10KHz PWM Operation with Microcontroller.



As for PWM pin in External PWM mode, user may provide a constant 5V or 12V to it if speed control is not required.

## 5.3 Connecting to switches (without microcontroller)

Typical Application Circuit using switches (internal speed control)



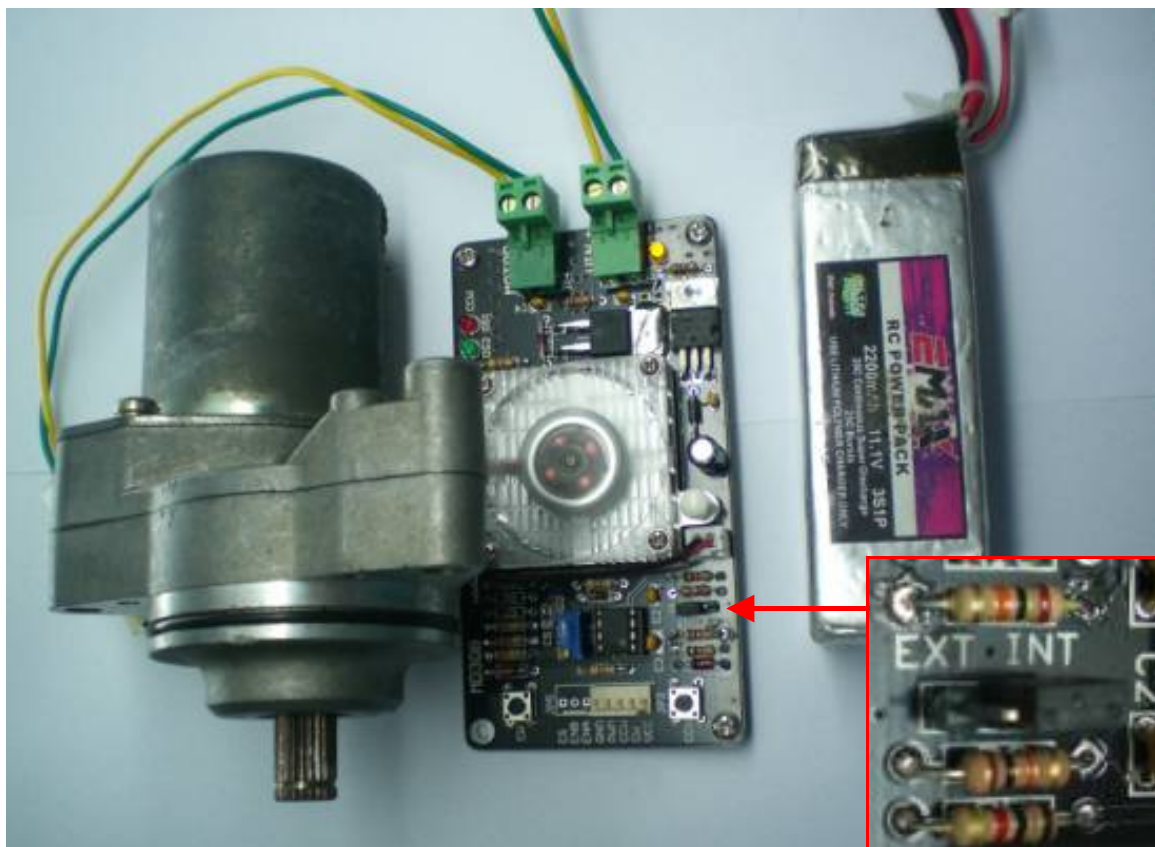
## 6. GETTING STARTED

This section will show the example on method to operate MD30B. Generally, there are two methods of using MD30B. It has been designed either to work by itself or to interface with microcontroller.

### 6.1 Connecting to switches (without microcontroller)

Based on user feedback for MD30A, MD30B was designed with onboard push button for self-testing. With minimum interface, the board is ready for plug and play. Simply connect the power source, this driver is ready to drive high current motor.

- a. To begin, short J1 pin to Internal PWM. User may connect power to 12V battery and a DC motor to the motor connector. Once power is inserted, power indicator LED (yellow) and fan will turn ON.



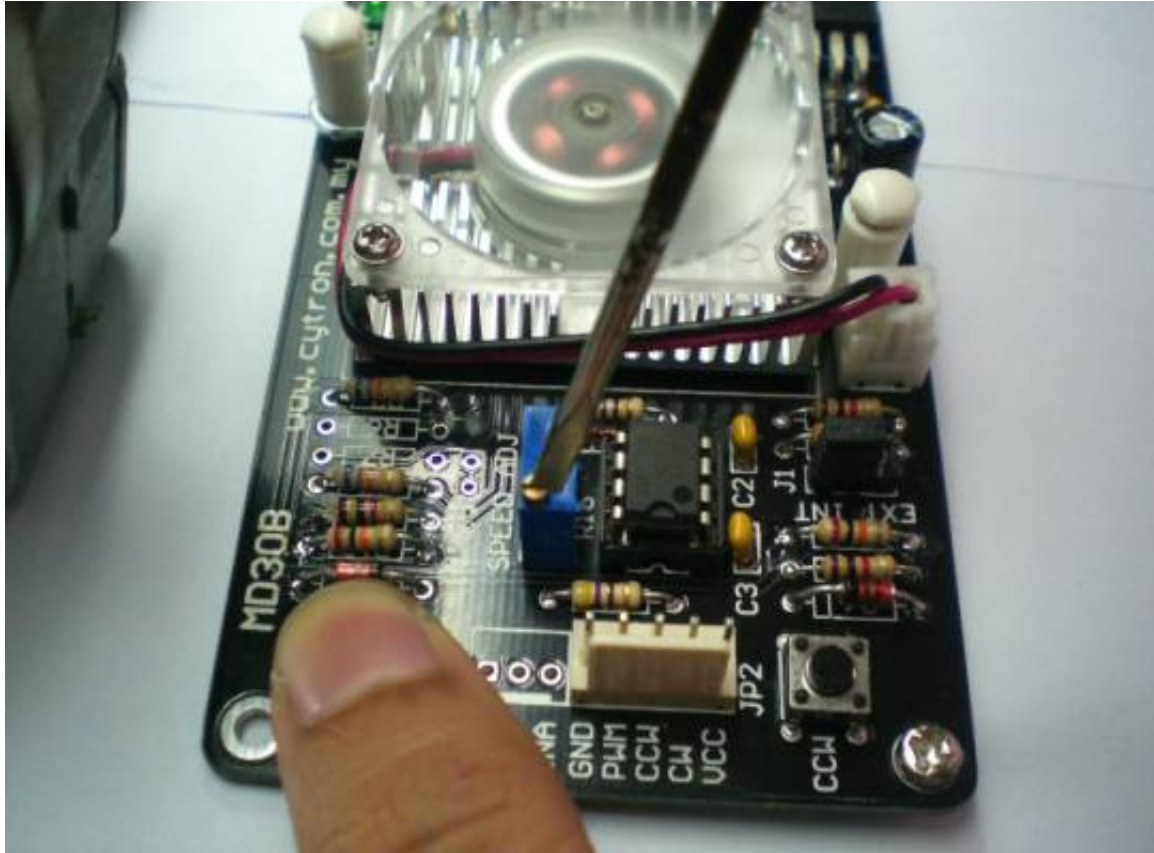
- b. To run the motor, press and hold CW or CCW button. If user press CW button, motor will run clockwise and CW indicator LED (green) will turn ON.



- c. If CCW button is press, motor will run counter clockwise and CCW indicator LED (red) will turn ON.



- d. To adjust motor speed, press and hold CW button and adjust the multi-turn variable resistor to increase or decrease motor speed.



## 6.2 Connecting to microcontroller

For this section, MD30B will be interface with PR10. Please refer PR10, DIY project from Cytron website for details example of interfacing to MD30B. PR10 shows the method of using MD30A, however MD30B was designed to be compatible to MD30A, user may refer to this project. This DIY project also shows the method of writing program to use with MD30B. Please refer to <http://www.cytron.com.my/PR10.asp>



## 8. WARRANTY

- Product warranty is valid for 6 months.
- Warranty only applies to manufacturing defect.
- Damage caused by mis-use is not covered under warranty.
- Warranty does not cover freight cost for both ways.

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