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TWO PHASE MICROSTEP DRIVER

D2HB882MB

PWM CURRENT CONTROL

1. Introduction, Features and Applications

Introduction

The D2HB882MB is an economical micro stepping driver based on patented technology of longs motor. It is suitable for driving 2-phase 4-phase hybrid stepping motors .By using the advanced bipolar constant-current shopping technique, it can output more speed and torque from the same motor, compared with traditional drivers ,such as L/R drivers .Its 3-state current control technology allows coil currents to be well controlled and with relatively small current ripple, therefore less motor heating is achieved.

Features

◆Low cost and good high-speed torque	◆14 selectable resolutions
◆Supply voltage up to +80VD	◆Suitable for-2-phase and 4-phase motors
◆Output current up to 8.2A ,rated current to 5.86A	◆Dip switch current setting 8different values
◆Optically isolated input signals	◆Pulse frequency up to 200KHz
◆Automatic idle-current reduction	◆Small size (107*97*48),Weight:1KG

2. Pin Assignment and Description

The D2HB882MB has two connectors, P1for control signals connections, and connector P2 for power and motor connections .The following tables are brief descriptions of the two connectors of the D2HB882MB.More Detailed descriptions of the pins and related issues are presented in section 7, 8, 9.

Connector P1 Configurations

Pin Function	Details
PUL +,PUL-	Pulse signal: In single pulse (pulse/direction) mode, this input represents pulse signal, effective for each rising or falling edge; 4-5V when PUL-HIGH, 0-0.5V when PUL-LOW. For reliable response, pulse width should be longer than 5μs.Series connect resistors for current limiting when +12V or +24V used.
DIR+,DIR-	DIR signal: In pulse mode, this signal has low/high voltage levels, representing two directions of motor rotation; For reliable motion response, DIR signal should be ahead of PUL signal by 5μs at least.4-5V when DIR-HIGH, 0-0.5V when DIR-LOW.
ENA+	Enable signal: This signal is used for enabling/disabling the driver. High level for enabling the driver and low level for disabling the driver.
ENA-	Usually left unconnected (enabled)

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Connector P2 Configurations

Pin Function	Details
Gnd	DC power ground
+V	DC power supply,20-80VDC,Including voltage fluctuation and EMF voltage
A+,A-	Motor Phase A
B+ B-,	Motor Phase B

3.Specifications and Operating Environment

Electrical Specifications (Tj=25℃)

Parameters'	D2HB882MB			
	Min	Typical	Max	Unit
Output current	1.29	-	5.86(rms)	A
Supply voltage((DC)	20	68	80	VDC
Logic signal current	6	10	30	mA
Pulse input frequency	0	-	200	KHz
Isolation resistance	500			MΩ

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4. Operating Environment and other Specifications

Cooling	Natural Cooling or Forced cooling	
Operating Environment	Environment	Avoid dust, oil fog and corrosive gases
	Ambient Temperature	0℃-50℃
	Humidity	40%RH-90%RH
	Operating Temperature	70℃Max
	Vibration	5.9m/s²Max
Storage Temperature	-20℃-65℃	
Weight	Approx 1000 gram(35.4oz)	

5. Applications

Suitable for a wide range of stepping motors from Nema size to ,It can be used in various kinds of machines ,such as tables ,labeling machines ,laser cutters, engraving machines, pick-place devices ,and so on .Particularly adapt to the applications desired with low vibration, high speed and high precision.

6. Selecting Supply Voltage

The power MOSEFTS inside the D2HB882MB can actually operate within20V—+80VDC
, including power input fluctuation and back EMF voltage generated by motor coils during motor shaft deceleration. Higher supply voltage can increase motor torque at higher speeds, thus helpful for avoiding losing steps.however,higher voltage may cause bigger

motor vibration at lower speed ,and it may also cause over-voltage protection or even driver damage .Therefore, it is suggested to choose only sufficiently high supply voltage for intended applications, and it is suggested go use power supplies with theoretical output voltage of +20V~+80V,leaving room for power fluctuation and back-EMF.

7. Selecting Micro step Resolution and Driver Output Current

This driver uses an 8-bit DIP switch to set micro step resolution. And motor operating current, as shown below:

7.1Microstep Resolution Selection

Micro step resolution is set by SW 5,6,7,8 of the DIP switch as shown in the following table:

Steps/rev.(for 1.8°motor)	SW5	SW6	SW7	SW8
400	On	On	On	On
500	Off	On	On	On
600	On	Off	On	On
800	Off	Off	On	On
1000	On	On	Off	On
1200	Off	On	Off	On
1600	On	Off	Off	On
2000	Off	Off	Off	On
2400	On	On	On	Off
3200	Off	On	On	Off
4000	On	Off	On	Off
5000	Off	Off	On	Off
6000	On	On	Off	Off
6400	Off	On	Off	Off
8000	On	Off	Off	Off
10000	Off	Off	Off	Off

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7.2Current Settings

For a given motor, higher driver current will make the motor to output more torque, but at the same time causes more heating in the motor and driver .Therefore, output current is generally set to be such that the motor will not overheat for long time operation .Since parallel and serial connections of motor coils will significantly change resulting inductance and resistance, it is therefore important to set driver output current ratting supplied by motor phase and connection methods. Phase current rating supplied by motor manufacturer is important in selecting driver current; however the selection also depends on leads and connections.
The first three bits (SW 1, 2, 3) of the DIP switch are used to set the dynamic current. Select a setting
Closest to your motor's required current

Dynamic Current Setting

RMS Current	PEAK Current	SW1	SW2	SW3	RMS Current	PEAK Current	SW1	SW2	SW3
1.29A	1.82A	OFF	OFF	OFF	3.93A	5.56A	OFF	OFF	ON
1.93A	2.73A	ON	OFF	OFF	4.57A	6.46A	ON	OFF	ON
2.57A	3.63A	OFF	ON	OFF	5.21A	7.37A	OFF	ON	ON
3.29A	4.65A	ON	ON	OFF	5.86A	8.20A	ON	ON	ON

Notes: Due to motor inductance, the actual current in the coil may be smaller than the dynamic current setting, particularly under high speed condition.

7.3Standstill Current Setting

SW4 is used for this purpose. OFF meaning that the standstill current is set to be half of the selected dynamic current and ON meaning that standstill is set to be the same as the selected dynamic current.

The current automatically reduced to 60% of the selected dynamic current 0.4 second after the last pulse.Theoretically,this will reduce motor heating to 36%(due to $P=1^2*R$)of the original value .If the application needs a different standstill current, please contact Longs motor.

8. Wiring Notes

◆In order to improve anti-interference performance of the driver, it is recommended to use twisted pair shield cable.

◆prevent noise incurred in PUL/DIR signal, pulse/direction signal wires and motor wires should not be tied up together.It is better to separate them by at least 10 cm, otherwise the disturbing signals generated by motor will easily disturb pulse direction signals, causing motor position error, system instability and other failures.

◆If a power supply serves several drivers, separately connecting the drivers is recommended instead of daisy-chaining.

◆It is prohibited to pull and plug connector P2 while the driver is powered ON. Because there is high current flowing through motor coils (even when motor is at standstill). Pulling or plugging connector P2 with power on will cause extremely high back-EMF voltage surge, which may damage the driver.

9. **Seauence Chart of Control Signals**

In order to avoid some fault operations and deviations.PUL, DIR and ENA signals must abide by some rules, as shown in the following diagram (assuming J1 default setting is upward-rising edge effective):

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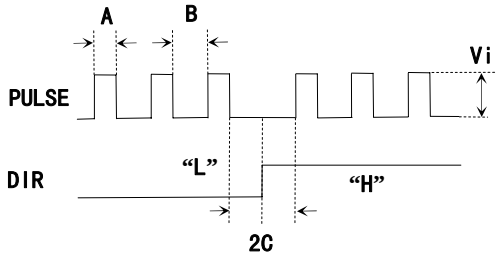

PULSE /DIR MODE

WIDTH OF PULSE A≥2.5μS; WIDTH OF PULSE B≥2.5μS; PLUSE FREQUENCY≤200KHz,

TIME OF CHANGE DIR≥2μS; INPUT SIGNAL Vi 3.6V≤H LEVEL≤5.5V; -5.5V≤L LEVEL ≤0.3V

Figure1: Sequence chart of control signals

10. Control Signal Connector (p1) Interface

The D2HB882MB can accept differential and single-ended input signals (including open-collector and PNP output). The D2HB882MB has 3 optically logic inputs which are located on connector P1 to accept line driver control signals .These inputs are isolated to minimize electrical noises coupled onto the drive control signals. Recommend use line driver control signals to increase noise immunity of the driver in interference environments. In the following figures, connections to open-collector and PNP signals are illustrated.

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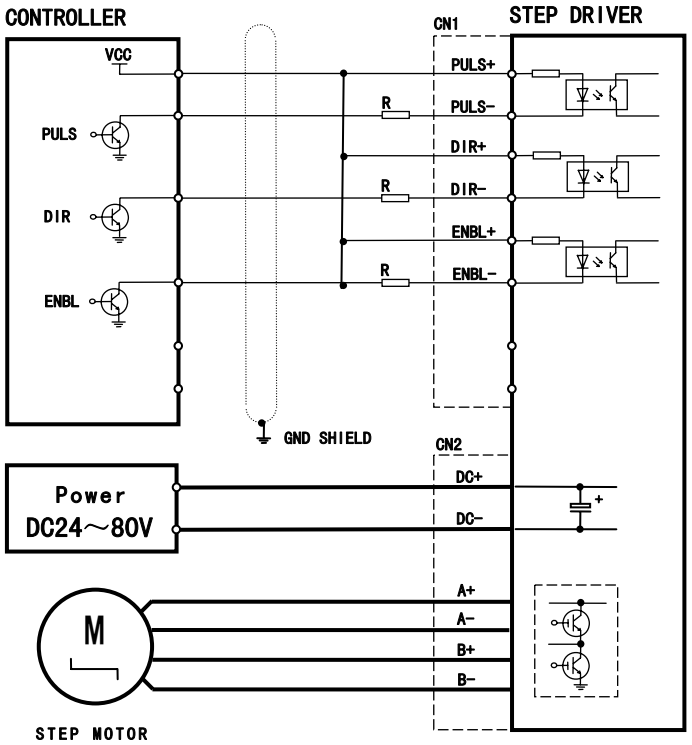
● NPN C-E OPEN PULSE SIGNALS CONNECTION：



ATTENTION：

- When VCC=＋5V，R is short circuit ，equal 0Ω；RA select 470 Ω。
- When VCC=＋12V，R and RA select 1kΩ/0.25W。
- When VCC=＋12V，R and RA select 2kΩ/0.25W。
- Cable from controller to driver need shield ，shield with ground or controller connect to GND。
- Choose diameter of power line and motor line,not less than 1mm² 。

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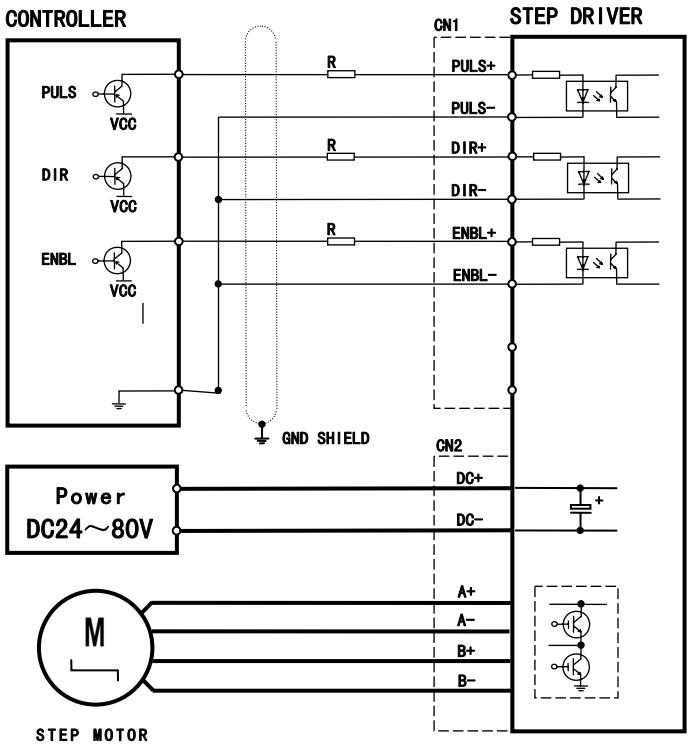
● PNP C-E OPEN PULSE SIGNALS CONNECTION：



ATTENTION：

- When VCC=＋5V，R is short circuit ，equal 0Ω；RA select 470 Ω。
- When VCC=＋12V，R and RA select 1kΩ/0.25W。
- When VCC=＋12V，R and RA select 2kΩ/0.25W。
- Cable from controller to driver need shield ，shield with ground or controller connect to GND。
- Choose diameter of power line and motor line,not less than 1mm²。

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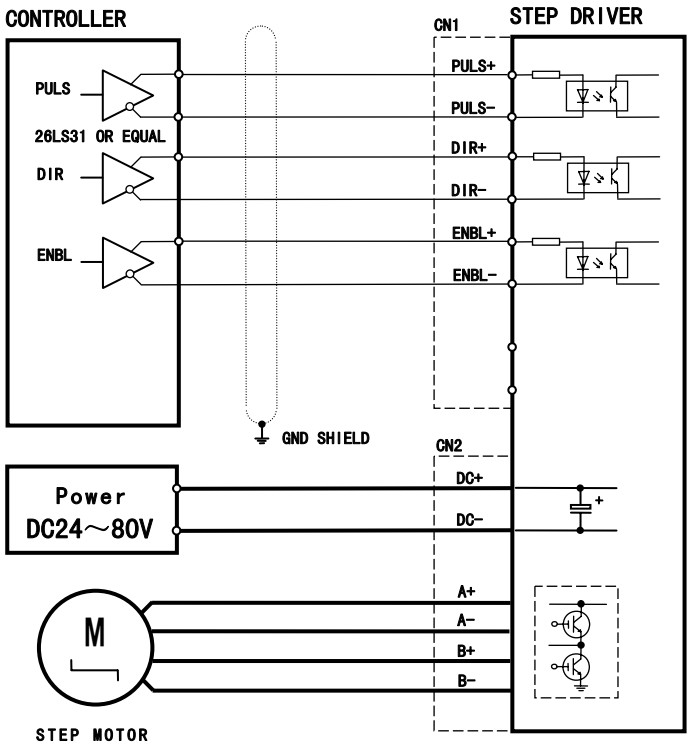
line driver control signals：



ATTENTION：

- When VCC=＋5V，R is short circuit ，equal 0Ω；RA select 470 Ω。
- When VCC=＋12V，R and RA select 1kΩ/0.25W。
- When VCC=＋12V，R and RA select 2kΩ/0.25W。
- Cable from controller to driver need shield ，shield with ground or controller connect to GND。
- Choose diameter of power line and motor line,not less than $1mm^2$ 。

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11. **Mechanical Specifications** (unit:mm,1 inch=25.4)

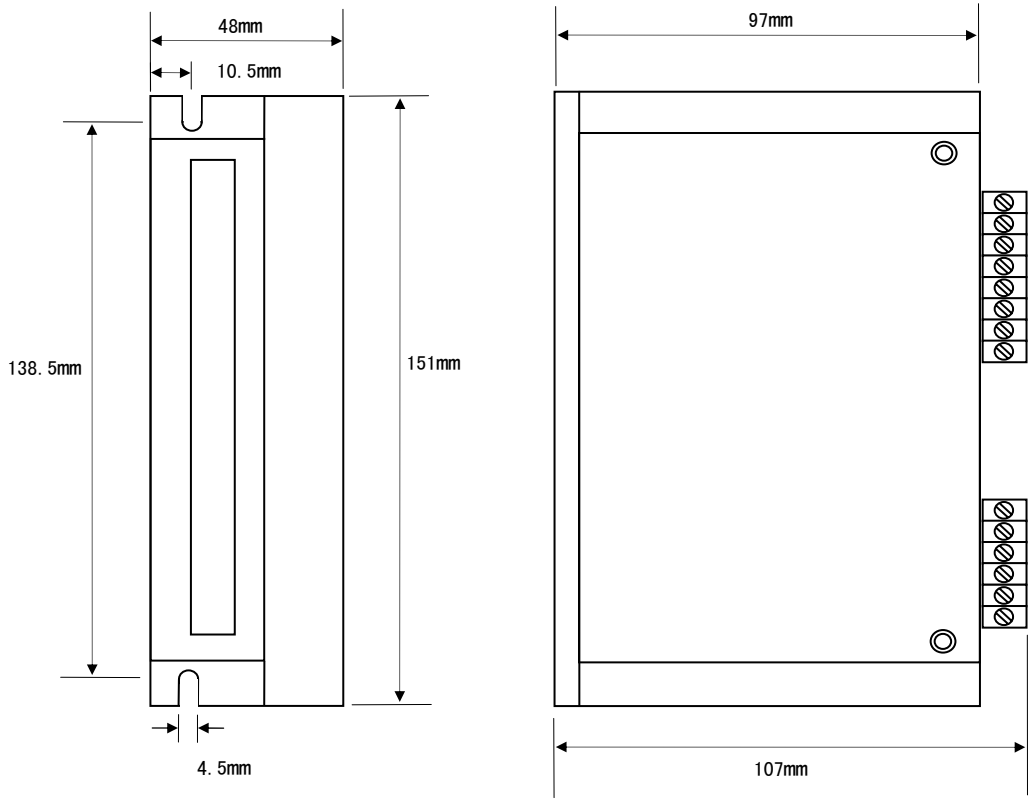

Figure 5: Mechanical specifications

*Recommended to use side mounting better heat dissipation

12.Connecting the Motor

The D2HB882MB driver can drive any 2-pahse and 4-pahse Hybrid stepping motors.

Connections to 4-leda Motors

4 lead motors are the least flexible but eadiest to wire.Speed and torque will depend on winding inductance.In setting the driver output current,multiply the specified current by 1.4 to determine the pack output current.

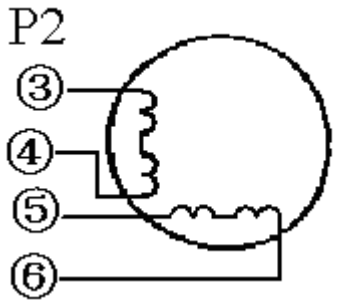

Figure5:4-lead motor connections

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Connections to 6-lead Motors

Like 8 lead stepping motors ,6 lead motors have two configurations a available for high speed or high torque operation. The higher speed configuration,or half coil ,is so described because it uses one half of the motor's inductor windings.The higher torque configuration,or full coil.,uses the full windings of the phases.

Half coil Configurations

As previously stated,the half coil configuration uses 50% of the motor phase windings.This gives lower inductance,hence lower torque..Like the parallel connection of 8 lead motor,the torque output will be more stable at higher speeds.This configuration is also referred to as half chopper.In setting the driver output current multiply the specified per phase(or unipolar)current rating by 1.4 to determine the peak output current.

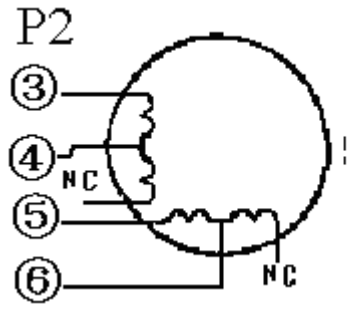

Figure 6:6-lead motor half coil (higher speed)connections

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Full Coil Configurations

The full coil configuration on a six lead motor should be used in applications where higher toraue at lower speeds is desirded.This configuration is also referred to as full copper.In full coil mode,the motor should be run at only 70%of their rated currrnt to prevent over heating.

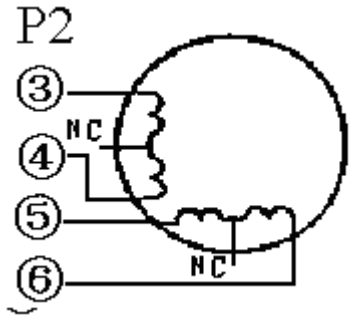

Figure7:6-lead motor full coil (higher torque) connections

Connections to 8-lead Motors

8 lead motors offer a high degree of flexibility to the system designer in that may be connected in series or parallel,thus satisfying a wide range of applications.

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Series Connections

A Series motor configuration would ty pically be used in applications where a higher torque at lower speeds is reauired.Because this configuration has the most inductance,the performance will start to degrade an higher speeds.In series mode,the motors should also be run at only 70% of their rated current to prevent over heating.

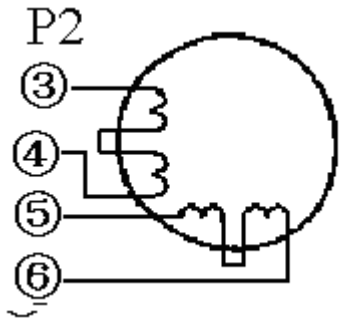

Figure 8:8-lead motorconnections

Parallel Connections

An 8 lead motor in a parallel configuration offers a more stale. but lower torque at lower speeds. But because of the lower inductance, there will be higher torque at higher speeds. Multiply the per phase (or unipolar) current rating by 1.96, or the bipolar current by 1.4,to determine the peak output current.

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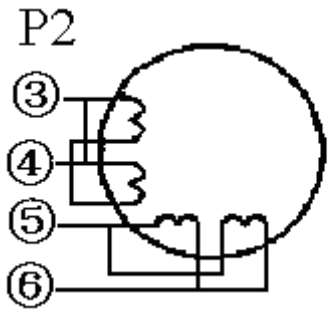

Figure 9:8-lead motor parallel connections

13. Power Supply Selection

The D2HB882MB can match medium and small size stepping motors(from Nema size 17 to 34)made by Longs motor or other motor manufactures around the world. To achieve good driving performances, it is important to select supply voltage and output current properly. Generally speaking, supply voltage determines the high speed performance of the motor, while output current determines the output torque of the driven motor (particularly at lower speed).higher supply voltage will allow higher motor speed to be achieved, at the price of more noise and heating. If the motion speed requirement is low, it's better to use lower supply voltage to decrease noise, heating and improve reliability.

Regulated or Unregulated Power Supply

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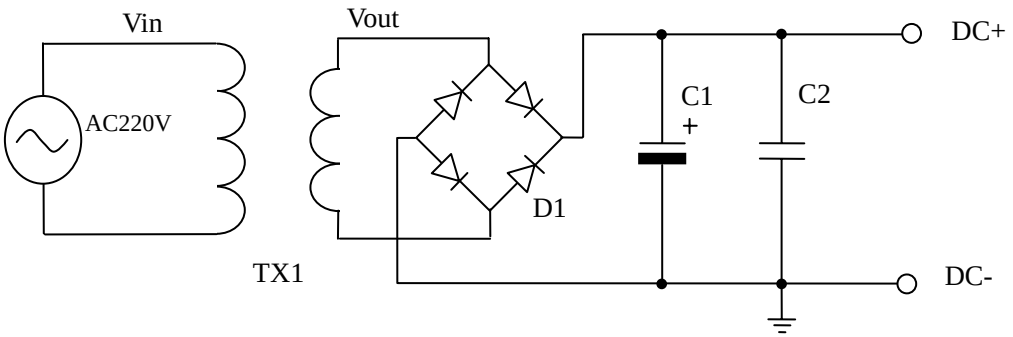

In figure ：

TX1 is transformer， VDC+≈1.414×Vout。power of transformer based on current of load.C1 is ，example ：100V/2200uF；C2 example：400V/0.22 uF；D1 based on current of load or output supply voltage

Both regulated and unregulated power supplies can be used to supply the driver. However unregulated power supplies are preferred due to their ability to withstand current surge. If regulated power supplies (such as most switching supplies.)are indeed used, it is important to have large current output rating to avoid problems like current clamp, for example using 4A supply for 3A motor-driver operation. On the other hand ,if unregulated supply is used ,one may use a power supply of lower current rating than that of motor (typically50%~70%of motor current).The reason is that the driver draws current from the power supply capacitor of the unregulated supply only during the ON duration of the PWM cycle, but not during the OFF duration. Therefore, the average current withdrawn

from power supply is considerably less than motor current, For example, two 3A motors can be well supplied by one power supply of 4A rating.

Multiple Drivers

It is recommended to have multiple drivers to share one power supply to reduce cost, if the supply has enough capacity. To avoid cross interference, DO NOT daisy-chain the power supply input pins of the drivers.(Instead, please connect them to power supply separately.)

14. Protection Functions

To improve reliability, the driver incorporates some built-in protections features.

15. Over-voltage Protection

When power supply voltage exceeds +85VDC, portetion will be activated and power indicator LED will turn red.

Coil-ground Short Circuit Protection

Protection will be activated in case of short circuit between motor coil and ground.
Attention: Since there is no protection against power leads(+,-)reversal, it is critical to make sure that power supply leads correctly connected to the driver .Otherwise, the driver will be damaged instantly. When power supply voltage is lower than +20VDC,the driver will not works properly.

16. Ferquently Asked Questions

In the event that your D2HB882MB doesn't operate properly, the first is to identify whether the problem is electrical or mechanical in nature. The next step is to isolate the system component that is causing the problem. As part of this process you may have to disconnect the individual document each step in the troubleshooting process. You may need this documentation to refer back to at a later date. And these details will greatly assist our Technical Support staff in determining the problem should you need assistance.

Many of the problems that affect motion control systems can be traced to electrical noise, controller software errors, or mistake in wiring.

17. APPENDIX

Twelve Month Limited Warranty

LONGS MOTOR .warrants its products against defects in materials and workmanship for a period of 12 months from shipment out of factory .During the warranty period, LONGS MOTOR will either ,at is option, repair or replace products which proved to be defective.

Exclusions

The above warranty does not extend to any product damaged by reasons of improper or inadequate handlings by customer, improper or inadequate customer wirings, unauthorized modification or misuse .or operation beyond the electrical specifications of the product and/or operation beyond environmental specifications for the product.

Obtaining Warranty Service

To obtain warranty service, a returned material authorization number (RMA) must be obtained from customer service at e-mail to celery@longs-motor.com before returning product for service. Customer shall prepay shipping charges for products returned to LONGS MOTOR for warranty service, and LONGS MOTOR shall pay for return of products to customer.

Warranty Limitations

LONGS MOTOR makes mo other warranty, either expressed or implied, with respect to the product. LONGS MOTOR specifically disclaims the implied warranties of merchantability and fitness for a particular purpose. Some jurisdictions do not allow limitations on

how long and implied warranty lasts .so the above limitation or exclusion may to apply to you, However, any implied warranty of merchantability or fitness is limited to the12-month duration of this written warranty.