3. Pin Assignment & Connectors Definitions

I. DB25 & DB9 definitions

Figure 2: DB25 & DB9 definitions

II. Connectors Definitions:

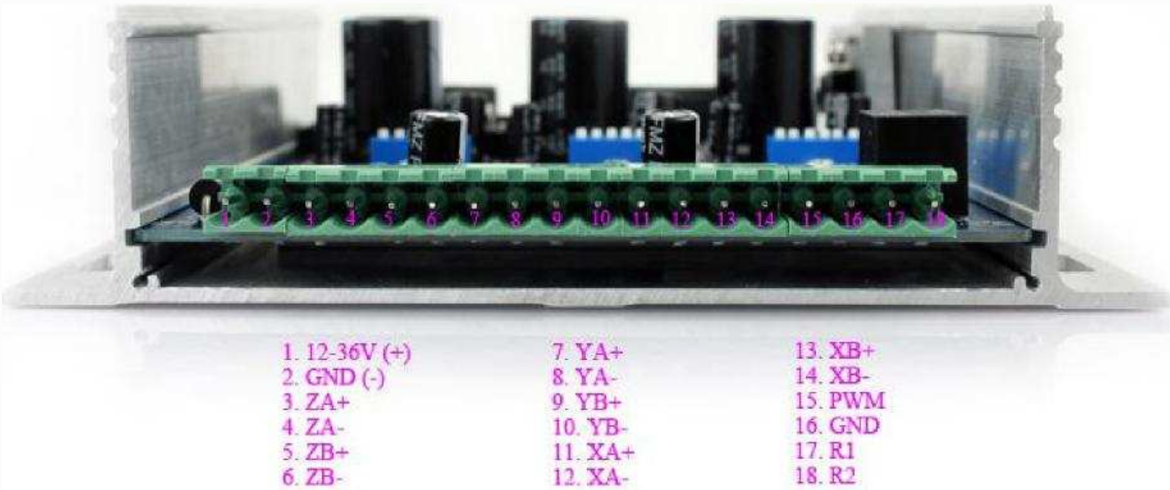

Figure 3: Connections Definitions

4. Working Principle

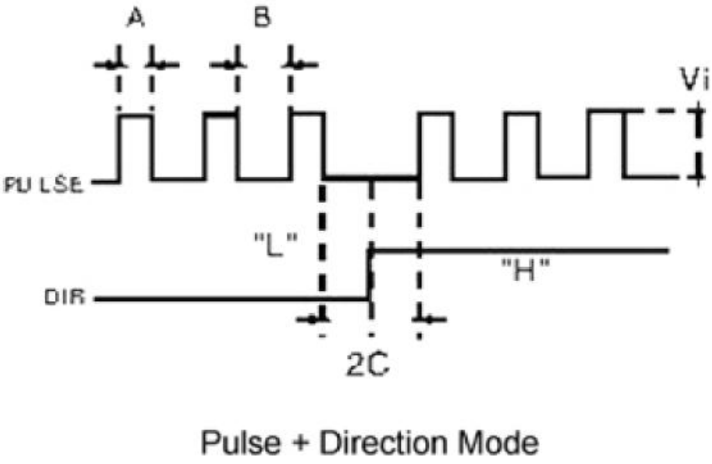

Figure 4: Working Principle

5. Selections & Connections about the Motors

The 3rd generation TB6560 stepper driver can drive 2-pahse and 4-pahse hybrid stepping motors, including 4, 6 or 8 leads.

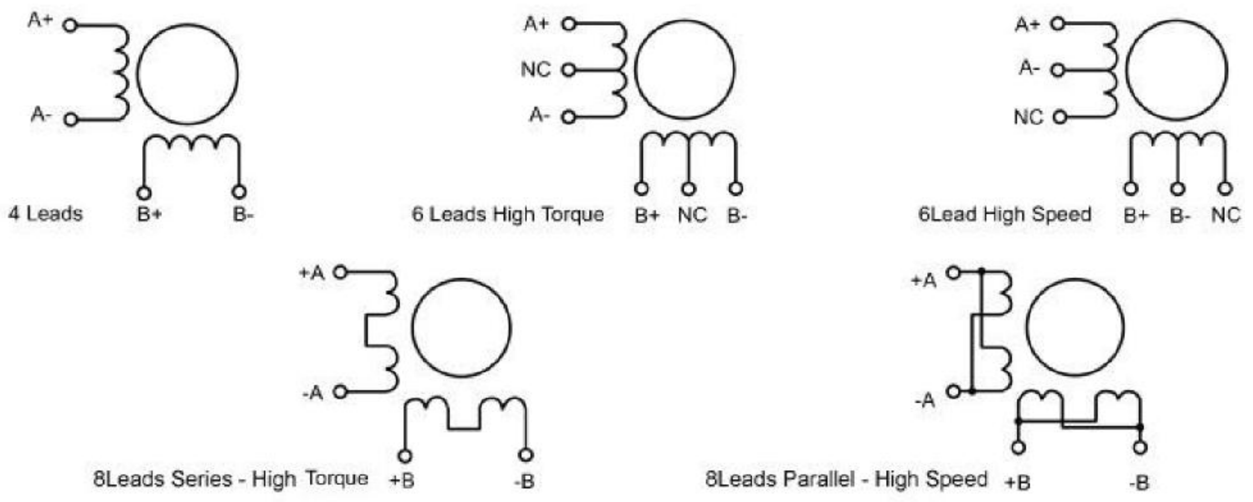

Figure 5: Wiring diagrams for 4/6/8 leads motors

I. Connections of 4-lead Motors

4 lead motors are the least flexible but easiest to wire. Speed and torque will depend on winding inductance. In theory, during adjusting stepper driver's output current, the output current can be set to 1.4 times than the rated current of the motor on the premise that the 1.4 times of rated current is lower than the TB6560 chip's 3.5A peak current.

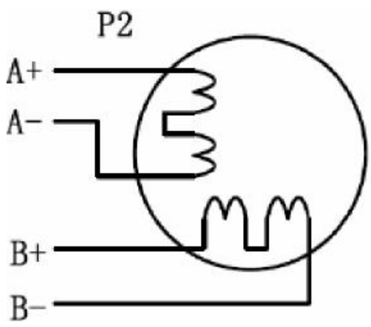

Figure 6: 4-lead Motor Connections

II. Connections of 6-lead Motors

Like 8 lead stepping motors, 6 lead motors have two configurations 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.

i. Half Coil Configurations

As previously stated, the half coil configuration uses 50% of the motor phase windings. This gives lower inductance, hence, lower torque output. 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.

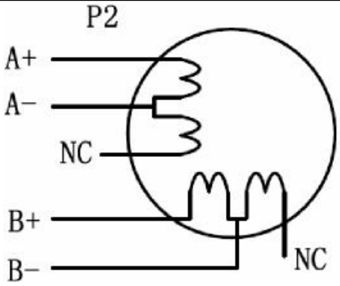

Figure 7: 6-lead motor half coil (higher speed) connections

ii. Full Coil Configurations

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

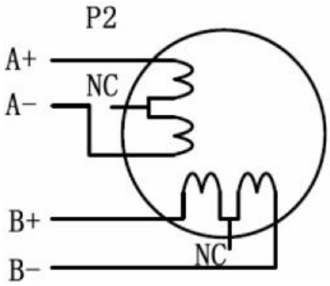

Figure 8: 6-lead motor full coil (higher torque) connections

III. Connections of 8-lead Motors

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

i. Series Connections

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

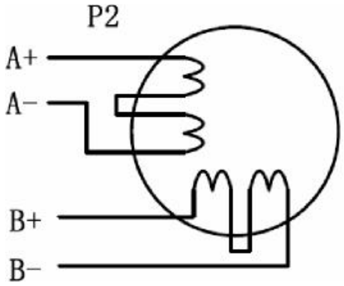

Figure 9: 8-lead motor series (higher torque) connections

ii. Parallel Connections

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

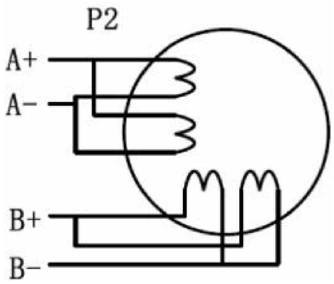

Figure 10: 8-lead motor parallel (higher speed) connections

6. Power Supply Selection

The 3rd Generation TB6560 stepper driver can match Large and small size stepping motors (from Nema size 17 to 34) made by us or other motor manufactures around the world, as long as the rated current of the motors is within **0.5-3.5A**(Peak Current) . 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.

I. Regulated or Unregulated Power Supply

Both of regulated and unregulated DC power supplies can be used to supply 3rd Generation TB6560 stepper driver. However, unregulated power supplies are preferred due to their ability to withstand current surge. If regulated power supplies (such as most off 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 (typically 50%～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. Although the unregulated power supplies are preferred, considering the cost, the cheap and easy-to-use regulated switching supplies in the market is also a good choice for the 3rd Generation TB6560 stepper driver and motors, as long as the total output current of the regulated switching supplies is larger than the motor's total rated current. Anyway, if users don't know how to select the suitable power supplies for the 3rd Generation TB6560 stepper driver and motors, please feel free to contact with us for assistances.

I. Selecting Supply Voltage

The 3rd generation TB6560 stepper driver can actually operate within 12 ~ 36VDC for different motors. Higher supply voltage can increase motor torque at higher speeds, thus helpful for avoiding losing steps. However, higher voltage may cause more motor vibration at lower speed, and it may also cause motor overheat and drive damage. Therefore, it is suggested to choose 12-16VDC supply to power the Nema17 motors, 16-24V supply to power the Nema23/24 motors and 24V-36V supply to power the Nema34 Motors.

7. DIP Switches Settings (Microstep, Decay Mode, Current)

This driver adopts a 6-bit DIP switch to set microstep resolution, decay mode (buffer) and motor operating current, as shown below:

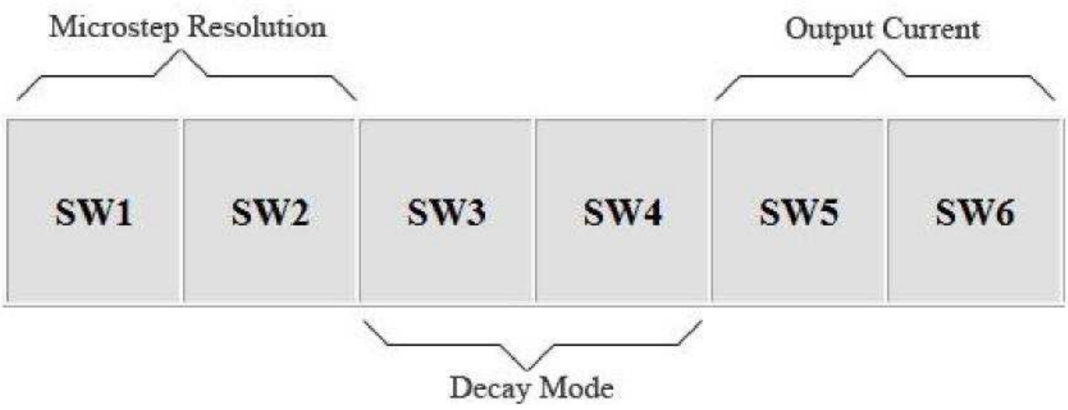

Figure 11: DIP Switches Settings

I. Microstep Resolution Selection:

Microstep Resolution	SW1	SW2
1	ON	ON
2	OFF	ON
8	OFF	OFF
16	ON	OFF

II. Decay Mode (Buffer) Selection:

Decay Mode (Buffer)	SW3	SW4
25%	ON	ON
50%	OFF	ON
75%	ON	OFF
100%	OFF	OFF

III. Output Current Selection:

Output Current	SW5	SW6
100%	ON	ON
75%	OFF	ON
50%	ON	OFF
25%	OFF	OFF

8. Wiring Notes

- In order to improve anti-interference performance of the driver, it is recommended to use twisted pair shield cable.
- Please shut down the power before plugging or unplugging the connectors from the