

DRIVER25PS

C R H Electronics Design

DRIVER25PS

2.5A Stepper motor drive board

C R H Electronics Design

Specifications

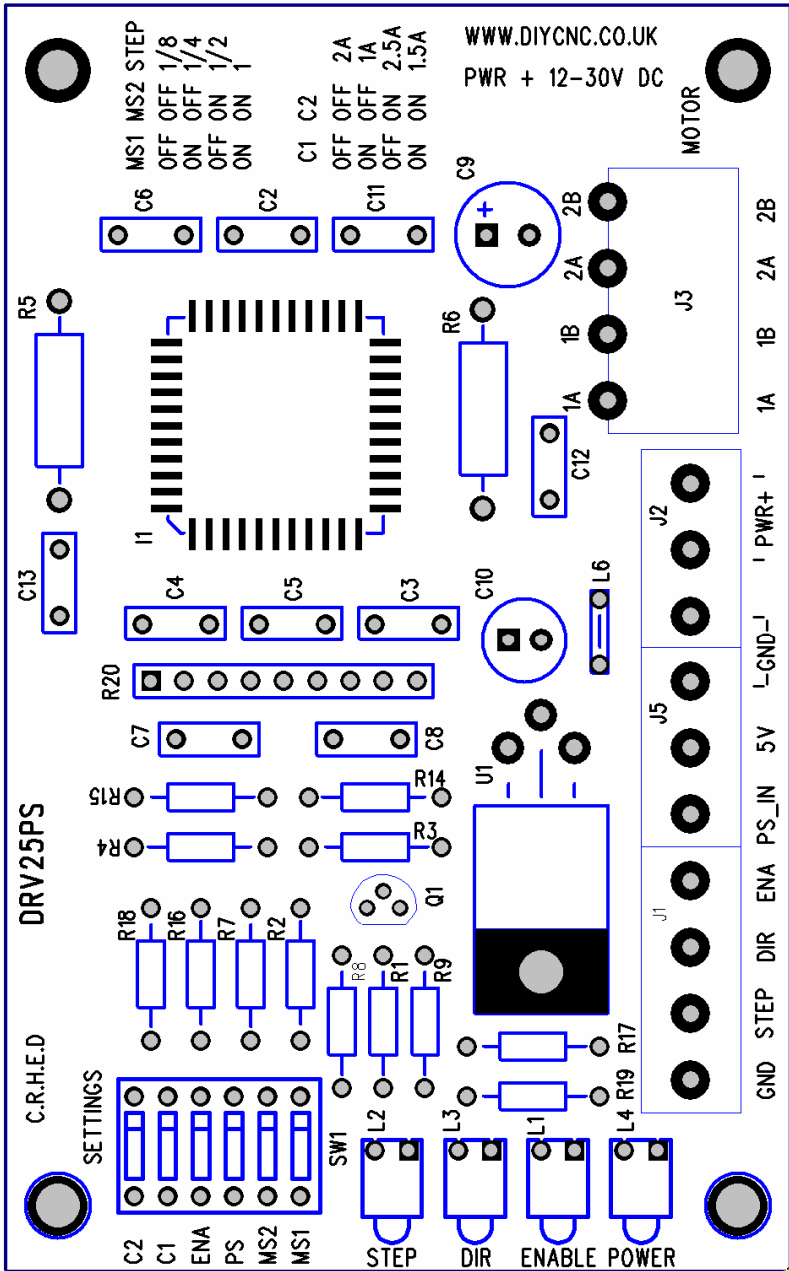
New features

1. Power save mode automatically reduces power consumption for cooler motors and driver chip (Used in conjunction with PS type interface board).
 2. Improved layout with optional vertical mounting bracket.
 3. Right angle motor connectors to reduce height.
- Two phase PWM operation.
 - Uses internal synchronous rectification to reduce board size and heat dissipation.
 - Includes thermal shutdown, UVLO and crossover current protection.
 - 1/8, 1/4, 1/2 or full Step selectable.
 - Works direct from PC Parallel port connections
 - 1, 1.5, 2 & 2.5Amp switch selectable max stepper current
 - Step, Direction, Enable & Power save inputs.
 - On board 5V regulator with spare output connection, uses single supply line (24V -30V DC regulated supply recommended)
 - Maximum 35V @ 2.5A per phase motor output.
 - LED indicator display of Step, Direction, Enable and Power.
 - Board size 97 X 60 mm. FR4, immersion gold, 2oz copper, RoHS compliant.
 - Loop through power connections.

Manual **V1.3 Sep 08**

Hardware **V1.1 Aug 08**

Board layout, of Driver25PS



The DRIVER25PS is the latest incarnation of this popular stepper motor drive board. The layout has changed as to provide all connections down one side of the board while a second side contains the dipswitch settings and display LED's. The board has also been designed to take a right angle bracket, facilitating vertical mounting of the PCB for a compact design layout. This bracket also acts as an extra heat sink allowing further cooling improvements. The main addition to the design is the new power saving feature. The little used sleep setting has been replaced with the PS enable function. By connecting this line to a suitable PS interface board more than halves the power consumption of the board when there are no stepper signals present. As soon as a step signal is detected the board returns to normal power conditions.

Dip switch settings

MS2 & MS1 Adjust Step rate.
(MS2 on MS1 on) Full Step
(MS2 on MS1 off) ½ Step
(MS2 off MS1 on) ¼ Step
(MS2 off MS1 off) 1/8 Step

PS (ON enables power save mode)
ENABLE (ON overrides enable logic input and enables board output)

C1 & C2 Control maximum stepper current

(C1 on C2 off) 1A
(C1 on C2 on) 1.5A
(C1 off C2 off) 2A
(C1 off C2 on) 2.5A

Power Input

Maximum input voltage 35V, recommended regulated voltage 24-30V although the board will actually run down to 12Volts this will impair performance at higher step rates.

If using an unregulated power supply, check peak voltage across output before connecting Driver25 board. A 25V unregulated supply can have 35V peak unloaded output. It may be necessary to place a load resistor permanently across the output to reduce the peak voltage as when the boards are not Enabled the power consumption is quite low.

Power is supplied to the board via the main terminal block.

This has two grounds and two power connection facilitating loop through to further driver boards. If you are looping through to three or four stepper boards it is a good idea to return the last board power connections back to the power supply thus creating a ring circuit and halving any voltage drop across the connecting wires.

Signal Inputs

The board has four inputs, Step, Direction, Enable and PS.

Enable is active low, if using external control you need to release the dip switch setting for overriding it. (Switch needs to be on if left unconnected)

Step takes pulses from the computer or controller to initiate rotation of the motor.

Direction is a logic level that alters the direction of motor rotation.

PS This signal, supplied from a suitable interface board allows a considerable power saving to the driver circuits and motors when in idle. The board will perform as normal without this signal present or the dip switch in the off position.

Stepper motor connections

The following diagrams show typical connections for a range of different motors.

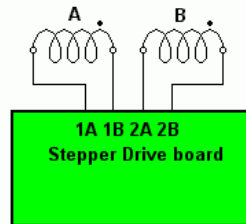
If your motor rating is in excess of the 2.5A maximum current limit then you should use the windings in serial connection for maximum efficiency.

4 leads - Bipolar Drive

4 Leads

The standard connection for a four lead motor.

This is the standard connection for a bipolar drive. There are still four windings and, depending on motor type, they are in series or parallel. Most manufacturers makes two models with the same winding, but one time connected in series and one time in parallel.



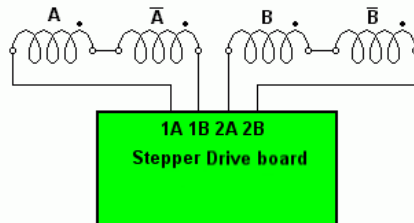
Bipolar Drive - Serial Connection

6 Leads

The windings are connected in serial. Since most 6 lead motors are wound bifilar - link -, so the inductance will be quadruple of the single winding value.

8 Leads

The windings are connected in serial. Since most 8 lead motors are wound monofilar - link -, then the inductance will be double. If the motor was wound bifilar - link -, the inductance will be quadruple.

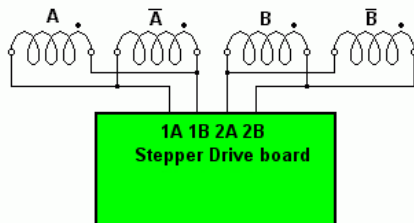


Bipolar Drive- 8 leads - Windings Parallel

8 Leads

This is the standard high speed connection for an eight lead motor.

With the windings in parallel, the motor current can be higher while the inductance is lower. This is a typical connection for a motor that need to run at a high speed..

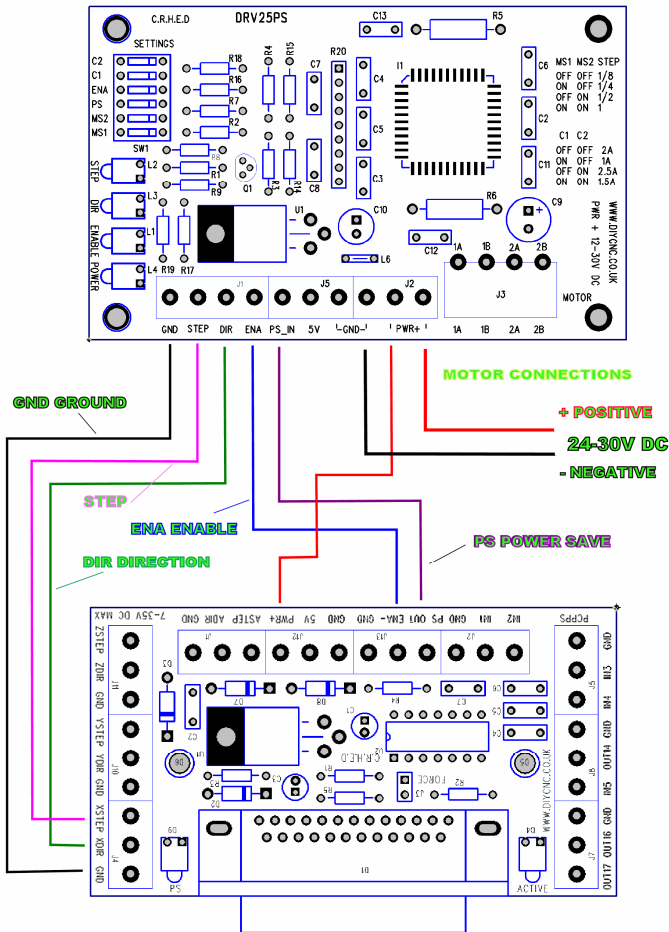


IMPORTANT:

Double check that connections are correct before applying power to the board, windings connected out of phase may cause damage to the board. Do not connect or disconnect wires with the power on. It is a good idea to set the current switch settings to minimum, to limit the current if you are in any doubt of the connections.

The PCB Stepper outputs on the Driver25PS board are marked 1A &1B this represents one winding. Outputs 2A & 2B are the other winding.

Connecting the Stepper motors



This circuit diagram is a simple computer connection to a single stepper motor on the X axis. Simply repeat these connections for Y, Z as required.

Outputs

5V+: Power output from the onboard regulator. This can be used to work other circuit boards, sensors, relays etc. **Maximum external load must not exceed 100mA.**

Contact Details

J Harding
12 Herm Close
Seabridge
Newcastle-under-Lyme.
ST5 3LL.
England

Email roy@diycnc.co.uk

KIT CONSTRUCTION

Building the stepper board kit should take less than one hour. You will need a good soldering iron, preferably temperature controlled and set to 400-450 degrees. The solder provided is lead free with a mild active flux. This helps it to flow easily but you need an extra 50 degrees higher temperature compared to lead solders. As the driver chip is a surface mount device the PCB is supplied with it ready mounted into position. With reference to the board layout diagram, start by placing the components with the longest leads that will need cropping after soldering. I find that the best way is to push the component through the holes until it is in contact with the board and then bending the leads at 45 degrees on the underside to stop the component moving while soldering. Using this technique you can place several components before soldering. The 0.18 ohm resistors will need there leads bent close to the body and positioned a couple of millimetres away from the board, see Fig2 for details. After soldering and cropping the long leaded components next place the small capacitors which have fairly short leads. The new version of the board has LED's that are mounted at right angles with the plastic housings provided. Slide the LED legs through the housing before bending the legs at 90 degrees. The longer of the two leads on the LED's is the anode or positive and goes to the square pad. Solder one leg first and then position square with the board before soldering the other leg. The 7805 regulator needs the centre leg bending slightly forward before bending all the legs back and fitting a bolt through the metal tag to secure. Fit the DIP Switch and the set of connector blocks. The blocks are manufactured in either a three or two terminals but there is an interlocking system built into their sides for multiplying the amount of terminals needed. Make sure that they are slid together before fitting to the PCB. There is an optional bracket available for the Driver25PS board allowing it to be mounted vertically and also acting as an extra heat sink. If available you could clean up the

flux residue with a proprietary flux cleaner when complete. I have found the SERVISOL DE-FLUX 160 flux remover / PCB cleaner is very effective.

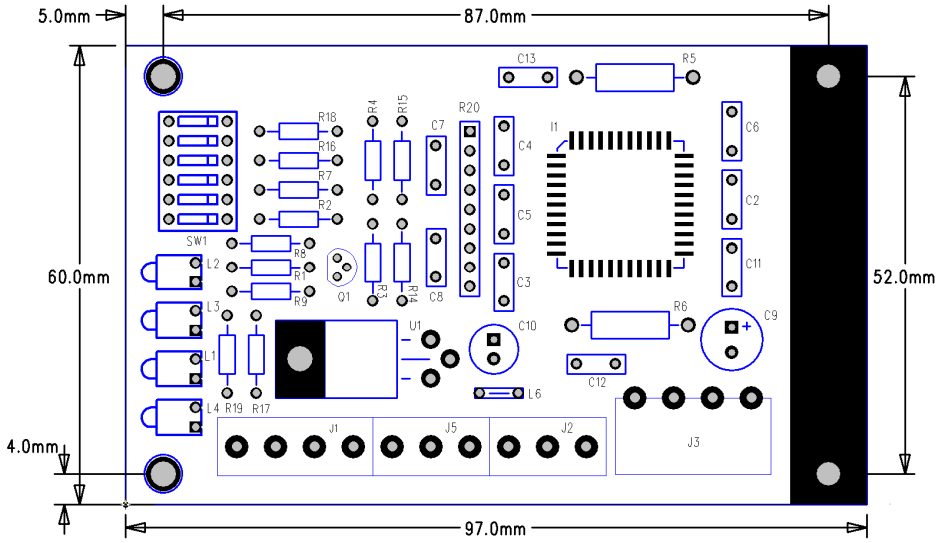
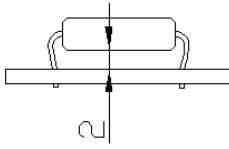
Notes:

- Position power resistors R5 and R6 so they are a couple of millimetres away from the PCB see Fig 2.
- L6 is a wire link used to couple the analogue and digital ground planes, use a chopped resistor lead.
- Long lead on LED is anode (goes to square pad)
- Long lead on electrolytic caps is positive (goes to square pad)

Component parts list for DRV25PS.

C3, C4, C5, C12, C13	0.1uF 100V
C2, C6, C11	0.22uF 63V
C7, C8	1nF 100V
C9	100uF 50V
C10	100uF 16V
R14, R15	22k 5% 1/4W
R2	15K 5% 1/4W
R3	10k 5% 1/4W
R5, R6	0.18ohm 5% 2W
R1, R9, R17, R19	470 5% 1/4W
R20	10k Network
R7	5.6K 5% 1/4W
R18	12K 5% 1/4W
R4, (R16 not fitted)	1K 5% 1/4W
R8	4.7k 5% 1/4W
I1	A3977SED I'C
U1	7805 5V Regulator
Q1	BC182 Transistor
L4	LED 3mm Blue
L2	LED 3mm Green
L1	LED 3mm Red
L3	LED 3mm Orange
J1, J2, J5	5mm pitch Terminal Blocks
J3	4 way 5mm pitch connector
D9	6 way DIP switch
4 off LED Holders, 3mm Nut & Bolt	
J1A	4 way terminal plug

Fig2



Mounting bracket for vertical operation.

