DPY50001
Bipolar Microstep Driver Pack

User's Guide

DPY50001 Microstep Driver Features

- Size (8.25"L x 5.05"W x 3.47"H)
- Output Current 5.0 Amps Peak
- 200 to 12,800 steps/rev (1, 2, 5, 8, 10, 16, 32 and 64 selectable step operations)
- Short Circuit Protection
- No Minimum Inductance
- Optional Isolation
- Motor ON/OFF Input

General Description

The DPY50001 is a single-axis 5A bipolar microstep motor driver and a 125W power supply enclosed in a package. The DPY50001's microstep driver has an output current capability of 0.5 Amps minimum to 5.0 Amps maximum (Peak Rating). The inputs are optically isolated with a minimum sourcing of 1.0mA per input (+3.5VDC minimum to +24VDC maximum). The clock input is set to receive either positive or negative edge clocks with a maximum frequency of 400kHz. The driver offers direction control and motor current ON/OFF capabilities. The Reduce Current Enabled automatically reduces motor current to 50% of set value after the last step is made (20msec delay). The driver has built-in features to indicate power on (Green LED), a fault condition (Red LED) and clocks being received. (Yellow LED)

With the DPY50001, various step resolutions can be implemented by the onboard dip switch. These divisions range from 200 steps per revolution to 12,800 steps per revolution. The bipolar driver configuration handles 4, 6 and 8 lead motors. Protection devices have been added to this driver for Phase to Phase Short-Circuit and Motor Miss-Wire conditions.

Pin Descriptions

The inputs on the DPY50001 are optically isolated with the anode (+) and cathode (-) both brought out to the user. With no current going through the opto-diode the input is considered high. To enable the input a minimum of 1.0mA needs to be sourced or sinked through the opto-diode. This is done simply by placing a voltage of +3.5 to +24 VDC across the two inputs of the opto-diode. If sourcing current in to the inputs, then all three cathodes (-) should be ties together and grounded as shown is Figure 2. If sinking current, then all three anodes (+) should be tied together to the +voltage as shown in Figure 1.

Optically Isolated Inputs

The following inputs to the DPY50001 are optically isolated.

Item	Pin #
Clock	1 & 2
Direction	3 & 4
On/Off	5 & 6

Table 1: Inputs That are Optically Isolated

To enable an input, apply a DC voltage source of +5VDC to +24VDC across the inputs. The Anodes (+) are pins 1, 3 and 5 and the Cathodes (-) are pins 2, 4 and 6.

TB1: 8 Pin Terminal Description

Pin #	Description
1	**Step Clock Input Anode (+):** A positive going edge on this isolated input advances the motor one increment. The size of the increment is dependent on the Microstep Select Inputs of Switch 1.
2	**Step Clock Input Cathode (-)**
3	**Direction Anode (+):** This isolated input is used to change the direction of the motor. Physical direction also depends on the connection of the motor windings.
4	**Direction Cathode (-)**
5	**ON/OFF Anode (+):** This isolated input is used to enable and disable the output section of the driver. When HIGH (open) the outputs are enabled. However, this input does not inhibit the step clock.
6	**ON/OFF Cathode (-)**

Table 2: TB1 Terminal Descriptions

TB2: 5 Pin Terminal Description

Pin #	Description
1	**Phase A:** Phase 1 of the step motor
2	**Phase A:** Phase 3 of the step motor
3	**Phase B:** Phase 2 of the step motor
4	**Phase B:** Phase 4 of the step motor
5	**Motor Ground**

Table 3: TB2 Terminal Descriptions

Absolute Maximum Ratings

Input Voltage: 130VAC, 50/60Hz
Output Current: 5.0 AMPS Peak
Max Plate Temperature: 70°C
Storage Temperature: 0° to +50°C
Input Voltage (For Isolated Inputs): +3.5V to +24V

Electrical Specifications

Item	Min	Typ	Max	Units
Input Operating Voltage	105	115	130	VAC
Phase Output Current	0.4		3.5	A (RMS)
Phase Output Current	0.5		5.0	A (PEAK)
Clock Frequency	0		400	kHz
Chopping Frequency	28	30	32	kHz
Input Signal Voltage	3.5		24	V
Operation Temperature	0		70	C
Storage Temperature	0		50	C

Table 4: Specifications
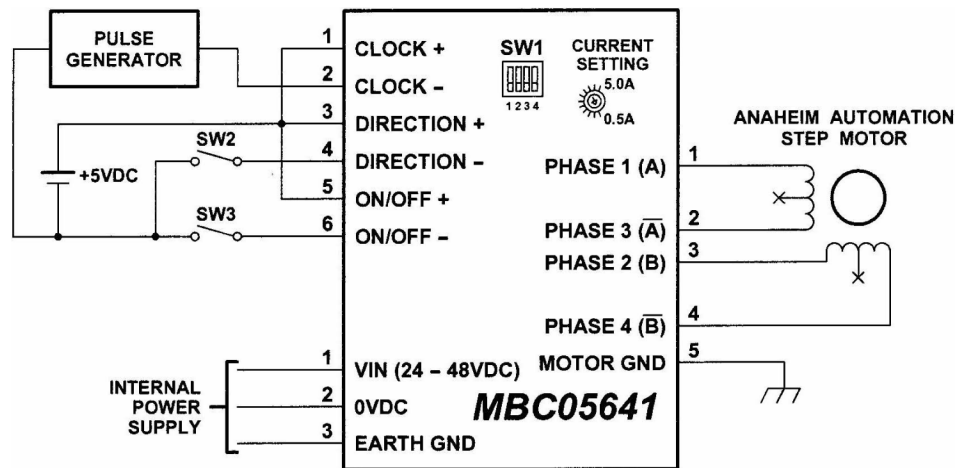
Hook Up Drawings
Sinking:

Figure 1: Hook Up for Sinking Current
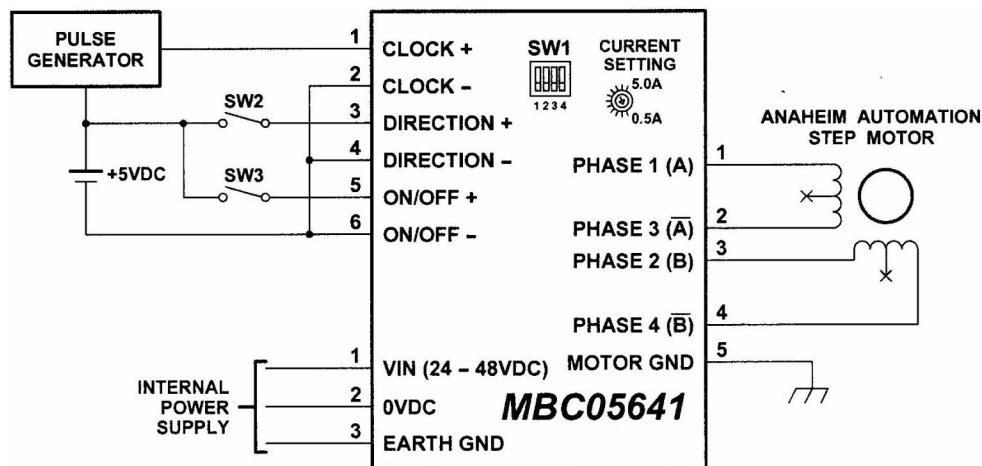
Sourcing:

Figure 2: Hook Up for Sourcing Current
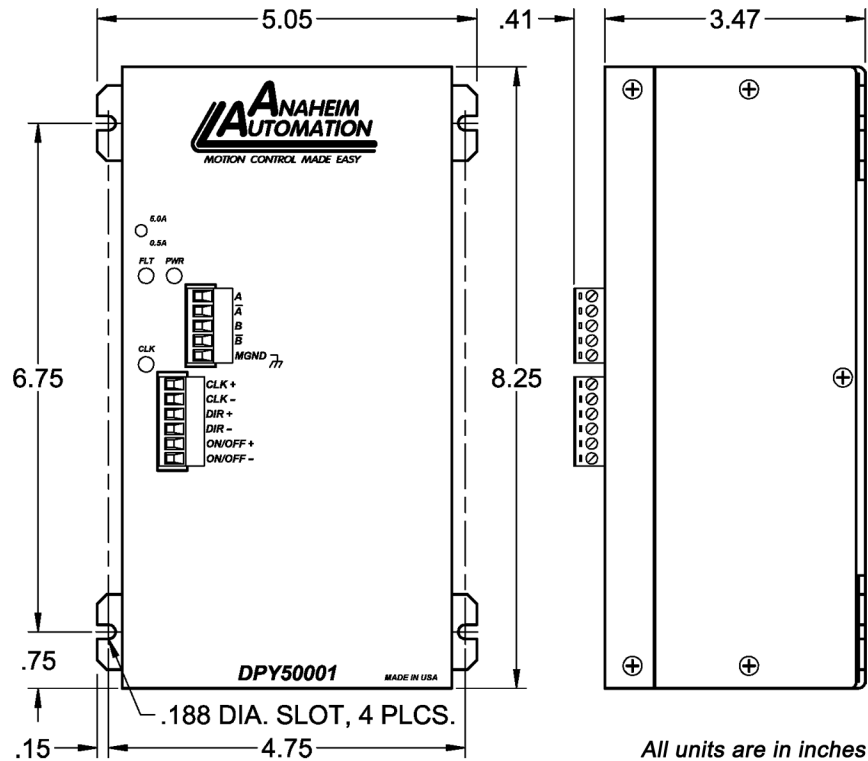
Dimension Drawing

Figure 3: Dimension Drawing

Motor Selection

The DPY50001 contains a Bipolar Microstep Driver that is compatible with both Bipolar and Unipolar Motor Configurations, (i.e. 8 and 4 lead motors, and 6 lead center tapped motors).

Step motors with low current ratings and high inductance will perform better at low speeds, providing higher low-end torque. Motors with high current ratings and low inductance will perform better at higher speeds, providing more high-end torque.

Since the DPY50001's driver is a constant current source, it is not necessary to use a motor that is rated at the same voltage as the supply voltage. What is important is that the driver is set to the appropriate current level based on the motor being used.

Anaheim Automation offers a comprehensive line of step motors in 17, 23, 34 and 42 frame sizes. Contact the factory to verify motor/drive compatibility.

Step Motor Selection Guide

Part Number	Unipolar Rating	Series Peak Rating	Parallel Peak Rating	Series Current Setting	Parallel Current Setting
23Y206	3.0A	3.0A	6.0A	60%	100%
23Y210	5.0A	5.0A	10.0A	100%	100%
23Y306	3.0A	3.0A	6.0A	60%	100%
23Y310	5.0A	5.0A	10.0A	100%	100%
34Y108	4.0A	4.0A	8.0A	80%	100%
34Y207	3.5A	3.5A	7.0A	70%	100%
34Y307	3.5A	3.5A	7.0A	70%	100%
23Y108	4.0A	4.0A	8.0A	80%	100%
23Y106	3.0A	3.0A	6.0A	60%	100%
23Y104	2.0A	2.0A	4.0A	40%	80%
17Y302	---	1.0A	---	22%	---
17Y202	---	1.0A	---	22%	---
17Y102	---	1.0A	---	22%	---

Table 5: Step Motor Selection Guide

Anaheim Automation offers motor cable, making hook-ups quick and easy!
Contact the factory or visit our website for more motor and cable offerings.

Microstep Selection (SW1 Settings)

Switches 2, 3 and 4, of the DIP switch select the number of microsteps per step. The table below shows the standard resolution values along with the associated positions for the select switches. The standard waveforms are sinusoidal.

Resolution	Steps/Rev	Select 2	Select 3	Select 4
1	200	ON	ON	ON
2	400	ON	ON	OFF
5	1000	ON	OFF	ON
8	1600	ON	OFF	OFF
10	200	OFF	ON	ON
16	3200	OFF	ON	OFF
32	6400	OFF	OFF	ON
64	12800	OFF	OFF	OFF

Table 6: SW1 Switch Settings

Setting the Output Current

The output current on the DPY50001 is set by an onboard potentiometer. This potentiometer determines the per phase peak output current of the driver. The relationship between the output current and the potentiometer value is as follows:

Peak Current	Potentiometer Setting	Peak Current	Potentiometer Setting
0.5A	0%	3.0A	60%
0.6A	10%	3.5A	70%
0.9A	20%	4.0A	80%
1.5A	30%	4.5A	90%
2.0A	40%	5.0A	100%
2.5A	50%	---	---

Table 7: Output Current POT Settings
Refer to Table 5 for specific motor current settings.

Reducing Output Current

Reducing the output current is accomplished by setting switch 1 of the DIP switch to the ON position and occurs approximately 20mSec after the last positive going edge of the step clock input. The amount of current per phase in the reduction mode is approximately 70% of the set current. When the current reduction circuit is activated, the current reduction resistor is paralleled with the current adjustment potentiometer. This lowers the total resistance value, and thus lowers the per phase output current.

Determine Output Current

The output current for the motor used when microstepping is determined differently from that of a full/half step unipolar driver. In the DPY50001, a sine/cosine output function is used in rotating the motor. The output current for a given motor is determined by the motors current rating and the wring configuration of the motor. There is a current adjustment potentiometer used to se the output current of the DPY50001. This sets the peak output current of the sine/cosine waves. The specified motor current (which is the unipolar value) is multiplied by a factor of 1.0, 1.4, or 2.0 depending on the motor configuration (series, half-coil, or parallel).

Step Motor Configurations

Step motors can be configured as 4, 6, or 8 leads. Each configuration requires different currents. Refer to the lead configurations and the procedures to determine their output current.

WARNING! Step motors will run hot even when configured correctly. Damage may occur to the motor if a higher than specified current is used. Most specified motor currents are maximum values. Care should be taken to not exceed these ratings.

6 Lead Motors

When configuring a 6 lead motor in a *half-coil configuration* (connected from one end of the coil to the center tap), multiply the specified per Phase (or unipolar) current rating by 1.4 to determine the current setting potentiometer value. This configuration will provide more torque at higher speeds when compared to the series configuration.
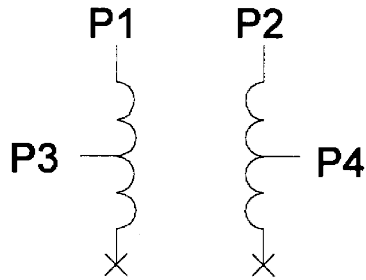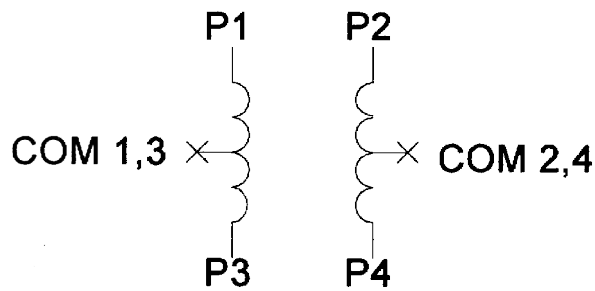

Figure 4: Half Coil Motor Connection

When configuring the motor is a *series configuration* (connected from one end to end with the center tap floating) use the specified per Phase (or unipolar) current rating to determine the current setting potentiometer value.

Figure 5: Series Motor Connection

4 Lead Motors

Multiply the specified *series* motor current by 1.4 to determine the current adjustment potentiometer value. Four Lead Motors are usually rated with their appropriate series current, as opposed to the *Phase Current*, which is the rating for 6 and 8 lead motors.
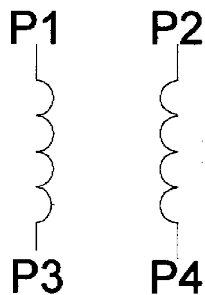

Figure 6: Series Motor Connection

8 Lead Motors

Series Connection: When configuring the motor windings in series, use the per Phase (or unipolar) current rating to determine the current setting potentiometer value.
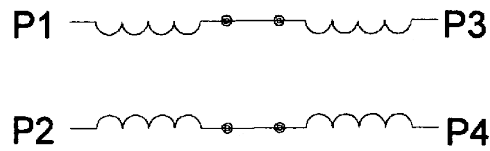

Figure 7: Series Motor Connection

Parallel Connection: When configuration the motor windings in parallel, multiply the per Phase (or unipolar) current rating by 2.0 to determine the current setting potentiometer value.
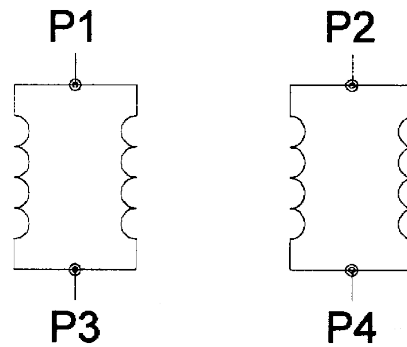

Figure 8: Parallel Motor Connection

NOTE: After the current has been determined, according to the motor connections above, use Table 7 to choose the proper setting for the current setting potentiometer.

Connecting the Step Motor

Phase 1 and Phase 3 of the step motor are connected to pins 1 and 2 on connector TB2. Phase 2 and Phase 4 of the step motor are connected to pins 3 and 4 on connector TB2. The motors case can be grounded to pin 5 on connector TB2. Refer to Figures 1 & 2 TYPICAL APPLICATION HOOK-UP.

NOTE: The physical direction of the motor with respect to the direction input will depend on the connection of the motor windings. To reverse the direction of the motor with respect to the direction input, switch the wires on Phase 1 and Phase 3.

WARNING: Do not connect or disconnect motor wires while power is applied!

Short-Circuit, Mis-Wire, and Over-Current Conditions

If it is found that there is a condition that causes on over current in the driver phase transistors, the Red LED will turn on solid and power will be shut off the motor. To reset the drive turn power off, check wiring, and turn power back on.

DISCLAIMER

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