MBC10101-75
Bipolar Microstep Driver

User's Guide

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MBC10101-75 Microstep Driver Features

- Enhanced Torque/Speed Output over 12VDC and 24VDC drives
- Output Current 10.0 Amps Peak
- Built in short circuit and mis-wire shut down
- Fixed Step Resolution of 2000 steps per revolution
- No Minimum Inductance
- Optical Isolation of Control Inputs
- Motor ON/OFF input

Introduction

The MBC10101-75 Microstep Motor Driver has an output current capability of 1.5 Amps minimum to 10.0 Amps maximum (Peak Rating). The MBC10101-75 driver operates from a DC voltage of 8 - 55 Volts. This driver will out perform all standard 12VDC and 24VDC drivers in the industry. If your system is designed for a 12VDC or 24VDC specification, this driver will allow your motor to increase its operating output performance thanks to this outstanding new driver design.

The inputs are optically isolated with a minimum sourcing of 1.0 mA per input (+5VDC minimum to +24VDC maximum). The clock input is set to receive either positive or negative edge clocks with a maximum frequency of 100KHz. The MBC10101-75 driver offers direction control, motor current ON/OFF capabilities, and built in short circuit and mis-wire shutdown. The Reduce Current Enabled automatically reduces motor current to 50% of set value after the last step is made. The driver has built-in features to indicate power on (Green LED) and Clocks being received, greater than 100 Hz (Yellow LED). The MBC10101-75 has a step resolution of 2000 steps per revolution and the bipolar drive configuration handles 4, 6, and 8 lead motors.

Optically Isolated Pin Descriptions

The inputs on the MBC10101-75 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 1.0 mA needs to be sourced or sinked through the opto-diode. This is done simply by placing a voltage of +5 to +24 VDC across the two inputs of the opto-diode. If sourcing current into the inputs, then all three cathodes (-) should be tied together and grounded as shown in Figure 2. If sinking current, then all three anodes (+) should be tied together to the +voltage as shown in Figure 1.
The *optional* output on the MBC10101-75 is an opto-decoupled open collector output. When normal operation occurs, this output will conduct current into the emitter. Care must be taken not to pass more than 50mA through this transistor. Please contact Anaheim Automation for functionality of this output.
To enable an input, apply a DC voltage source of +5VDC to +24VDC across the inputs. The Anodes (+) are pins 1, 3, and 5 on TB1 and the Cathodes (-) are pins 2, 4, and 6 on TB1.

Connecting the Step Motor

Phase 1 and 3 of the Step Motor is connected between pins 1 and 2 on the TB3. Phase 2 and 4 of the Step Motor is connected between pins 3 and 4 on TB3. Refer to Figures 1 & 2 for 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, swap the wires on Phase 1 and Phase 3.

WARNING: Do not connect or disconnect motor wires while power is applied! This driver *does not* protect itself if the motor is disconnected while powered.

Terminal Block Descriptions

Pin #	Description
	Terminal Block 1 (TB1)
1	**Step Clock Input Anode (+):** A positive going edge on this isolated input advances the motor one increment.
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 (-)**
7	**OUT1 (Collector):** The output on the MBC10101-75 is an opto-decoupled open collector output. When normal operation occurs, this output will conduct current into the emitter. Care must be taken not to pass more than 50mA through this transistor.
8	**OUT1 (Emitter)**
	Terminal Block 2 (TB2)
1	**DC IN: Input voltage for the driver (8-55VDC)**
2	**Ground: Return path for driver voltage**
	Terminal Block 3 (TB3)
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**

Table 1: Pin descriptions for terminal blocks

Power Supply Requirements

The MBC10101-75 can only be powered by a DC voltage with a range of 8 to 55VDC.

Power Draw:

The power consumption of this driver from the DC power supply is determined by the DC voltage in. The power draw is also motor dependent. Motors exceeding 200 watts are not intended for the MBC10101-75 driver. The following formula can be used to determine the maximum power delivered by the driver:

Output Power = (VDC in) x 4.

Power Supply Ordering Information

DC Supply	Description	Power
PSA40V4A	40V @ 4A, 175/230VAC IN	160Watts
PSA24V2.7A	24V @ 2.7A, 90-265VAC IN	65Watts
PSA40V8A	40V @8A, 115 VAC IN	320Watts

Table 2: Power Supply Ordering Information

Absolute Maximum Ratings

Input Voltage: 55VDC
Output Current: 10.0 AMPS PEAK
Max Plate Temperature: 70° C
Storage Temperature: 0° to +50° C
Input Voltage (For isolated inputs): +5V to +24V at 2.5mA

Electrical Specifications

Item	Min	Typ	Max	Units
Input Voltage (Power)	8		55	VDC
Phase Output Current	1.1		7.1	A (RMS)
Phase Output Current	1.5		10.0	A (PEAK)
Input Voltage (Inputs)	5		24	VDC
Clock Frequency	0		100	kHz
Chopping Frequency	30	32	34	kHz
Operation Temperature	0		70	C

Table 3: MBC10101-75 electrical specifications

Setting the Output Current

WARNING: Do not set the current setting above the step motors rated current. When using a higher current setting into a motor, the motor will overheat and burnup. Should this occur, the driver will also be damaged.

The output current on the MBC10101-75 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
1.5A	0%	7.0A	60%
2.3A	10%	7.9A	70%
3.1A	20%	8.7A	80%
4.0A	30%	9.6A	90%
5.0A	40%	10A	100%
6.0A	50%	--	--

Table 4: Potentiometer values with respect to the output current

Refer to Table 5 for specific motor current settings.

Reducing Output Current

Reducing the output current is accomplished automatically and occurs approximately 1 second after the last positive going edge of the step clock input. The amount of current per phase in the reduction mode is approximately 50% of the set current.

Hook Up Drawings

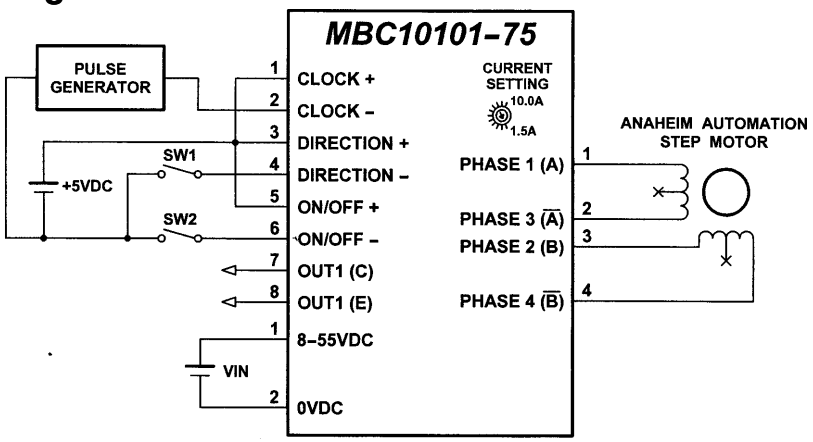


Figure 1: Hook up for current sinking inputs

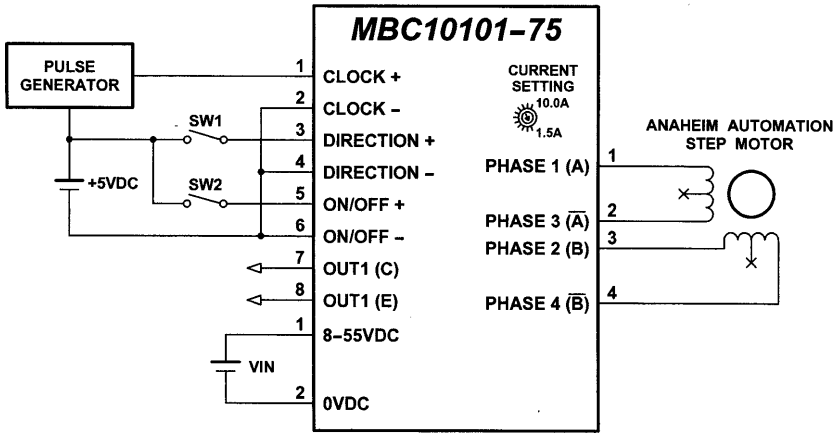


Figure 2: Hook up for current sourcing inputs

Dimension Drawing

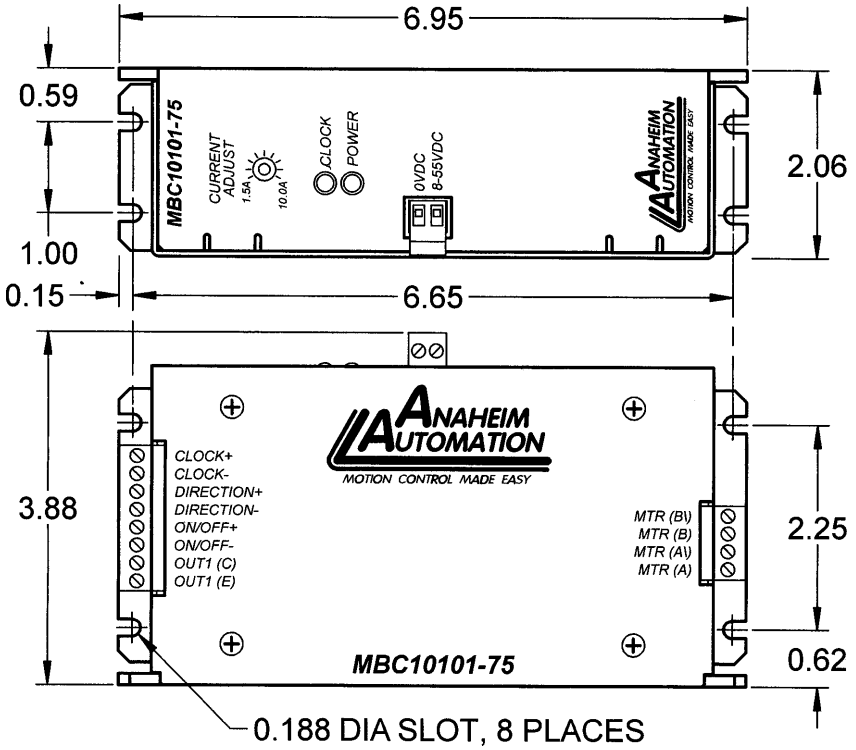


Figure 5: MBC10101-75 dimensions

Motor Selection

The MBC10101-75 is 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. Higher voltages will cause the current to flow faster through the motor coils. This in turn means higher step rates can be achieved. *Care should be taken not to exceed the maximum voltage of the driver.*

Since the MBC10101-75 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 MBC10101-75 is set to the appropriate current level based on the motor being used. Refer to the following chart for setting the current potentiometer based on the current code in the part number of the motor. Examples of motor part numbers are shown below. Anaheim Automation offers a comprehensive line of step motors in 14, 17, 23, 34 and 42 frame sizes. Contact the factory to verify motor compatibility with the MBC10101-75.

Step Motor Current Setting Guide

Motor Example	Motor Current Number Code	Unipolar Rating	Series Peak Rating	Parallel Peak Rating	Series Current Setting	Parallel Current Setting
23D102S	02	1.0A	1.0A	2.0A	----	5%
23L303D-LW8	03	1.5A	1.5A	3.0A	0%	20%
34N104S-LW8	04	2.0A	2.0A	4.0A	5%	30%
23L4005D-LW8	05	2.5A	2.5A	5.0A	10%	40%
34A106B	06	3.0A	3.0A	6.0A	20%	50%
34N207S-LW8	07	3.5A	3.5A	7.0A	25%	60%
34K108S-LW8	08	4.0A	4.0A	8.0A	30%	70%
42N209S-CB	09	4.5A	4.5A	9.0A	35%	85%
23L310S-LW8	10	5.0A	5.0A	10.0A	40%	100%
34D311D	11	5.5A	5.5A	11.0A	45%	100%
42K112S-CB	12	6.0A	6.0A	12.0A	50%	100%
34D213S	13	6.5A	6.5A	13.0A	55%	100%
34N314S-LW8	14	7.0A	7.0A	14.0A	60%	100%
42N115D-CB	15	7.5A	7.5A	15.0A	65%	----
34K416S-LW8	16	8.0A	8.0A	16.0A	70%	----
42D119D	19	9.5A	9.5A	19.0A	90%	----
42N322S-CB	22	11.0A	11.0A	22.0A	100%	----
42D225S	25	12.5A	12.5A	25.0A	100%	----

Table 5: Table selection for Anaheim Automation motor current settings.

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

Determining 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 MBC10101-75, 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 wiring configuration of the motor. There is a current adjustment potentiometer used to set the output current of the MBC10101-75. 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).

WARNING: Do not set the current setting above the step motors rated current. When using a higher current setting into a motor, the motor will overheat and burnup. Should this occur, the driver will also be damaged.

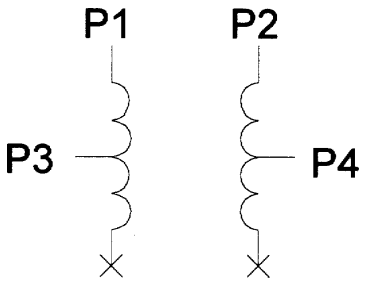
Step Motor Configurations

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.

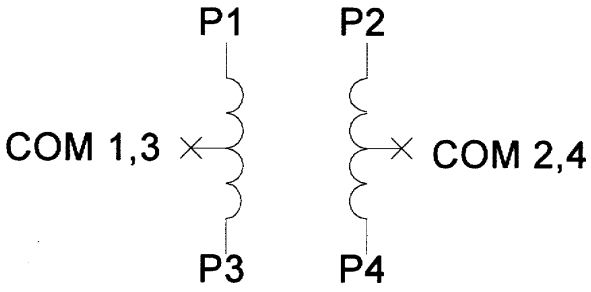
WARNING! Step motors will run hot even when configured correctly. Damage may occur to the motor if a higher than specified current is used. Most specified motor currents are maximum values. Care should be taken to not exceed these ratings.

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.

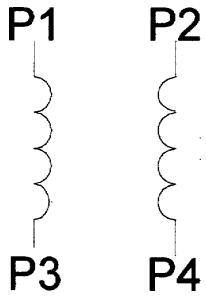


When configuring the motor in a ***series configuration*** (connected from end to end with the center tap floating) use the specified per Phase (or unipolar) current rating to determine the current setting potentiometer value.



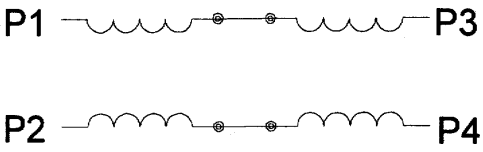
4 Lead Motors

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.

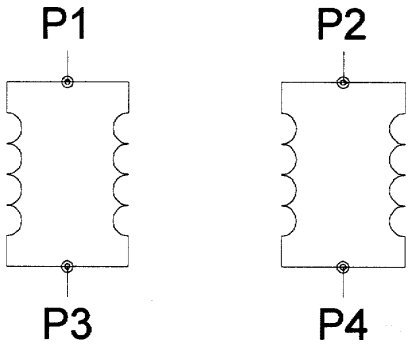


8 Lead Motors

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



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



NOTE: After the current has been determined, according to the motor connections above, use Table 3 to choose the proper setting for the current setting potentiometer.

Torque Speed Curves