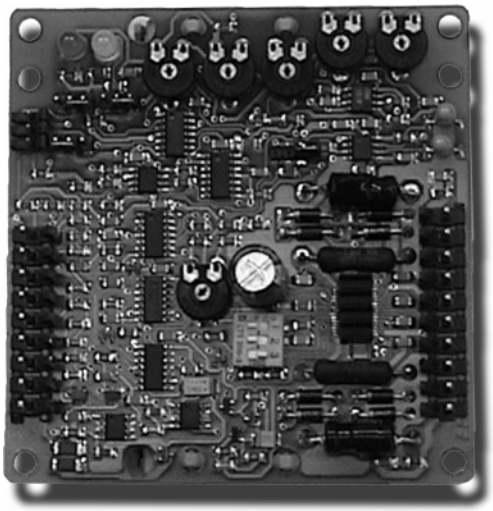
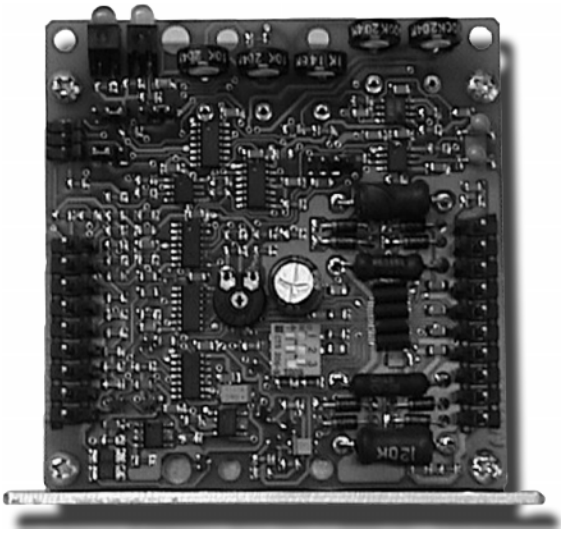
MBC25PG1 / MBC25PG1L
Microstep Driver with Pulse Generator

User's Guide





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Features

- ***Output Current of 2.5A Peak***
- ***200 to 1600 Steps/Revolution (1, 2, 4 and 8 Selectable Step Operation)***
- ***Drives Two Motors In Series***
- ***On-Board Pulse Generator***
- ***Pulses From 50Hz to 44kHz***
- ***Clock Output for Daisy Chaining***
- ***Motor On/Off Input***
- ***Short Circuit Protection***

Introduction

The MBC25PG1(L) microstep driver/pulse generator has an output current capability of 0.5A minimum to 2.5A maximum (peak rating). The MBC25PG1(L) driver operates with a DC voltage of 12VDC to 35VDC. The logic inputs can be operated from +5VDC minimum to +24VDC maximum. The MBC25PG1(L)'s internal PG (pulse generator) is a linear ramping PG designed to be used with this driver. It has adjustable base speeds and max speeds, independent adjustments for acceleration (ramping up) and deceleration (ramping down), jumper selectable external or on-board max speed potentiometer and a jumper selectable deceleration profile. The MBC25PG1(L) also has an avialable clock output of its internal pulse generator that can be used for daisy chaining drivers together. The MBC25PG1(L) driver features direction control and motor current On/Off capabilities. The "Reduce Current Enabled" feature automatically reduces motor current to 70% of the set value. The driver has built in features to indicate power on (green LED) and clocks being received (yellow LED). The MBC25PG1(L) has various step resolutions that can be implemented by using the on-board dip switch. These divisions range from 200 steps/rev to 1600 steps/rev. The bipolar drive configuration handles 4, 6, and 8 lead step motors and is also equipped with short circuit, over temperature and crossover current protection.

Speed Ranges

The internal PG has an adjustable base speed (starting speed) and two adjustable maximum speeds (running speed). The base speed is adjusted using the on-board potentiometer, while the maximum speeds are adjusted using either the on-board or external potentiometer, which is chosen by using jumper JP4. To use the on-board potentiometer, set JP4 in position 2-3. To use the external potentiometer, set JP4 in position 1-2. The following chart shows the speed ranges of the pulse generator. Jumper JP6 is used to switch between the set speeds.

Speed Range	Base Low	Base High	Max Low	Max High	JP6
1	50Hz	2.5kHz	70Hz	11kHz	Open
2	100Hz	5kHz	100Hz	22kHz	1 & 2
3	200Hz	10kHz	200Hz	44kHz	2 & 3

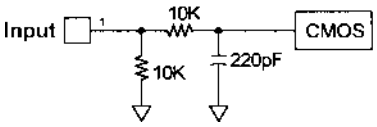
Note: It is possible to have a max speed that is lower than the base speed.

Ramping

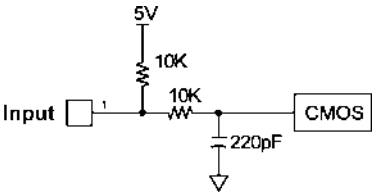
There are separate adjustments for acceleration and deceleration. The ramp times are adjustable from 50 milliseconds to 1.0 seconds. This is the time it takes to ramp from the lowest base speed to the highest max speed. In terms of acceleration units, the accel/decel rates are adjustable from 5,000 steps/s^2 to 100,000 steps/s^2 on the low speed range and from 20,000 steps/s^2 to 400,000 steps/s^2 on the high speed range.

Input Power Requirements

Inputs: All inputs are either pulled up to 5VDC or pulled down to 0VDC based on JP1. For pullups place JP1 in position 1-2, for pulldowns place JP1 in position 2-3. A logic "0" activates inputs that are pulled up, while a logic "1" activates an input that is pulled down. An unconnected input will allways remain inactive.



Positive Going Inputs



Negative Going Inputs

External Clock: When using an external clock, either positive or negative pulses may be used by setting jumpers JP1 in the appropriate position (Refer to Demensions/Jumper and Potentiometer Locations). To determine which setting to use, first consider the type of clock pulse output the external pulse generator or controller possesses. If the clock output on the controller is open-collector type (sinking), then use the negative going jumper setting. If the clock output on the controller is a PNP or P channel (sourcing) type, then use the positive going jumper setting. If the clock output on the controller is a TTL/CMOS type (totem pole), then either type of setting will work. Always take into consideration the jumper setting chosen based on the voltage level of the clock output when the controller is not pulsing. If the clock is low when not pulsing, then use positive going jumper settings. If the clock is high when not pulsing, use the negative going jumper setting.The clock input is pulled up to +5VDC through a 10K ohm resistor for negative going clock inputs or pulled down to 0VDC through a 10K ohm resistor for positive going clock inputs. The pullups/pulldowns are followed by an RC filter. For an external clock, the Stop/Run and Base/Max inputs must be inactive.

Direction: When this input is not active, the motor will be moving in the clockwise or “+” direction. When this input is active, the motor will move in the counterclockwise or “-“ direction. When two motors are used, the second motor will move in the opposite direction.

On/Off: When this input is not active, the motor will be enabled or turn on. When this input is active, the motor will be disabled or turned off.

Stop/Run: When this input is not active, the PG is stopped and will not output any pulses. When this input is active the PG will output pulses at the base speed rate if the Base/Max input is not active. If both the Stop/Run and the Base/Max inputs are activated, the PG will ramp up and output pulses at the max speed rate. This input is only used in the two-input operation.

Base/Max: This input has two functions; In the two-input operation, this input selects either base speed (not active) or max speed (active). When this input changes, the PG will ramp from one speed to the other. In the single-input operation, this input is used to start and stop the PG (not active = stop, active = run). Upon starting, the PG will start running at base speed and immediately ramp up to the max speed and continue to run at the max speed while this input is active. When this input goes back to inactive, the PG will either stop immediately, or it will ramp down and stop when it reaches base speed (depending on JP5 setting). With single-input operation, the PG only uses base speed as a starting speed. The Stop/Run input is not used with single-input operation. (See Internal PG Operating Modes for further explanation)

Max A/ Max B: When this input is not active, the PG will run at max speed A. When this input is active, the PG will run at max speed B.

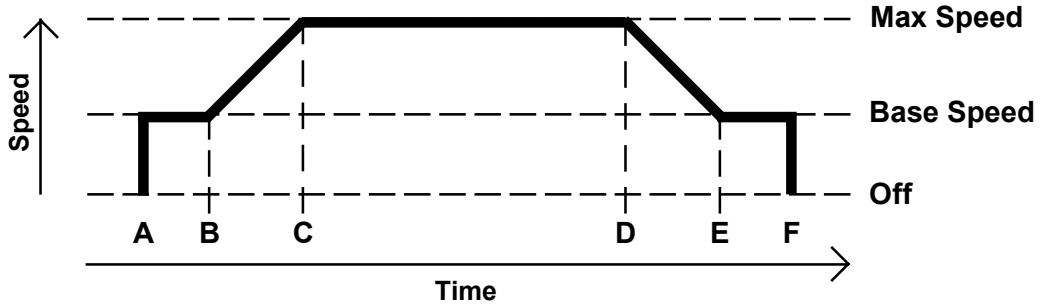
External Potentiometer: To use an external potentiometer for the max speed you need to place jumper JP4 to position 1-2 (Refer to Dimensions/Jumper and Potentiometer Locations). Connector P2 is used for this potentiometer with the wiper in Pin 2. The max speed limit is set with the internal speed pots MAX A/ MAX B and the minumum speed is 200Hz. A value of 10K ohms to 100K ohms should be used.

External Clock Output: The external clock is the output of the internal pulse generator that can be used to daisy chain other MBC25PG1(L)s together. This is an open collector output that is internally pulled up to +5V. It is capable of sinking 10mA and when no clocks are being sent is in the logic "1" state.

Internal PG Operating Modes

Two Input Operation:

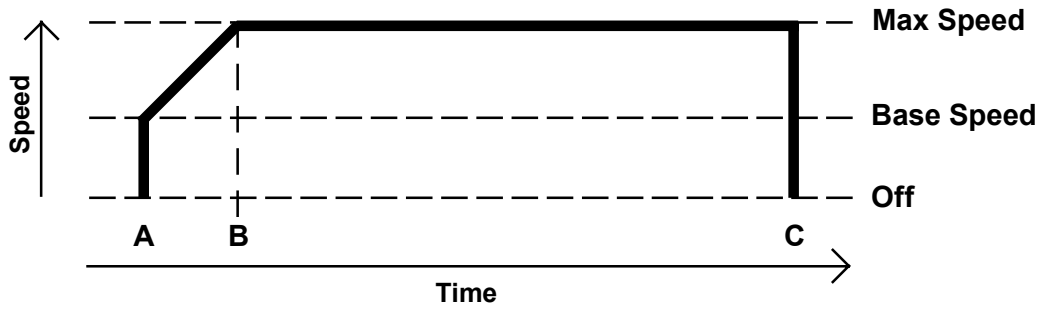
A) Stop/Run is active; Starts at base speed and runs for a while at base speed.
B) Base/Max is active; Ramps up to max speed.
C) Both inputs are still active; Max speed is reached (keeps running at max speed).
D) Base/Max is inactive and Stop/Run is still active; Ramps down to base speed.
E) Stop/Run is active; Base speed is reached.
F) Stop/Run is inactive; Pulses stop.



Single Input Operation with No Ramping Down (JP5 Position 2-3):

A) Base/Max is active; Starts at base speed and immediately ramps up to max speed.
B) Base/Max is still active; Max speed is reached (keeps running at max speed).
C) Base/Max is inactive; Pulses stop.

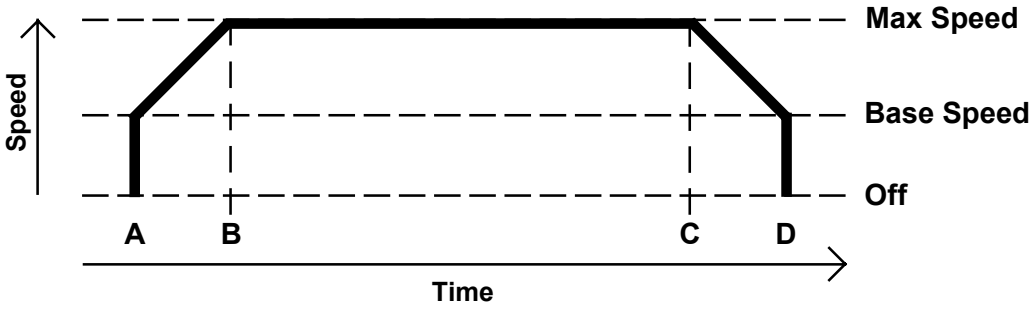
Note: In this mode, the PG still ramps down internally even though pulses stop; so before ramping again, 50 milliseconds must be allowed for the PG to ramp back down to base speed with the decel adjustment set for the fastest ramp down.



Single Input Operation with Ramping Down (JP5 Position 1-2)

A) Base/Max is active; Starts at base speed and immediately ramps up to max speed.
B) Base/Max is active; Max speed is reached (keeps running at max speed).
C) Base/Max is inactive; Motor ramps down.
D) Pulses automatically stop when base speed is reached.

Note: With single-input operation, jumper JP5 is used to select ramping down (Position 1-2), or no ramping down (Position 2-3).



Connector Descriptions

Connector P1:	
Pin #	Description
1	Power Supply Ground (0VDC)
2	Power Supply Input (12VDC -35VDC)
3	Stop/Run
4	Base/Max
5	Max Speed A/Max Speed B
6	Pulse Generator Clock Out
7	On/Off
8	Direction
9	External Clock

Connector P2:	
Pin #	Description
1	External Potentiometer
2	External Potentiometer Wiper
3	External Potentiometer

Connector P3: (One Motor)	
Pin #	Description
1	Motor 1, Phase 1
2	No Connect
3	No Connect
4	Motor 1, Phase 4
5	Motor Ground
6	No Connect
7	Motor 1, Phase 3
8	No Connect
9	Motor 1, Phase 2
10	No Connect

Connector P3: (Two Motors)	
Pin #	Description
1	Motor 1, Phase 1
2	Motor 1, Phase 3
3	Motor 1, Phase 2
4	Motor 1, Phase 4
5	Motor 1 Ground
6	Motor 2, Phase 1
7	Motor 2, Phase 3
8	Motor 2, Phase 2
9	Motor 2, Phase 4
10	Motor 2 Ground

Ordering Information

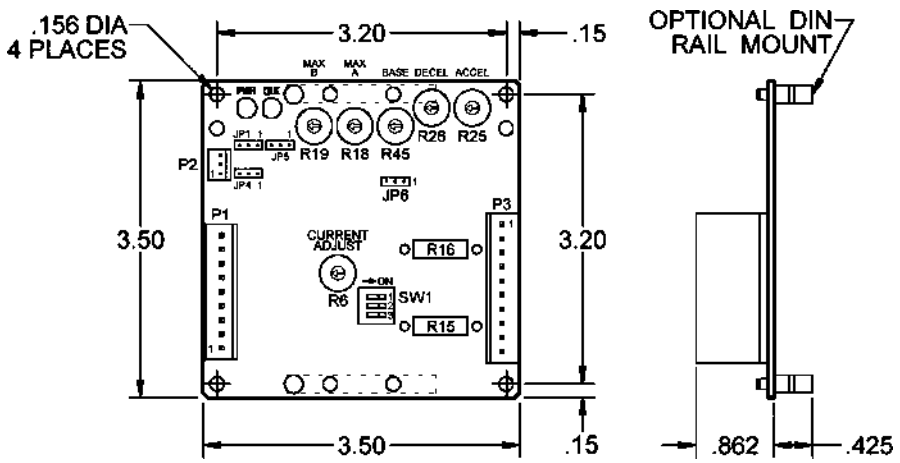
Part #	Description
MBC25PG1	Driver/Pulse Generator
MBC25PG1L	Driver/Pulse Generator with L Bracket for Vertical Mounting
DIN-209-188	Optional Din Rail Mountable Feet for MBC25PG1
CON-6404289	Optional 9 pin, 0.156" IDC (AMP part no. 640428-9)
CON-16404280	Optional 10 pin, 0.156" IDC (AMP part no. 1-640428-0)
CON-6404403	Optional 3 pin, 0.100" IDC (AMP part no. 640440-3)
PSAM24V2.7A	Optional Power Supply 24V, 2.7A

Specifications

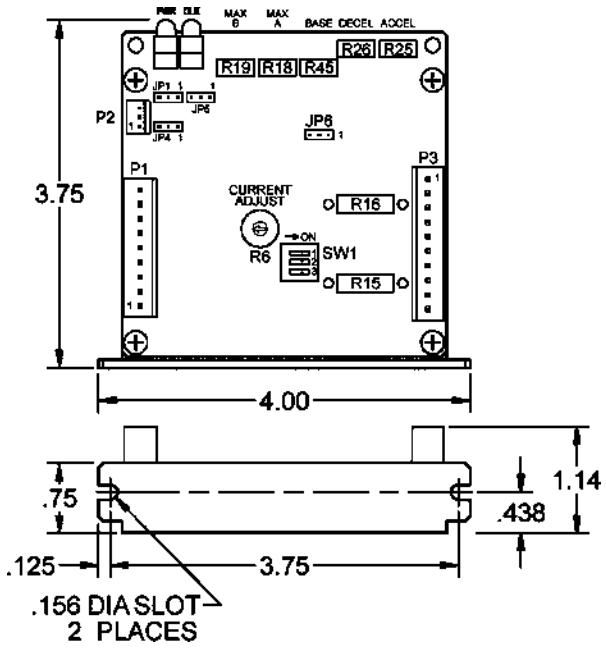
Power Requirements	12-35VDC	
Base/Max Input (P1, Pin 4)	Base Speed	Inactive
	Max Speed	Active
Stop/Run Input (P1, Pin 3)	Stop	Inactive
	Run	Active
Direction Input (P1, Pin 8)	CW	Inactive
	CWW	Active
On/Off Input (P1, Pin 7)	On	Inactive
	Off	Active
Max A/Max B Input (P1, Pin 3)	Max Speed A	Inactive
	Max Speed B	Active
Ramp Times	Lowest base speed to highest max speed in 50ms - 1.0 sec	
Acceleration/Deceleration Rates	Low Speed Range	5000 - 10000 pulse/sec^2
	High Speed Range	20000 - 400000 pulses/sec^2
Output Current: T_A = 25°C (MBC25PG1)	Min	0.5A peak
	Max	2.0A peak (2.5A with air flow)
Output Current: T_A = 25°C (MBC25PG1L)	Min	0.5A peak
	Max	2.5A peak
Clock Out Frequency (P1, Pin 6)	Min	50Hz
	Max	44kHz
Driver Chopping Frequency	25kHz - 30kHz	
Operating Tempature	0 - 70°C	
LEDs	Green	Power On
	Yellow	Clocks being received above 10Hz

Dimensions/Jumper and Potentiometer Locations

MBC25PG1



MBC25PG1L

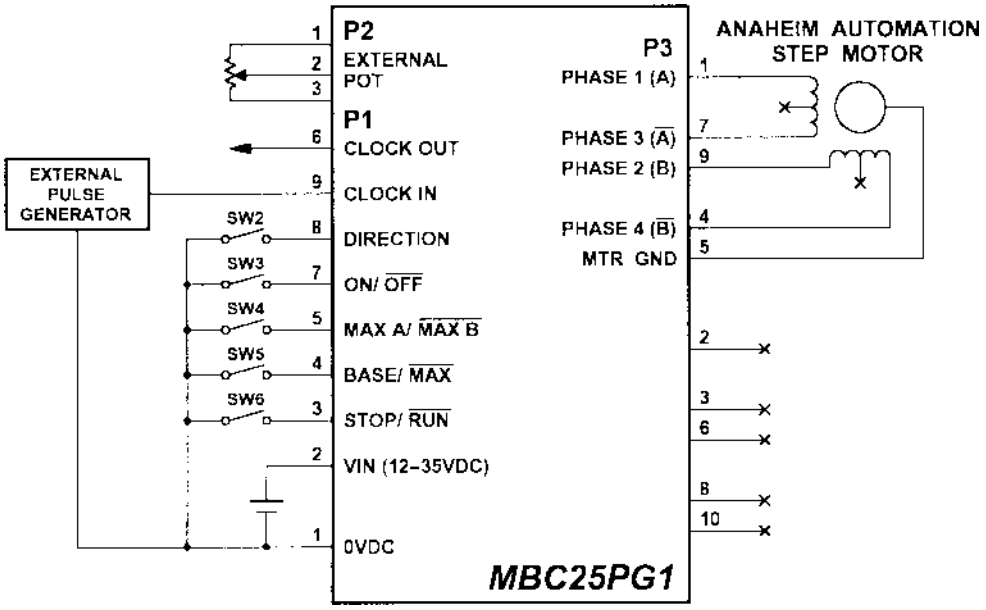


Jumper Functions

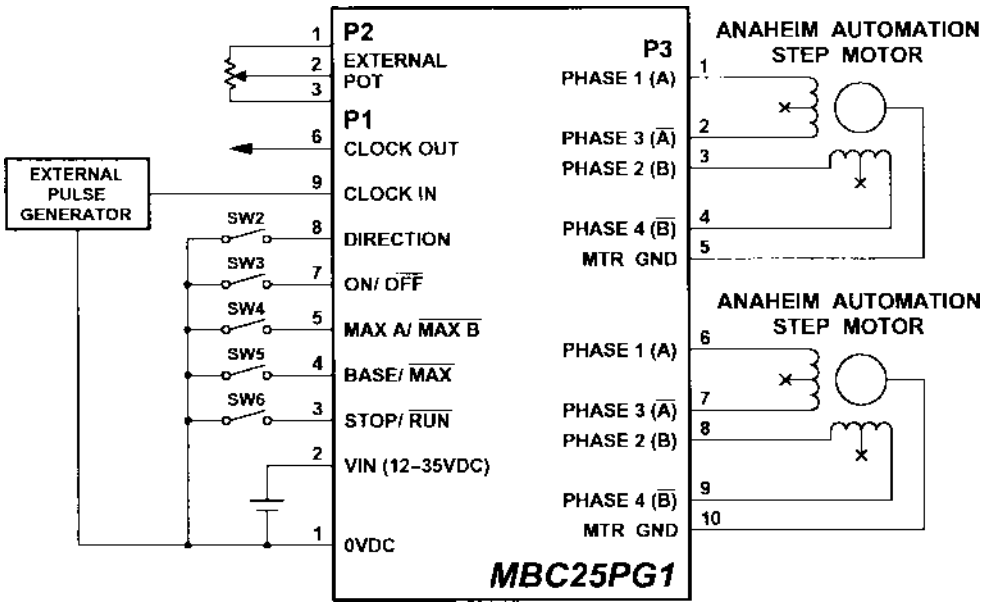
Jumper #	1-2	2-3	No Jumper
JP1	Negative Going Clocks	Positive Going Clocks	N/A
JP4	External Max Speed Control	On Board Max Speed Control	N/A
JP5	Single Input Operation with Ramping Down	Single Input Operation with No Ramping Down	N/A
JP6	Speed Range 2	Speed Range 3	Speed Range 1

Hookup Diagrams

One Motor



Two Motors



Microstep Modes (Switch Settings)

Dip Switch Functions

SW1	Function
Dip Switch 1	Least Significant Bit for Microstepping Divisor
Dip Switch 2	Most Significant Bit for Microstepping Divisor
Dip Switch 3	Reduced Current Enabled

Microstep Switch Settings

Microstep Mode	Dip Switch 1	Dip Switch 2	Dip Switch 3	Auto Reduce Current
Full Step	On	On	Off	Disabled
Half Step	Off	On	Off	Disabled
Quarter Step	On	Off	Off	Disabled
Eighth Step	Off	Off	Off	Disabled
Full Step	On	On	On	Enabled
Half Step	Off	On	On	Enabled
Quarter Step	On	Off	On	Enabled
Eighth Step	Off	Off	On	Enabled

Setting the Output Current

The output current on the MBC25PG1(L) is set by the on-board potentiometer R6 (Refer to Dimensions/ Jumper and Potentiometer Locations). This current adjust potentiometer determines the per phase peak output current of the driver. This relationship between the output current and the potentiometer setting is as follows:

Potentiometer Settings

Peak Current	Potentiometer Setting
0.5A	0%
0.7A	10%
0.9A	20%
1.1A	30%
1.3A	40%
1.5A	50%
1.7A	60%
1.9A	70%
2.1A	80%
2.3A *	90%
2.5A *	100%

* **Warning:** For the MBC25PG1 your system must have airflow to dissipate heat. Failure to do so may cause a driver failure. The MBC25PG1L will work upto 2.5A without airflow.

Reducing Output Current

Reducing the output current is accomplished by setting switch 3 of SW1 to the on position and occurs approximately 1 second after the last 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.

Determining Output Current

The output current used for the motor when microstepping is determined differently from that of a full/half step unipolar driver. In the MBC25PG1(L), 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 MBC25PG1(L). 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).

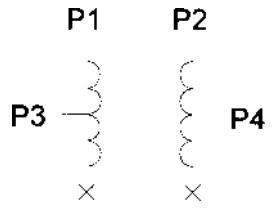
Step Motor Configurations

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.

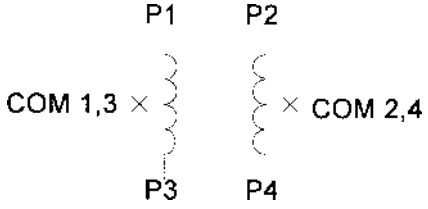
WARNING! Step motors will run hot even when configured correctly. Damage may occur to the motor if a higher than specified current is used. Most specified motor currents are maximum values. Care should be taken to not exceed these ratings.

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.

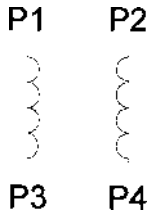


When configuring the motor in a ***series configuration*** (connected from end to end with the center tap floating) use the specified per phase (or unipolar) current rating to determine the current setting potentiometer value.



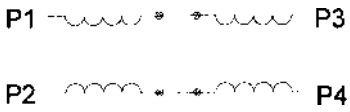
4 Lead Motors

Multiply the specified ***series*** motor current by 1.4 to determine the current adjustment potentiometer value. 4 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.

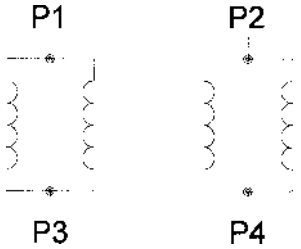


8 Lead Motors

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 the potentiometer setting table to choose the proper setting for the current setting potentiometer.

Connecting the Step Motor

The MBC25PG1(L) is designed to accept either one or two motors. For wiring of the motor refer to the pages containg the connector descriptions and hookup diagrams.

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. With the operation of 2 motors, they will run in the opposite direction when wired the same.

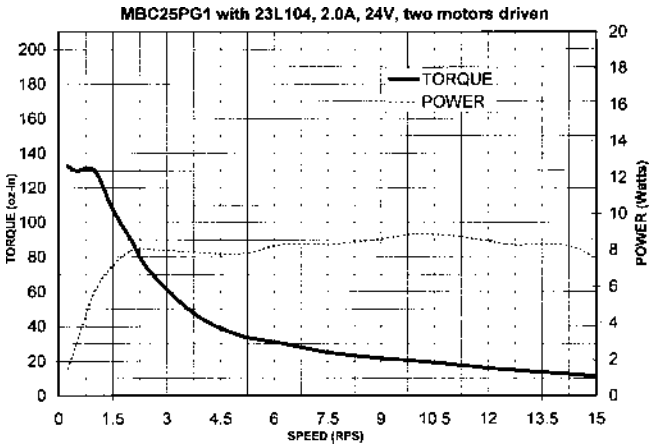
WARNING: Do not connect or disconnect motor wires while power is applied!

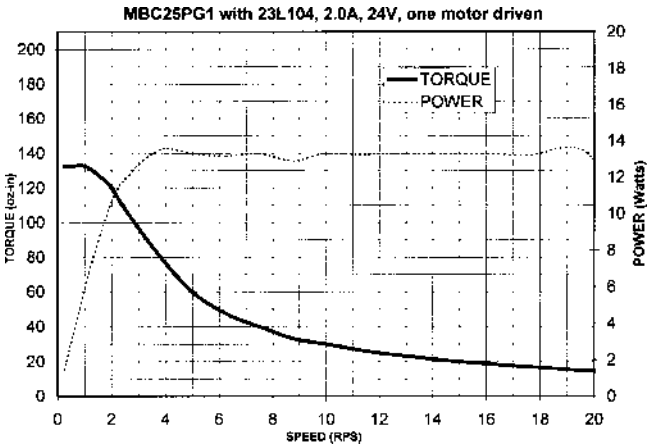
Circuit Protection

This driver is equipped with short circuit, over temperature and cross over current protection.

Note: When drive experiences a fault condition, it will seize to function. Power down, inspect wiring, motors, etc. and allow for a 30 second pause to resume functioning. If driver is too hot, additional ventilation and airflow should be added to prevent temperature to exceed recommended temperature.

Torque Speed Curves





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