

## 15 Amp Bidirectional PWM Motor Speed Controller BIDIR-115 and BIDIR-115S

The BIDIR-115(S) PWM controller allows you to control the speed and direction of a motor using any potentiometer from 1 – 30k. Use of PWM and low on-resistance MOSFETs allows for high efficiency control with minimal power loss.

### Absolute Maximum Ratings:

Parameter	Max	Units
Continuous Output Current	15	A
Instantaneous Output Current	20	A
Continuous Input Voltage	30	V

**Warning – operating at or above the absolute maximum ratings may damage your controller or your equipment under control.**

### Operating Parameters:

Parameter	Min	Typical	Max	Units
Input Voltage	10	12	26	V
Continuous Output Current	--	--	15	A
Digital Logic Input Low Level	0	--	1.5	V
Digital Logic Input High Level	3.5	--	5	V
Digital Input Capacitance	--	0.1	--	uF
Analog Voltage Input	0.0	--	5.0	V
Potentiometer Total Resistance	1	10	30	kΩ
Soft Start from Disabled Mode, Ramp Rate*	--	100	--	% / s
PWM Frequency	150	200	250	Hz
Quiescent Current Drain	70	75	80	mA
Temperature	-40	25	+60	°C

\* on BIDIR-115S models

### Pin-out:

Pin Label	Function	Active H/L
<b>P-</b>	Lower pin of potentiometer (GND)	--
<b>Center</b>	Wiper of potentiometer	--
<b>P+</b>	Upper pin of potentiometer (5V)	--
<b>DIR</b>	Direction	L = forward H = reverse
<b>EN</b>	PWM output enable (internal pull-up)	H = enable L = disable
<b>M-</b>	Negative output to LOAD	--
<b>M+</b>	Positive output to LOAD	--
<b>GND</b>	Ground from power supply	--
<b>V+</b>	Positive Power Supply	--

**Analog Control Mode**

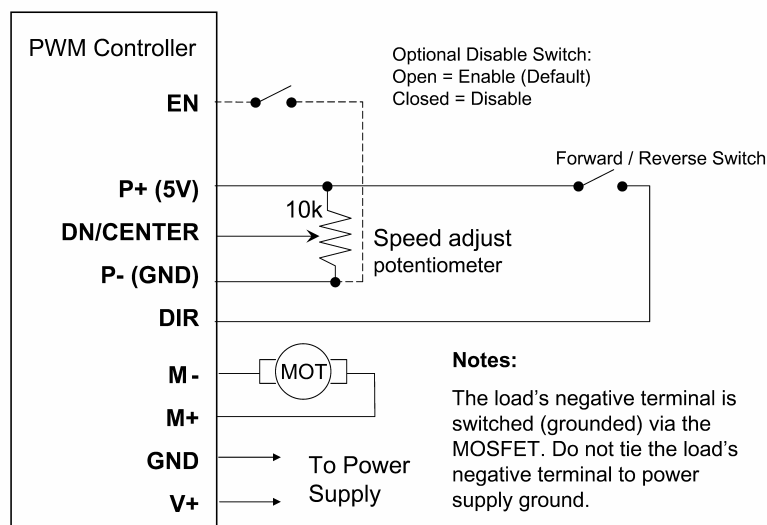


Figure 1: Connection Diagram

**Operation:**

A potentiometer of 1k – 30k can be used to control the pulse width. Alternatively, a varying voltage (0 – 5 V) level applied between the CENTER and POT- pins can be used as well. The voltage input is converted to a pulse width at the output (0 – 100%).

There is a built-in dead-band for potentiometer operation that sets the duty cycle to:  
 0% for any voltage level < 0.10 V.  
 100% for any voltage level > 4.90 V.

This dead-band along with digital filtering ensures smooth and reliable operation even with dirty potentiometers.

**Output Enable:**

The output is enabled by default and is internally pulled up. Bringing the EN pin low immediately brings the PWM output to 0%. Allowing the pin to return to high re-enables the PWM output at the previous duty cycle.

**Direction:**

A switch can be connected between the DIR input and P+ to reverse the direction of the motor. Ensure that the motor is completely stopped before reversing direction. The controller enters a braking mode for about 1 second after the direction input is received before reversing. The onboard fuse protects the motor in the event of an accidental reverse when the motor is still rotating. Replace only with a fuse of the same type and rating.

In applications where this delay is not necessary, it can be disabled. To disable the delay, connect a 1k resistor between EN and P+, and a 4.7k resistor between EN and P-. This disables the delay. The controller's EN pin can still be used, but the voltage on the EN pin should be around 4 volts at startup to disable the delay.

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**Soft Start (on BIDIR-115S models only):**

The output is automatically ramped up back to the original PWM level at a rate of 100% per second when the controller is switched from disabled to enabled. This reduces the stress placed on power supplies and mechanical linkages as motors come back up to speed.

**Application Notes:**

The controller automatically puts the motor into braking mode when power is removed. **Please be aware that if the motor is still spinning when the power is removed, the motor will brake suddenly.**

This controller is not reverse-polarity protected. **Ensure that it is wired correctly before applying power.** Always turn off the power supply before making any changes to the wiring.

PWM controllers switch currents at high frequencies to vary the average power to the load. This switching can cause undesirable RF interference. To minimize such interference, it is recommended to twist the input V+ and Ground wire pair as well as the Out+ and Out- wire pair. Please see application note AN-100 for more tips on reducing noise.

Ensure that the controller has adequate air flow for proper cooling. If operating for extended periods of time in high temperature environments, a cooling fan may be necessary.

**Use the shortest possible wiring between the load and controller, and between the controller and the power source.** Ensure that the cables carrying the load current are adequately sized. If the wiring from the power source to the controller is more than 12 inches long, a 2200 uF 50V filter capacitor should be connected to the V+ and GND terminals of the PWM controller. Inadequate power supply filtering or other causes leading to a high impedance path to the power supply will result in higher losses in the filter capacitor and wiring, and may damage the load and/or controller.

The heat sink on the controller is electrically live. Do not connect anything to the heat sink, and do not use it as a mounting location. Use only the holes provided on the board itself for mounting.

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**30-Day Limited Warranty:**

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