

15 Amp Bidirectional PWM Motor Speed Controller

BIDIR-415 board configured as BIDIR-115(S)

The BIDIR-415 board wired as a BIDIR-115(S) PWM controller allows you to control the speed and direction of a motor using any potentiometer from 1 – 25k, with 5k being typical. 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 the controller or 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	--	10	V
Digital Input Capacitance	--	0.1	--	uF
Analog Voltage Input	0.0	--	5.0 or 10**	V
Potentiometer Total Resistance	1	5	25	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

** up to 10V analog input when 0-10V mode switch is active.

Pin-out:

Pin Label	Function	Active H/L
P-	Lower pin of potentiometer (GND)	--
Center	Wiper of potentiometer	--
P+	Upper pin of potentiometer (5V)	--
DIR	Direction [internal pull-up – please note difference from legacy BIDIR-115(S)]	L = forward H = reverse
EN	PWM output enable (internal pull-up)	H = enable L = disable
M-	Negative output to LOAD	--
M+	Positive output to LOAD	--
GND	Ground from power supply	--
V+	Positive Power Supply	--

DIP Switch Settings:

The BIDIR-415 board has a set of DIP switches. Since this board has been wired as a BIDIR-115(S) controller, the only switch that has any effect is switch 5.

Switch	OFF	ON	Description
1 – Analog/Digital	N/A	N/A	Not used. Controller is hardwired in analog mode.
2 – Digital Mode	N/A	N/A	Not used.
3 – Soft Start Mode	N/A	N/A	Not used. Controller is hardwired for soft start (BIDIR-115S only)
4 – Brake on Disable	N/A	N/A	Not used. Controller is hardwired for coasting on disable (EN pulled low)
5 – Analog Mode	0-10V Analog input	0-5V Analog Input	Set to OFF for 0-10V operation, or ON for 0-5V operation

Wiring:

Analog Control Mode

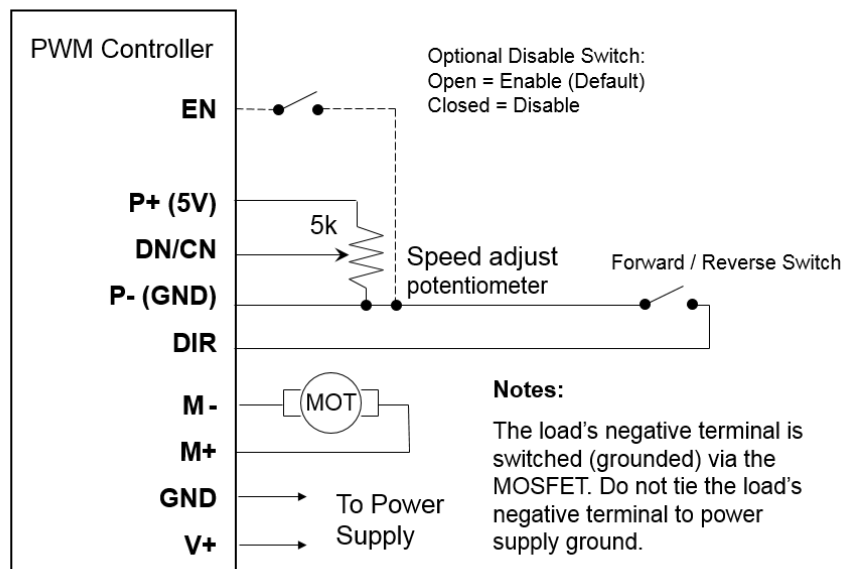


Figure 1: Connection Diagram

Operation:

A potentiometer of with a total resistance of 1k up to 25k can be used to control the pulse width. A 5k potentiometer is typical. Alternatively, a varying voltage (0 – 5 V) or (0 – 10 V if mode is selected) applied between the DN/CN and P- 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 < 0.20 V.
- 100% for any voltage level > 4.80 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. This input is internally pulled high. Ensure that the motor is completely stopped before reversing direction. The controller enters a braking mode for a fraction of a 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 with a large amount of inertia. Replace only with a fuse of the same type and rating.

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 or upon powerup. This reduces the stress placed on power supplies and mechanical linkages as motors come 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 area on the controller board is electrically live. Do not connect anything to the heat sink, and do not use it as a mounting location. Use only the holes at the corners on the board itself for mounting.

30-Day Limited Warranty:

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