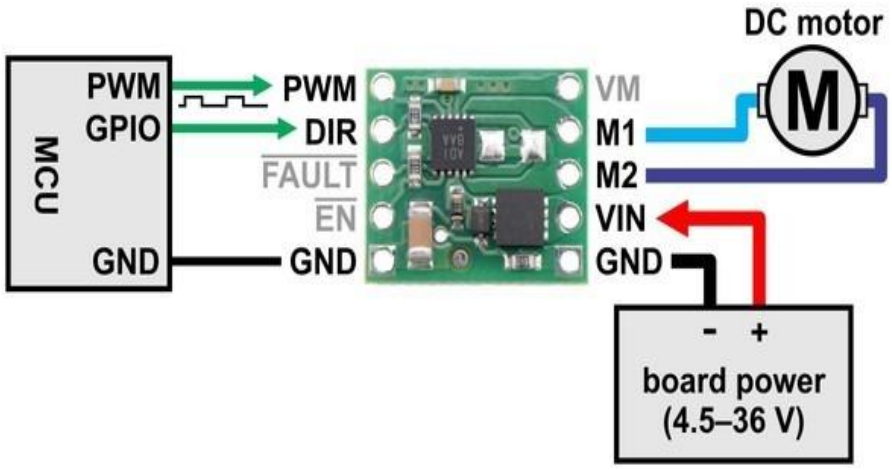
POLOLU MAX14870 SINGLE BRUSHED DC MOTOR DRIVER CARRIER

USER'S GUIDE

USING THE MOTOR DRIVER



Minimal wiring diagram for connecting a microcontroller to a MAX14870 Single Brushed DC Motor Driver Carrier.

Motor and power connections are made on one side of the board and control connections are made on the other. The driver requires an operating voltage between 4.5 V and 36 V to be supplied to the reverse-protected power input, VIN. The VM pin provides convenient access to the reverse-protected supply voltage.

The MAX14870 offers a simple two-pin DIR/PWM control interface, where the DIR pin determines the motor direction and the PWM pin can be supplied with a PWM signal to control the motor speed. The PWM control input is pulled low on the carrier board through a 100 kΩ pull-down resistor. When the PWM pin is low, the motor outputs are both shorted to ground, which results in dynamic braking of a connected motor.

The EN pin can be driven high to turn off motor outputs, which is useful if you want to let the motor coast. The EN pin is pulled low through a 100 kΩ pull-up resistor on the carrier board so that the driver is enabled by default.

The following simplified truth table shows how the driver operates:

EN	PWM	DIR	M1	M2	operating mode
1	X	X	high-impedance	high-impedance	coast (outputsfloating/disconnected)
0	1	0	GND	VIN	“reverse”
0	1	1	VIN	GND	“forward”
0	0	X	GND	GND	brake low (outputs shorted to ground)

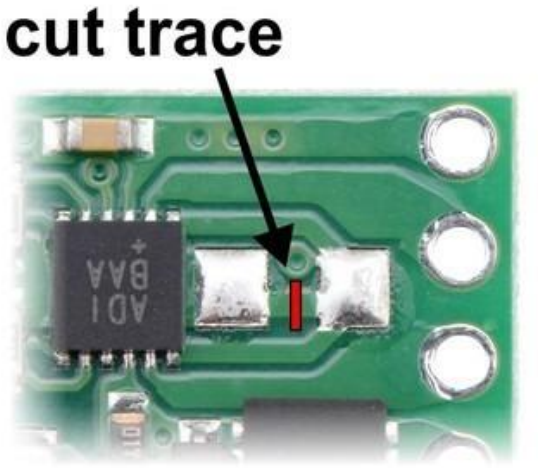
This carrier board can also be used with Maxim’s MAX14872 motor driver IC, which is a pin-compatible alternative to the MAX14870. The MAX14872 has the same functionality and performance as the MAX14870, but it offers a different control interface. The two parts share the same datasheet (492k pdf), which makes it easy to directly compare the two. If you are looking for a MAX14872 carrier, you can swap out the MAX14870 on one of these boards for a MAX14872 (if you have the appropriate surface-mount rework tools), or we might be able to manufacture a high-volume custom batch for you. If you are interested in this latter option, please contact us.

PINOUT

PIN	Default State	Description
VIN		Reverse-protected power supply input; supply this pin with 4.5 V to 36 V.
GND		Ground connection points for the power supply and control signals. The control source and the motor driver must share a common ground.
VM		This pin gives access to the motor power supply after the reverse-voltage protection MOSFET (see the board schematic below). It can be used to supply reverse-protected power to other components in the system. This net connects to the pin labeled "VDD" in the MAX14870 datasheet.
M1		H-bridge output 1.
M2		H-bridge output 2.
PWM	LOW	Speed control input; logic high causes the motor to drive.
DIR		Direction control input
$\overline{\text{FAULT}}$	FLOATING	Open-drain, active-low fault output. This pin goes low during an over-current or over-temperature condition. You must use an external pull-up resistor to give this pin a default high value if you want to use it.
$\overline{\text{EN}}$	LOW	Active-low enable input; drive high to tri-state the driver outputs.

OPTIONAL CURRENT LIMITING

The MAX14870 IC features a SNS input that can be used for optional automatic current limiting. By default, this input is connected to ground on the carrier board, which bypasses the current regulation feature. To enable current limiting, you must first cut the trace between the two unpopulated 1206 resistor pads on the top side of the carrier board:



Then, you will need to add your own appropriate surface-mount 1206 resistor to these pads. An example of this is shown below:

The driver tries to keep the voltage on the SNS pin from exceeding 100 mV, so for example, a 100 mΩ resistor limits the current to 1 A and a 200 mΩ resistor limits it to 0.5 A. For more information on current limiting, see the MAX14870 datasheet (492k pdf).

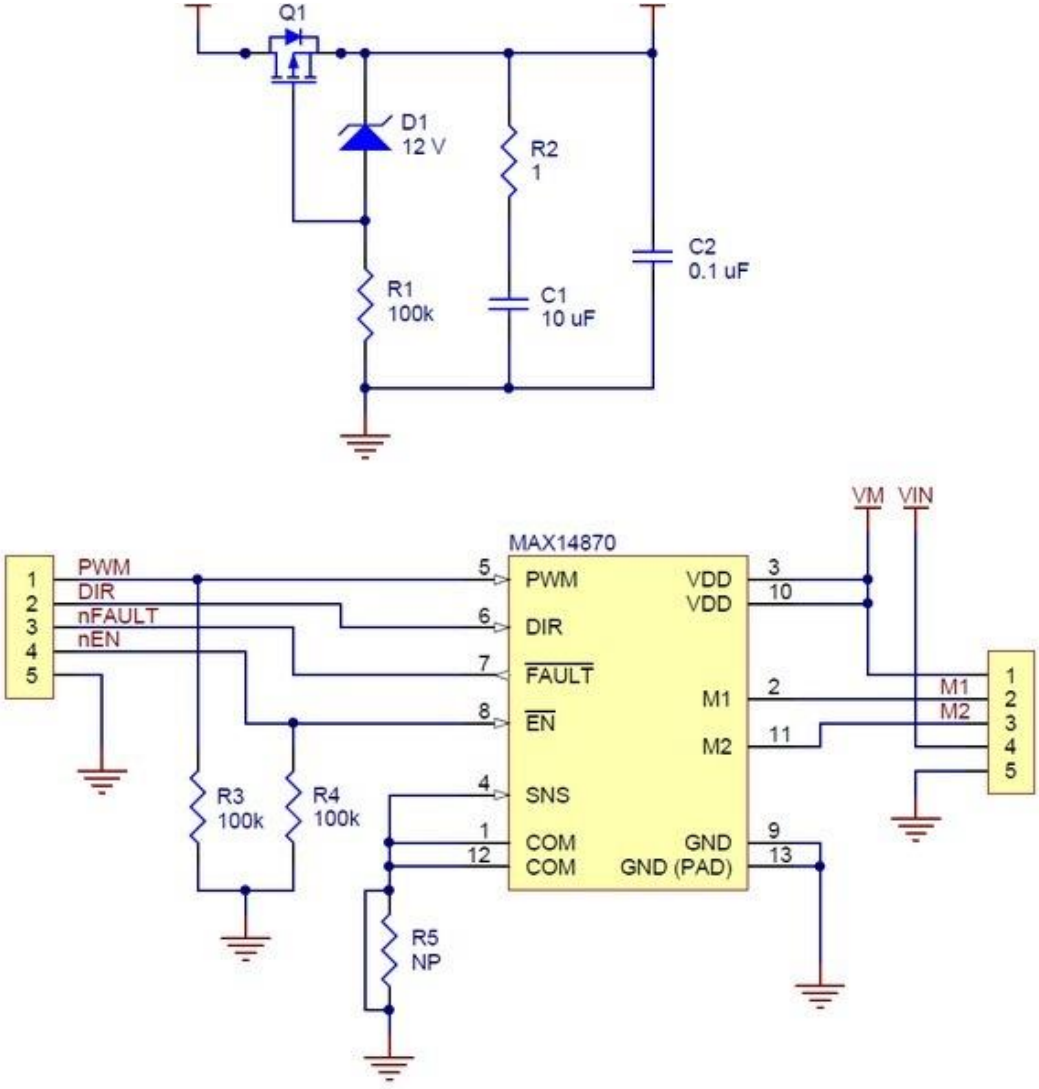
REAL-WORLD POWER DISSIPATION CONSIDERATIONS

The MAX14870 datasheet recommends a maximum continuous current of 2.5 A. However, the chip by itself will typically overheat at lower currents. In our tests, we found that the chip was able to deliver 2.5 A for only a few seconds before the chip's thermal protection kicked in and disabled the motor outputs; a continuous current of 1.7 A was sustainable for many minutes without triggering a thermal shutdown.

The actual current you can deliver will depend on how well you can keep the motor driver cool. The carrier's printed circuit board is designed to help with this by drawing heat out of the motor driver chip. Our tests were conducted at 100% duty cycle with no forced air flow; PWMing the motor will introduce additional heating proportional to the frequency.

This product can get hot enough to burn you long before the chip overheats. Take care when handling this product and other components connected to it.

SCHEMATIC



MAX14870 single brushed DC motor driver carrier schematic diagram.