

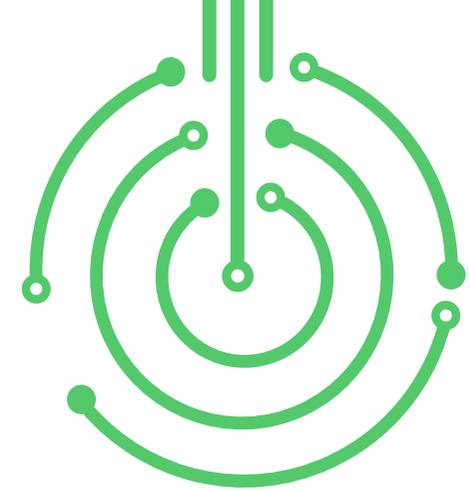
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” Brushed DC Motor Driver with Integrated Current Regulation



SKU: EL130495

Brushed DC Motor Driver with Integrated Current Regulation



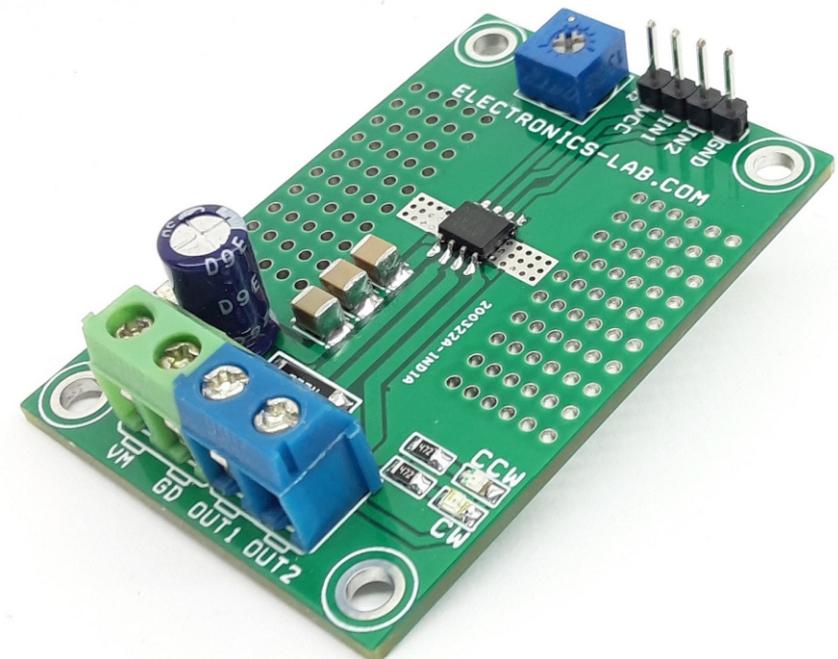
The highly efficient DC brushed motor driver including an onboard shunt resistor for current regulation presented here is built using the DRV8251 chip. The operating supply voltage range of the project is 4.5V to 48V DC and the default output current capability is 2.1A. A trimmer potentiometer PR1 is provided to adjust the current regulation threshold. The device includes under-voltage lockout (UVLO), Latched overcurrent protection (OCP), and thermal shutdown (TSD). Output is disabled and latched when over current/stall current condition occurs.



Note: If current regulation is not required, the ISEN pin should be directly connected to the PCB ground plane, thus shunt resistor R4 should be 0 Ohms. Refer to the datasheet of the chip for adjusting the load current regulation.

Features

- 5V to 48V operating supply voltage range
- VCC Supply 5V DC 10mA (V-Ref = 4V for 2.1A Adjust Using PR1)
- Load Current Up to 2.1Amp
- Motor Trip Point 1.9 Amp
- Pin-to-pin, RDS (on), voltage, and current sense/regulation variants (external shunt resistor and integrated current mirror)
- PWM control interface, PWM Frequency 20Khz (Range Up to 200Khz)
- Supports 1.8-V, 3.3-V, and 5-V logic inputs, IN1 and IN2
- Integrated current regulation
- Low-power sleep mode
- Integrated protection features, VM under-voltage lockout (UVLO), latched overcurrent protection (OCP)
- Thermal shutdown (TSD)
- PCB Dimensions 55.25 x 37.47mm
- 4 x 3mm Mounting Holes



For direction control of the motor use IN1 and IN2 as logic inputs and for speed control these inputs can be connected to a PWM source with duty cycle 0 to 100% and frequency 20Khz.

DRV8251

The DRV8251 device is an integrated motor driver with N-channel H-bridge, charge pump, current regulation, and protection circuitry. The charge pump improves efficiency by supporting N-channel MOSFET half bridges and 100% duty cycle driving. The DRV8251 implements a current regulation feature by comparing the analog input VREF and the voltage across a current-sense shunt resistor on the ISEN pin. The ability to limit current can significantly reduce large currents during motor start-up and stall conditions. A low-power sleep mode achieves ultra-low quiescent current draw by shutting down most of the internal circuitry. Internal protection features include supply undervoltage lockout, output overcurrent, and device overtemperature. The DRV8251 is part of a family of devices that come in pin-to-pin, scalable RDS(on) and supply voltage options to support various loads and supply rails with minimal design changes.

Current Regulation

The DRV8251 device limits the output current based on the analog input, VREF, and the resistance of an external sense resistor on the ISEN pin, RSENSE R4, according to Equation:

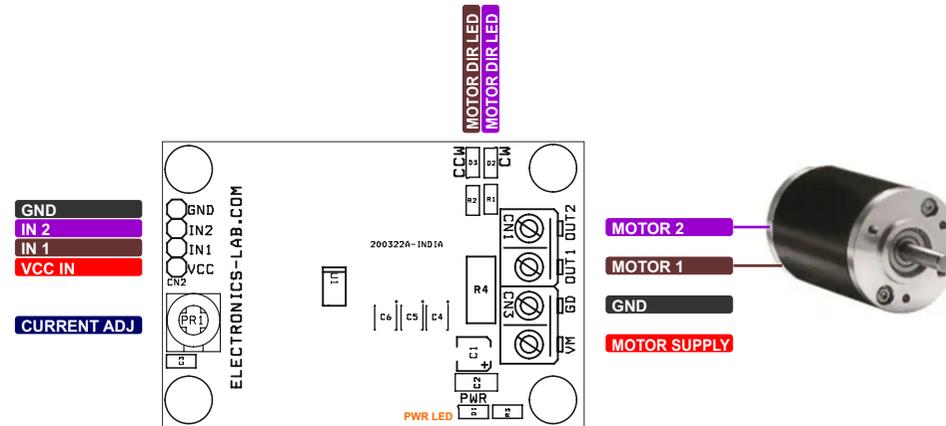
$$ITRIP = VREF / AV \times RSENSE = VREF / 10 \times RSENSE$$

By using current regulation, the device input pins can be set for 100% duty cycle, while the device switches the outputs to keep the motor current at the ITRIP level. The default current limit is 2.1A, if VREF = 4 V and an RSENSE = 0.22 Ω, the DRV8251 limits motor current to 2.1 A during high torque conditions. Refer data sheet of the chip for guidelines on selecting a sense resistor. When ITRIP is reached, the device enforces slow current decay by enabling both low-side FETs, and it does this for a time of tOFF.

Inputs IN1 and IN2

The inputs can be set to static voltages for 100% duty cycle drive, or they can be pulse-width modulated (PWM) to variable motor speed. When using PWM, switching between driving and braking typically works best. For example, to drive a motor forward with 50% of the maximum RPM, IN1 = 1 and IN2 = 0 during the driving period, and IN1 = 1 and IN2 = 1 during the other period.

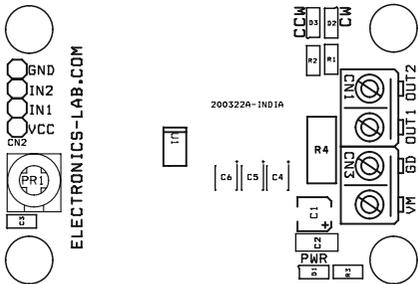
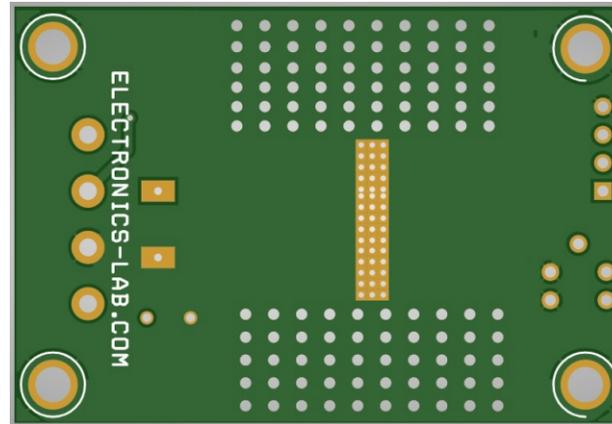
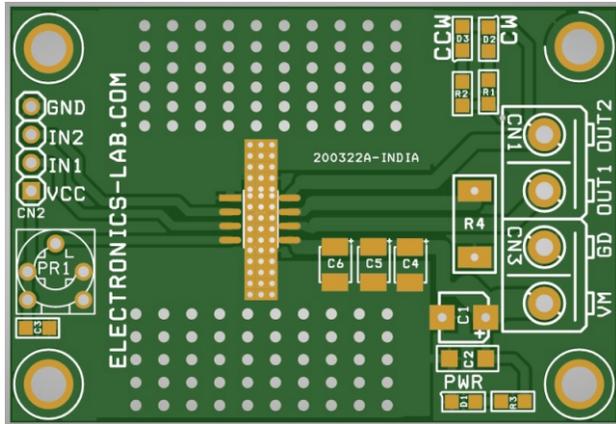
Connections



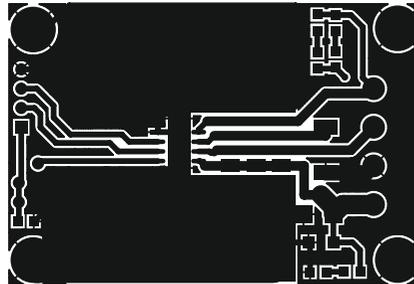
Connections and Other details

- CN1: Pin 1 Output 1, Pin 2 Output 2 (Motor Connections)
- CN2: Pin 1 VCC 5V DC for V-REF, Pin 2 Input 1 PWM or Logic, Pin 3 Input 2 PWM or Logic, Pin 4 GND
- CN3: Pin 1 VM Motor Supply 4.5V to 48V DC, Pin 2 GND
- LED: D2, D3 Motor Direction Indicator
- LED: D1 Power LED
- PR1 Trimmer Potentiometer: Current Regulation Threshold Adjust

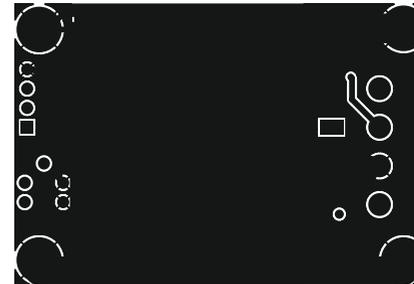
PCB



SILK SCREEN TOP



BOTTOM LAYER



TOP LAYER

PCB DIMENSIONS 55.25MM X 37.47MM

Parts List

BOM					
NO.	QNTY.	REF.	DESC.	MANUFACTURER	SUPPLIER
1	1	CN1	2 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY
2	1	CN2	4 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY
3	1	CN3	2 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY
4	1	C1	47uF/63V ELECTROLYTIC	ILLINOIS CAPACITOR	DIGIKEY
5	1	C2	1uF/63V CERAMIC SMD SIZE 1206	MURATA/YAGEO	DIGIKEY
6	1	C3	0.1uF/50V CERAMIC SMD SIZE 0805	MURATA/YAGEO	DIGIKEY
7	3	C4,C5,C6	10uF/63V CERAMIC SMD SIZE 1210	MURATA/YAGEO	DIGIKEY
8	1	D1	RED LED SMD SIZE 0805	LITE ON INC	DIGIKEY
9	1	D2	RED LED SMD SIZE 0805	LITE ON INC	DIGIKEY
10	1	D3	GREEN LED SMD SIZE 0805	DIALIGHT	DIGIKEY
11	1	PR1	5K OR 10K TRIMMER POT	BOURNS	DIGIKEY
12	3	R1,R2,R3	4.7K 5% SMD SIZE 0805	MURATA/YAGEO	DIGIKEY
13	1	R4	0.2E/2W 1% SMD SIZE 2512	MURATA/YAGEO	DIGIKEY
14	1	U1	DRV8251	TI	DIGIKEY

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