DC Motor Hybrid Drive 6A

DCMHD -126 : For 12V Motor System
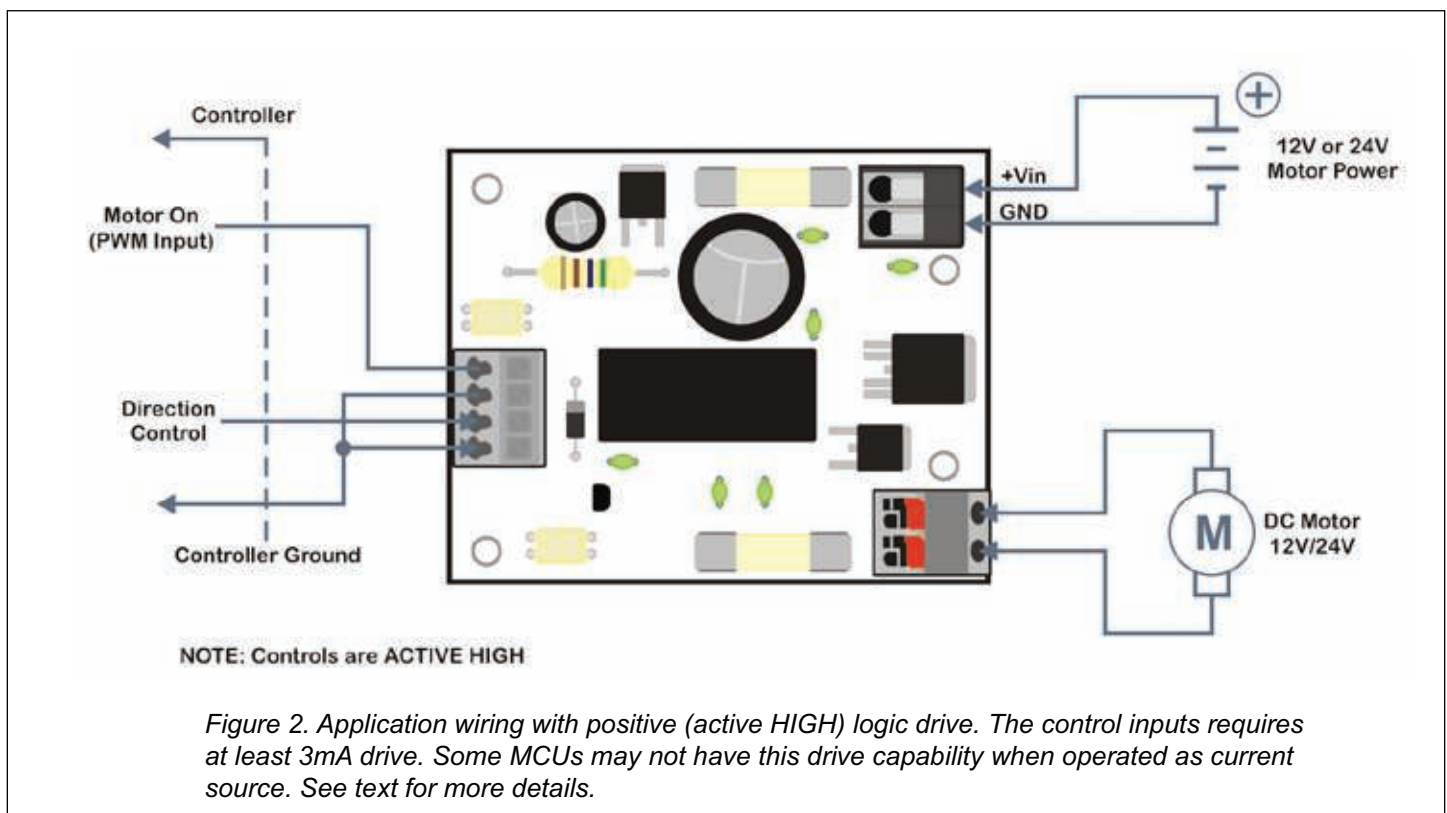**DCMHD - 246 :For 24V Motor System**
Tehnical Manual Rev 1r0

The DC Motor Hybrid Drive is a DC motor control circuit that that incorporates both electromechanical means (Relay) and electronic switching to produce a robust drive that is reasonably immune from permanent damage brought about by incorrect wiring and misuse. For example, if you accidentally connected the power supply in reverse or in the wrong terminal (i.e. motor terminal), the worst that can happen is an open fuse. Replacing the fuse puts you back on track.

The control inputs are opto-isolated for similar reason. It will take an extremely imaginative wiring error to inflict permanent damage to these ports

Figure 1. The DC Motor Hybrid Drive is available in 12V and 24V DC Version.

Figure 2. Application wiring with positive (active HIGH) logic drive. The control inputs requires at least 3mA drive. Some MCUs may not have this drive capability when operated as current source. See text for more details.

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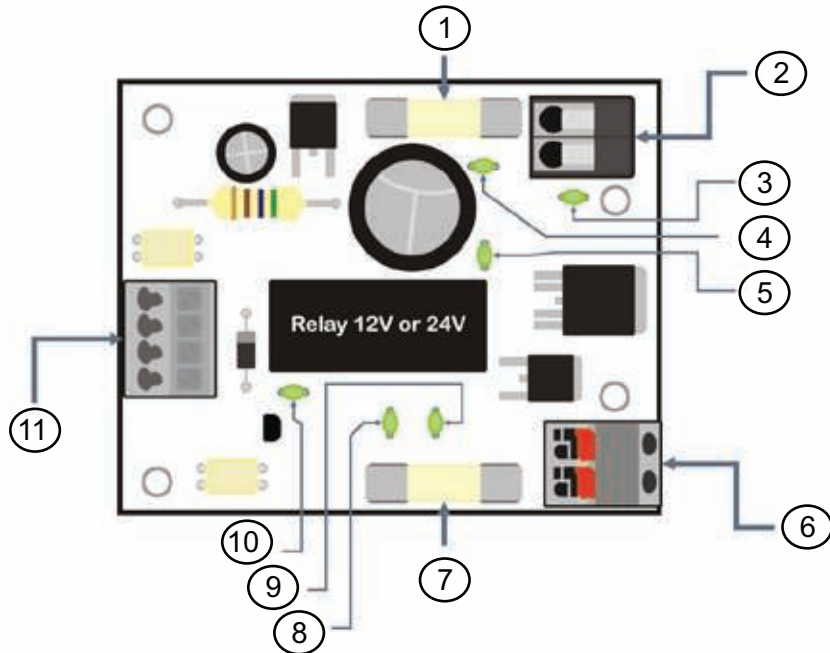# TERMINALS AND INDICATORS LAYOUT

Figure 3. DCMHD PCB Layout showing the locations of major components, terminals, and LED indicators.

Table 1. Identification of Terminals and Indicators

Power Supply			
1	F1	Power Fuse	Main Power Fuse, 8Amp
2	P2	Power Input	+12V or +24V DC input.
3	D2	Power Indicator	Indicates presence of power to logic section. Normally ON.
4	D7	Fuse Indicator	Blown Fuse indicator. Normally OFF. Replace F1 (1) if illuminated
Motor Drive			
5	D5	Q2 Status	Indicates the operating status of high side switch Q2. See Table 2 for details.
6	P3	Motor Terminal	Connect the DC motor through these terminals.
7	F2	Motor Fuse	Motor circuit fuse protection, 8Amp
8	D10	Fuse Indicator	Blown Fuse indicator (Motor). Normally OFF. Replace F2 (7) if illuminated
9	D9	Fuse Indicator	Blown Fuse indicator (Motor). Normally OFF. Replace F2 (7) if illuminated
Control			
10	D3	Direction	Forward/Reverse indicator. Actual rotation depends on motor polarity in (6).
11	P1	Control Input	Opto isolated control inputs. See Table for details

Electrical Specifications:

Supply Voltage: 12VDC +/- 15% DCMHD-126
                            24VDC +/-15% DCMHD-246
Max Ouput Current: 6A
Control Input Drive :   3mA, 3.3V to 5V logic
PWM Input Frequency: 1KHz max

Table 2. P2 Main Power Terminal

12VDC (DCMHD-126) or 24VDC (DCMHD-246) input. Make sure you are using a module with a correct voltage rating.

Pin #	ID	Description
1	GND	(-) Power Input
2	VIN+	(+) Power Input

Table 3. P3 Motor Terminal

Motor polarity as indicated is for reference only. The correct polarity is the wiring that gives the desired rotation direction. Feel free to reverse the motor connections as may be required.

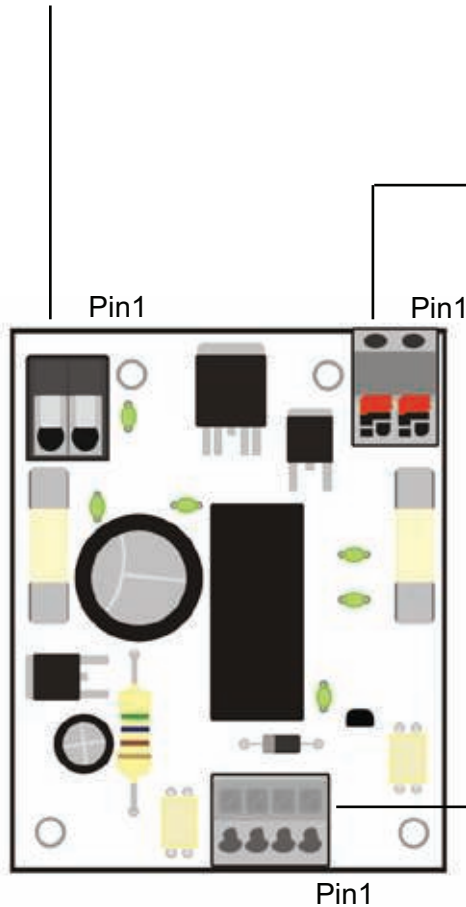| Pin #	ID	Description
1	-M	(-) Motor Terminal
2	+M	(+) Motor Terminal

Pin1   Pin1

Table 4. P1 Control Input

Opto-isolated control inputs require at least 3mA drive to fully drive ON. Can be driven by 3.3V to 5V logic source.

Pin #	ID	Description
1	DIR-	(+) Direction
2	DIR+	(-) Direction
3	PWM-	(-) PWM
4	PWM+	(+) PWM

Pin1

See text for more details.

Table 5: D2 Status Indicator

High side switch Q2 status. High side switch is the main switching element and is protected against overload and over temperature condition. The LED indicator is normally OFF. If the status LED illuminates, it can be due to any one of the following fault:

PWM INPUT	Status Meaning	Output State
ON	Open/No Load Connected (1)	ON
ON	Short Circuit/Overload	OFF
ON/OFF	Over Temperature	OFF

Notes:
1. Output load below 600mA may be detected as No load condition.

APPLICATION

The DC Motor hybrid driver uses a high-side intelligent MOSFET switch to switch ON or OFF the motor, and a power relay to switch direction. Hence, only two control pins are needed to operate the driver. The following tables gives a short summary of the functions of the control pins.

PWM	DIR	Function
OFF	X – No effect(3)	Motor OFF(1)
ON	OFF	Motor in Forward Direction (2)
ON	ON	Motor in Reverse Direction(2)

Notes.
1.   Motor terminals are open circuit, no braking action.
2.   Actual direction depends on how you connect the motor.
3.   Keep DIR in OFF state to save battery power.

The control inputs can be driven to ON state depending on how you connect them. If you want them ON with positive logic (HIGH=ON), wire the control inputs in source configuration as is shown in figure 1.

If you are using a microcontroller MCU to drive the control inputs, make sure the MCU I/Os have enough drive capacity. A drive capability at least 3mA is required. Most MCUs have I/Os can sink current better than source it. In these cases, a reverse logic (LOW=ON) configuration may be the preferred choice. Wiring the driver in reverse logic (active low) configuration is schematically shown in figure 5.

Speed Control

Speed is always set to maximum whenever the PWM input is driven by a steady ON signal. Variable speed control can be effected by driving the PWM input with PWM pulses. Speed goes up in proportion with the pulse duty cycle. PWM frequency must not exceed 1000Hz.
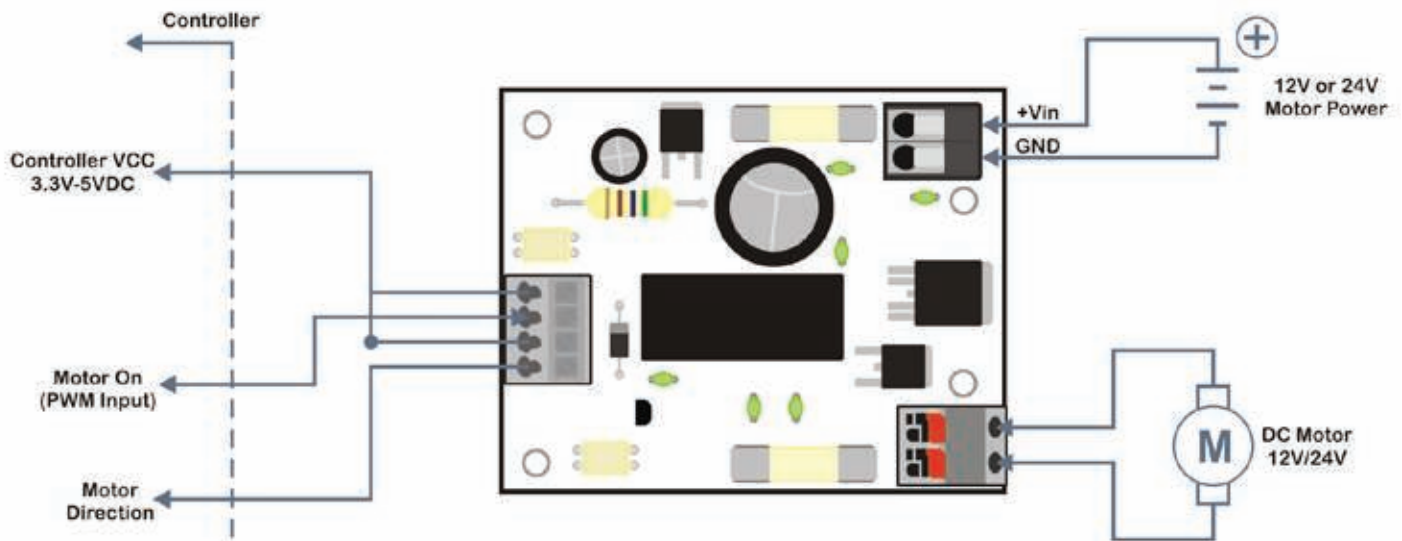

Figure 5. The DC Motor Hybrid Drive wired to work in reverse logic (active LOW) configuration. See text for more details.