

## P0613 DC Motor driver module

The P0613 DC motor driver module provides a high performance pulse width modulation based bi-directional driver for motors or other electro-magnetic devices in a small low cost module. The module measures just 66 x 30 x 12mm, uses the Allegro A3950 DMOS full bridge motor driver and is capable of driving motors at up to 36 Volts and 2.5 Amps.

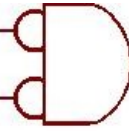
The module interface is simple, there are 4 opto-isolated inputs for Enable, Direction, Mode and Sleep. There is a single fault output which is connected to ground if any of a number of fault conditions is detected. The Mode input allows for basic PWM control in both directions and also provides for fast current decay and if combined with the Enable input can provide electronic braking.

The module includes thermal protection, under-voltage lockout for power supply failures and protection against short-circuits of the motor wiring, short to each other, short to ground, short to supply.

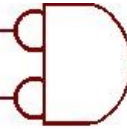
The module requires 2 power supplies, one supply for the motor in the range of 8 to 36 Volts and a second supply of +5 Volts for the logic and control interface. The module does not generate the +5 Volt logic supply on board because it would increase cost. A +5 Volt supply can be provided easily and where there is more than one module only a single supply is required. Our P0615 mini regulator is ideal for supplying up to 8 modules.

## Specification

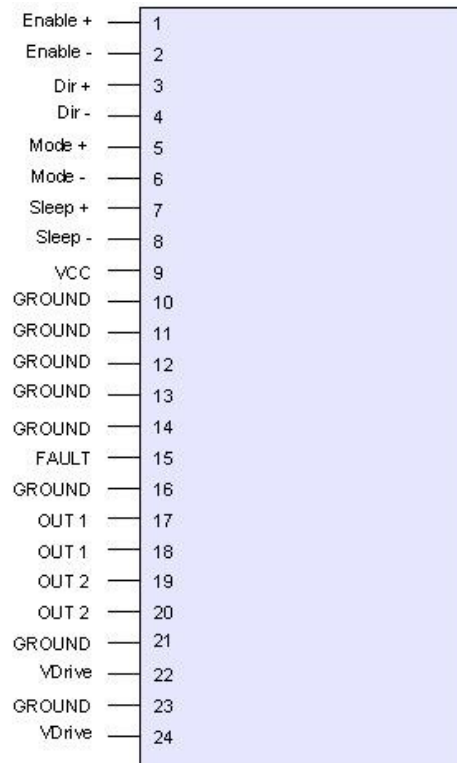
<i>Parameter</i>	<i>Condition</i>	<i>Signal</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>
Motor supply voltage	Normal	VDrive	8.0 V	-	30.0 V
Motor driver supply current	Normal	VDrive	-	-	8.5 mA
	Sleep	VDrive	-	-	10uA
Logic supply voltage range	Normal	VCC	3.5 V	5.0	7.0 V
Logic supply current	Inputs off	VCC	-	-	20uA
	Inputs on	VCC	-	31mA	45mA
PWM frequency	Normal	Enable+, Enable-	-	-	100KHz
Thermal shutdown temperature			-	175° C	-
Thermal shutdown hysteresis			-	15° C	-
Thermal warning temperature		Fault	-	165° C	-
Enable input voltage level	Active	Enable+, Enable-	3.5 V	5.0 V	8.0 V



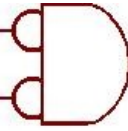
<i>Parameter</i>	<i>Condition</i>	<i>Signal</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>
	Inactive	Enable+, Enable-	-0.6 V	-	0.8 V
Enable input current	Active	Enable+, Enable-	6.8 mA	11mA	21mA
Dir input voltage level	Active	Dir +, Dir -	3.5 V	5.0 V	8.0 V
	Inactive	Dir +, Dir -	-0.6 V	-	0.8 V
Dir input current	Active	Dir +, Dir -	6.8 mA	11 mA	21 mA
Mode input voltage level	Active	Mode +, Mode -	3.5 V	5.0 V	8.0 V
	Inactive	Mode +, Mode -	-0.6 V	-	0.8 V
Mode input current	Active	Mode +, Mode -	4.7mA	8 mA	15mA
Sleep input voltage level	Active	Sleep +, Sleep -	3.5 V	5.0 V	8.0 V
	Inactive	Sleep +, Sleep -	-0.6 V	-	0.8 V
Sleep input current	Active	Sleep +, Sleep -	3.3 mA	5.5mA	10mA



## Layout and pin description



Pin	Name	Function
1, 2	Enable+, Enable-	Opto-isolated inputs for the Enable (PWM) signal.
3, 4	Dir +, Dir -	Opto-isolated inputs for the Direction signal.
5, 6	Mode+, Mode-	Opto-isolated inputs for the Mode signal.
7, 8	Sleep +, Sleep -	Opto-isolated inputs for the Sleep signal.
9	VCC	The power supply input for the control logic.
15	FAULT	Output signal indicating a fault condition.
17, 18	OUT 1	The drive output for one connection to the motor.
19, 20	OUT 2	The drive output for the second connection to the motor.
22, 24	VDrive	Motor drive power supply input.
10, 11, 12, 13, 14, 16, 21, 23	GROUND	Module common supply GROUND connection.



## ***Enable+, Enable-***

This is the basic control signal for turning the output on and off. If the Mode input is low and the Sleep input is high then Enable and Dir can be used to perform basic PWM motor control in forward (Dir HIGH) and reverse (Dir LOW).

## ***Dir+, Dir-***

This is the direction input, High for forward, low for reverse.

## ***Mode+, Mode-***

This input selects between fast and slow current decay modes.

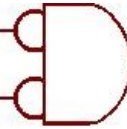
When low (or disconnected) slow decay mode is active. In this mode power is driven into the load when Enable is high and the load is short-circuited when enable is low.

When High fast decay mode is active. In this mode power is driven into the load when Enable is high and reverse power is applied for a short period when enable goes low, causing current in the load to dissipate quickly.

## ***Sleep+, Sleep-***

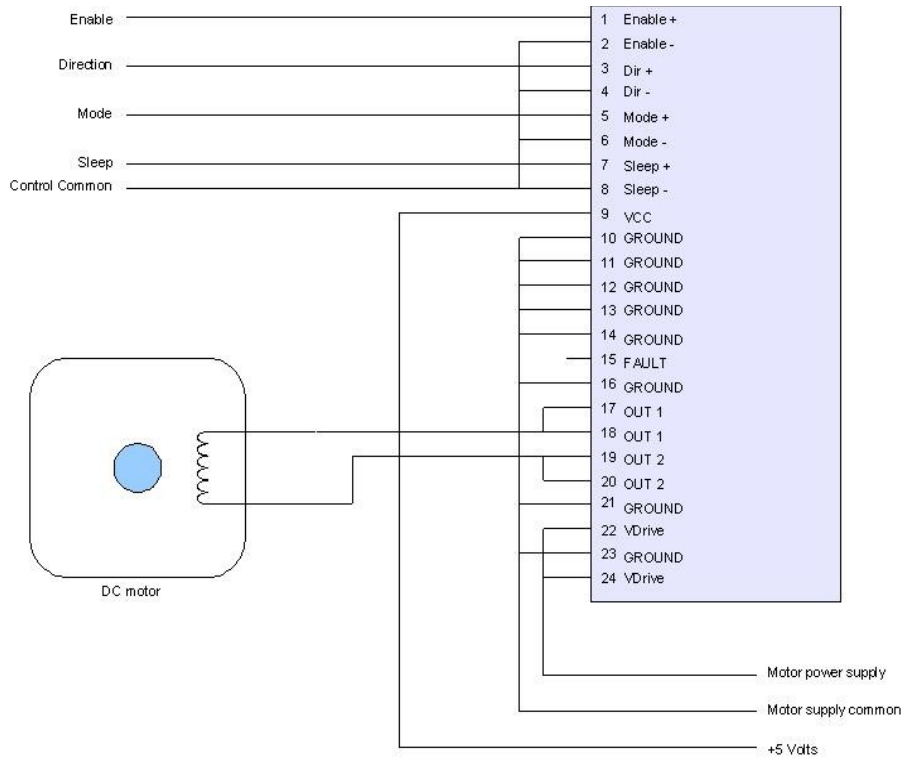
This input enables the module and motor to be effectively switched off, in sleep mode the module consumes very little power and all power is removed from the motor.

For normal operation there must be a high level across the sleep inputs.



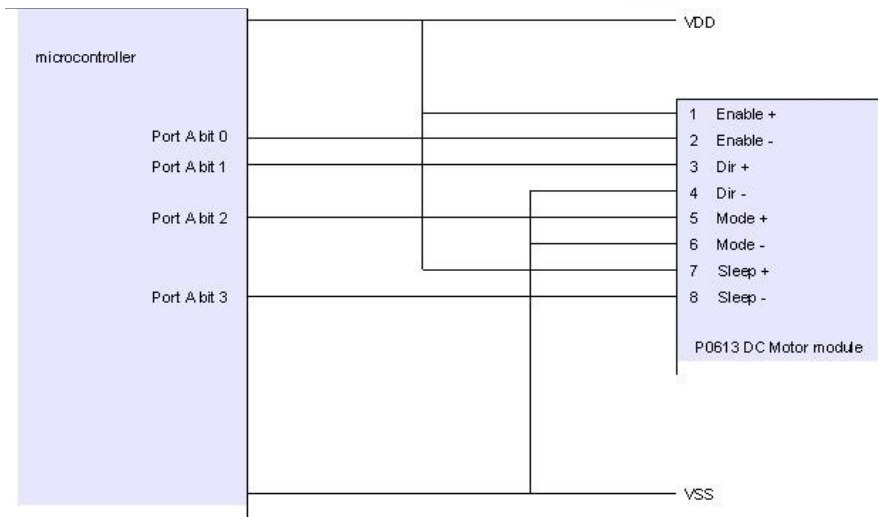
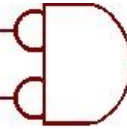
## DC Motor driver wiring

The diagram below shows the basic DC motor driver configuration.



*Basic motor driver connection*

The motor driver basic requirements are +5 Volts to the VCC supply input, a motor supply voltage of 8 to 36 Volts to the VDrive supply input and all 8 ground inputs connected to the common for VCC and Vdrive. The above example shows all 4 control inputs having their – signal connected to a common negative from whatever is controlling the module, this is a common scheme but the reason for each input having + and – inputs is to enable the inputs to be driven by active high or active low signals as dictated by the device controlling the P0613 module. The example below shows a typical connection to a micro-controller.



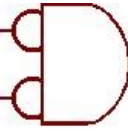
*Example connection to a microcontroller*

In the above example, Mode – and Dir – are connected to VSS (negative supply), so port A bit 1 and port A bit 2 each need to go HIGH to activate their respective signals. Enable + and Sleep + are connected to VDD (positive supply), so port A bit 0 and port A bit 3 each need to go LOW to activate their respective signals. The connections depend on the output polarities available for the signals. Some motor controllers have fixed polarities and some firmware available for microcontrollers is also not too flexible.

## Power supply and board layout

The P0613 includes all necessary decoupling capacitors so there is no requirement for any additional components on the power supplies. The logic supply VCC requires a fairly clean supply of +5 Volts +/- 10% with ripple and noise below 100mV; a Linear regulator could be used and we recommend a simple L-C filter on its input, mainly to protect the regulator from spikes and switching noise that may be present on the motor supply. A good ground connection is essential for reliable operation; the P0613 has 8 ground pins and all 8 should be used and connected to a ground plane if possible. A ground plane is recommended but not essential.

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