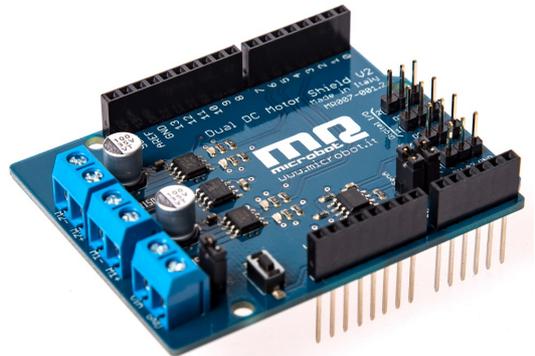Name: **Dual DC Motor Shield V2**
Code: **MR007-001.2**

The *Dual DC Motor Shield V2* is a shield that has been projected to enable an Arduino board to drive two brushed DC motors or one 4-wire two-phase stepper motor, controlling the speed and direction of each one independently.

Some applications may need to control the motor speed or a servo angular position by a potentiometer; for these reasons in this shield two digital I/O ports and two analog input ports have been added (see Fig.1) .



*Fig.1 – Digital and Analog ports*

Analog input ports can be used to read potentiometers or any other analogic sensor, while digital I/O ports can be used to drive servos or to interface other digital devices.

In this new version we have replaced the obsolete L298 driver with the more powerful A4953 from Allegro Microsystems; DMOS technology guarantees less heat production and consequently better efficiency.

To ensure safely operating conditions you can measure the motor current absorption of each motor; this allow to avoid stall conditions. On this shield it has been included an integrated I2C digital temperature sensor to monitor the shield temperature in order to prevent overtemperature threat.

IIn fact when the A4953 chip works at high current values it may become very hot and this heat can flow through all the shield. To avoid dangerous overheating conditions you can use the integrated I2C digital temperature sensor mounted close to the A4953 chip. This allows the temperature monitoring via the I2C bus using the Arduino pins *SCL* and *SDA*. The sensor is the

integrated circuit TCN75A and you can refer to its datasheet to better understanding its communication protocol.

The logic of the *Dual DC Motor Shield V2* is powered directly from the Arduino board, whereas motor outputs can be powered both from Arduino Vin pin or from external power source, even if it is strongly encouraged to use external power supply.

The selection of the power source is made through a jumper. By inserting the jumper in the two pins the motors will be powered by the Arduino Vin (see Fig.2), if instead it is removed the motors will be powered with an external source connected to the terminal block.



*Fig.2 – Power selection*

This board also provides direction LED indicators for both channels and this is very usefull during setup stage to verify the firmware behaviour; the led indicators work also without appling a real motor to the output .

!!! CAUTION !!!
The Driver IC may become very hot when working with current more than 1A.

## INSTRUCTIONS

This shield has two separate channels, called A and B. Each channel uses 2 Arduino pins to drive the motor, plus a possible third to monitor the current absorbed by the motor. You can use each channel separately to drive two DC motors or combine them to drive one stepper motor.

The shield pins, divided by channel, are shown in the table below:

| Canale A | | Canale B | |
|---|---|---|---|
| **Pin Arduino** | **Funzione** | **Pin Arduino** | **Funzione** |
| 3 | In1_1 | 6 | In2_1 |
| 5 | In1_2 | 9 | In2_2 |
| A0 | Current sense | A1 | Current sense |

*Tab.1 - Connections*

To understand the meaning of these signals and their use you can read the following table (Tab.2), where all conditions are reported. Note that there are reported only the conditions for channel A because those for channel B are just alike them, you only have to replace *In1_1* with *In2_1* and *In1_2* with *In2_2*.

| In1_1 | In1_2 | M1+ e M1- outputs |
|:-----:|:-----:|:------------------|
| 0 | 0 | High impedance (motor is in free running) |
| 0 | 1 | Current flows from M1+ to M1- (direction 1) |
| 1 | 0 | Current flows from M1- to M1+ (direction 2) |
| 1 | 1 | LOW state for both output (motor stopped) |

**Tab.2 – Conditions**

This *Dual DC Motor Shield V2* is able to monitor the current absorption of both motors; the current value is converted in a voltage signal proportional to the current with a ratio of 2.4. This means that for each Ampere that flows through a channel, the current sensing signal will output 2.4V. The maximum analog output will be 4.8V at 2A current absorption.

Channel A current can be monitored on Arduino analog pin A0 and Channel B current can be monitored on pin A1. If you don't need the current sensing and above all if you need more pins for your application you can disable this feature by removing the two jumpers on the *SenA* and *SenB* strip connectors (see Fig.3).



*Fig.3 - Current sensing jumpers*