**Stepper Motor Controller Rev. 0**

Functional **Description**

J1 is the power supply connector. F1 is the 5x20mm fuse, which might require to be adjusted to the application/stepper motors. D1 is a TVS diode for transient (0voltage spike) suppression. It is calculated for a 12V supply voltage. In case a different supply voltage is desired, a different TVS diode has to be selected.

IC1 is shown as a Traco TRS2-2450 DC/DC converter. Since this is pin compatible to the standard linear regulators, a 7805 can be populated instead of the DC/DC converter, which might be required for higher supply voltages (e.G. 24V for 24V stepper motors).

D3 is a protection when switching off the Stepper motor controller. It helps that the output voltage of IC1 is not much higher than the input voltage (due to charged capacitors).

M1 is a Pro Micro, a popular Atmel Atmega32U4 based micro processor module, which is compatible to the Arduino Leonardo. To send the program/script to the Pro Micro, the USB-B micro connector has to be connected to the PC, the Arduino IDE software is running, the Arduino Leonardo is selected and the proper COM-Port.

IC2 is the level translator for RS-232 (the logic levels of RS-232 are about +/-10V with the MAX232. C3, C5, C6 and C7 are part of the charge pump for generating the required voltages for the IC2. J2 is the RS-232 jack. CTS and RTS are connected as well as DTR, DSR and DCD.

J8 can be used to repurpose the RX and TX pins or for spying the serial traffic at TTL level.

J6 is a pin header for the unused I/O pins of M1. It usually does not require to be populated.

The circuit around Q1 serves as a buzzer amplifier/protection circuit. Actually, an IO-Pin of M1 could drive the buzzer, but the buzzer can act as a high voltage spike generator on a mechanical impact. Thus, the circuit. R1 is the base resistor of Q1, R2 is for current limiting, D2 is kind of a free-wheeling diode, that helps to prevent reverse voltages.

M2 and M3 are the Allegro A4988 based stepper drivers. M2 is for Channel A/Stepper 1 and M3 for Channel B/Stepper 2. C9 and C10 are the buffer capacitors for VMOT, the +12V supply voltage for the stepper motors. JP1 and JP2 configure the micro step mode. All jumpers open mean “full step”. An open jumper is interpreted as a LOW signale by the A4988.

There is one common Enable Signal () for both stepper motors. In case it is LOW, the stepper motors are active and the axis cannot be moved manually. It performs steps in this mode. In case is HIGH, no current flows through the stepper windings and the axis can be moved manually (at least, if the stepper does not have a gear).

J7 is a connector for the I²C-Bus. Usually, a display is connected. Since the I²C is a bus, additional I²C devices can be connected.

J3 is a connector for the rotary encoder. A KY-040 module, which is pretty wide spread and unexpensive can be connected here.