

# GRBLDuino Mega Integrated Relay Datasheet – GRBL v1.1



GRBLDuino Mega Integrated Relay is a GRBL v1.1 compatible 3-axis CNC Controller based on the ATmega2560 (Arduino Mega) platform. The GRBLDuino Mega Integrated Relay comes pre-programmed with GRBL Mega v1.1 and is compatible with the Arduino IDE for updates. GRBLDuino Mega Integrated Relay will appear as a USB serial port and requires Silicon Labs VCP drivers available for Mac, Linux, Windows, and Android.

GRBLDuino Mega Integrated Relay is designed to provide easy access to the pins required for complete machine control through terminal blocks for easy connections to control buttons and dual-axis limit switches.

GRBLDuino Mega Integrated Relay is designed around user replaceable Pololu DRV8825 stepper drivers.

Input voltage range for GRBLDuino Mega Integrated Relay is up to 45 volts DC and should be selected based on your stepper motor specifications and requirements. The Pololu DRV8825 drivers have a maximum input voltage of 45 volts and A4988 drivers have a maximum input voltage of 35 volts – anything higher will damage the drivers. Be sure to select a power supply appropriate to the stepper drivers you have chosen. The device itself uses power from the USB connection. There is no reverse voltage protection on GRBLDuino so take care when connecting the power wires.

## Bill of Materials

- |                                       |  |                               |
|---------------------------------------|--|-------------------------------|
| • 1 GRBLDuino Mega Integrated PCB     | • 4 2x3 male pin headers                     | • 1 1uF capacitor (C8)        |
| • 1 ATmega2560 (U1)                   | • 1 6mm tactile switch (SW1)                 | • 3 diodes (D1, D2, D3)       |
| • 1 CP2102 (U2)                       | • 1 680 ohm resistor array (RN1)             | • 1 green LED (LED1)          |
| • 1 16MHz crystal (Y1)                | • 5 10k ohm resistors (R1, R2, R4, R5, R6)   | • 3 transistors (Q1, Q2, Q3)  |
| • 1 micro B USB jack                  | • 4 1k ohm resistors (R3, R7, R8, R9)        | • 3 relays (RLY1, RLY2, RLY3) |
| • 21 2 position screw terminal blocks | • 3 100uF capacitors (C1, C2, C3)            | • 9 short shunts              |
| • 6 1x8 female pin headers            | • 3 22pF capacitors (C11, C12, C13)          | • 1 long shunt                |
| • 1 1x3 male pin headers              | • 4 0.15uF capacitors (C4, C5, C6, C7)       |                               |
| • 3 1x4 male pin headers              | • 6 0.1uF caps (C9, C10, C14, C15, C16, C17) |                               |

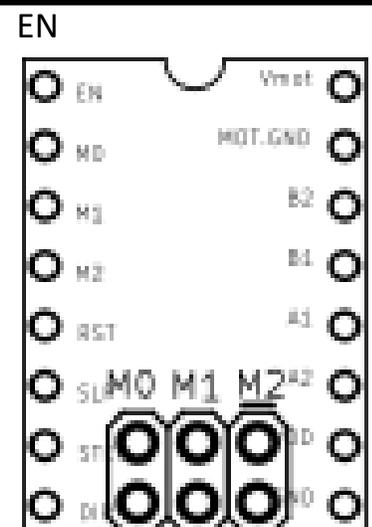
## USB Connection

GRBLDuino Mega Integrated Relay is connected to the computer via a mini B USB connection and a user supplied cable. The device will show up as a Silicon Labs USB port though you may need to install the VCP drivers first. Drivers are available through Silicon Labs and are available for Mac, Linux, Windows, and Android.

## Stepper Driver Connections

GRBLDuino Mega Integrated is designed to be used with Pololu DRV8825 stepper drivers though other pin compatible drivers such as DRV8880, DRV8834, and A4899 will also work.

The Stepper Driver Enable Pin is the upper left pin in each axis socket and is marked with the axis letter and EN. Pay attention to orientation when inserting stepper drivers as incorrect orientation will destroy the drivers (and possibly the GRBLDuino Mega Integrated Relay as well as the host computer).

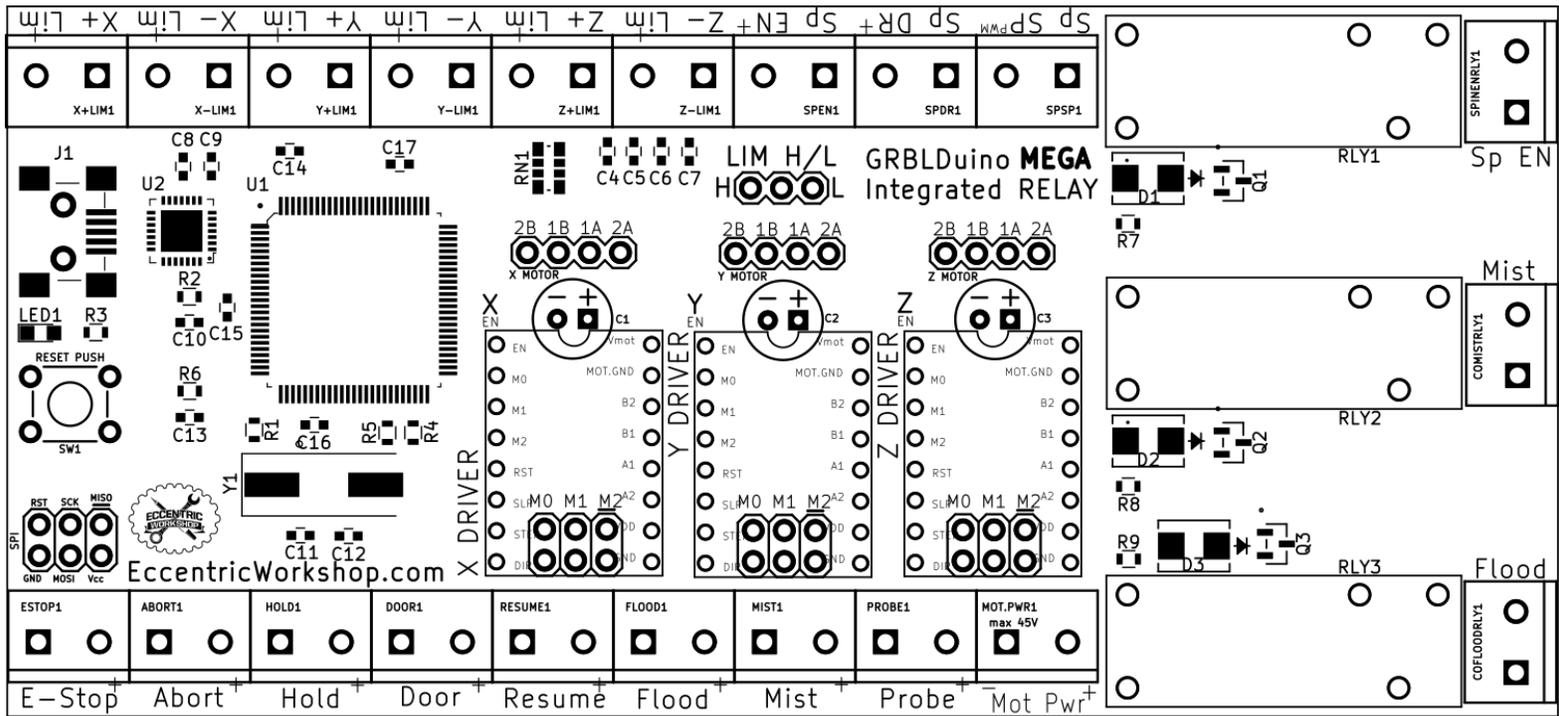


GRBLDuino Mega Integrated Relay allows for connection of 11 machine functions: Resume, Hold, Abort, Emergency Stop, Door Safety, Flood Coolant, Mist Coolant, Spindle Enabled, Spindle Direction, Spindle Speed, and Probe. Screw terminal blocks are provided to allow for easy connections to the control buttons and machine functions. All input are activated by connecting the two terminals together so wire polarity into the terminal blocks does not matter. Control pins are marked with either text or + on the top of the board and are circle on the bottom of the board.

The two pin screw terminal blocks for E-Stop, Abort, Hold, Door Safety, Resume, Coolant (flood and mist), and Probe are located along the bottom edge of the board. The active pins marked with + on the top of the board and a circle on the bottom.

The limit switch and Spindle (enabled, direction, and speed) screw terminals are located along the top edge of the board. Spindle Speed is GRBL PWM spindle speed control ready to connect to a spindle motor driver PWM input and the active pin is marked with PWM.

Relay controlled terminals for Spindle Enabled, Mist Coolant, and Flood Coolant are located on the right end of the board. The two pins are connected when the appropriate G Code command is sent to GRBL.



## Limit Switch Settings

GRBLDuino Mega Integrated Relay allows for connection of 6 limit switches: two (+ and -) per X, Y, and Z axis. Two pin screw terminal blocks are provided to allow for easy connections to each limit switch. Because each switch is on an independent terminal block, either switch wire can go into either terminal without regard to polarity.

High Limit Activation    Low Limit Activation



GRBL default is for limit switch activation through a normally-open switch connecting the limit switch pin to ground. This mode is picked by using the Limit Hi/Lo jumper to select the center and right points. If you prefer to have high activated limit switches, use the Limit Hi/Lo jumper to select the center and left pins.

GRBLDuino Mega Integrated Relay stepper motor connections are located near the upper right corner of the board and are labelled as X Motor, Y Motor, and Z Motor.



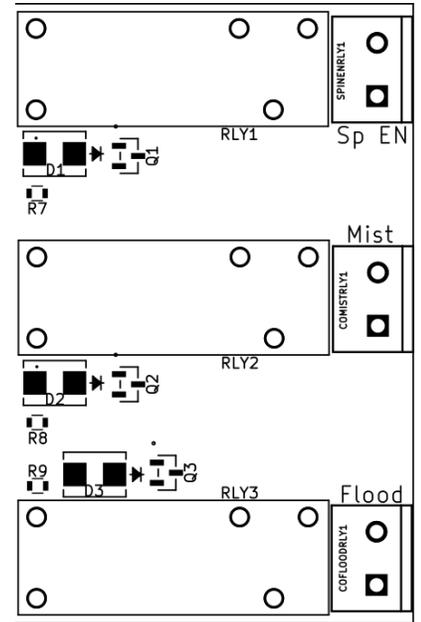
All motor headers have the same pin outs. From left to right the motor connections are B2, B1, A1, and A2.

## Relay Connections

The relay connections for Spindle Enable, Mist Coolant, and Flood Coolant are driven by Omron G6RL-1 miniature power relays. These relays are capable of switching 10 amps at 250 VAC and 5 amps at 30 VDC.

The relay driven terminals are located at the right end of the board to provide separation from the other signals.

Each pair of pins is connected when the appropriate G Code command is sent to GRBL.



## Microstep Settings

GRBLDuino Mega Integrated Relay microstep settings are located within the sockets for each stepper motor driver and are only adjustable with power disconnected and the stepper driver removed.

All microstep headers have the same pin outs. From left to right, the pins are M0, M1, M2.

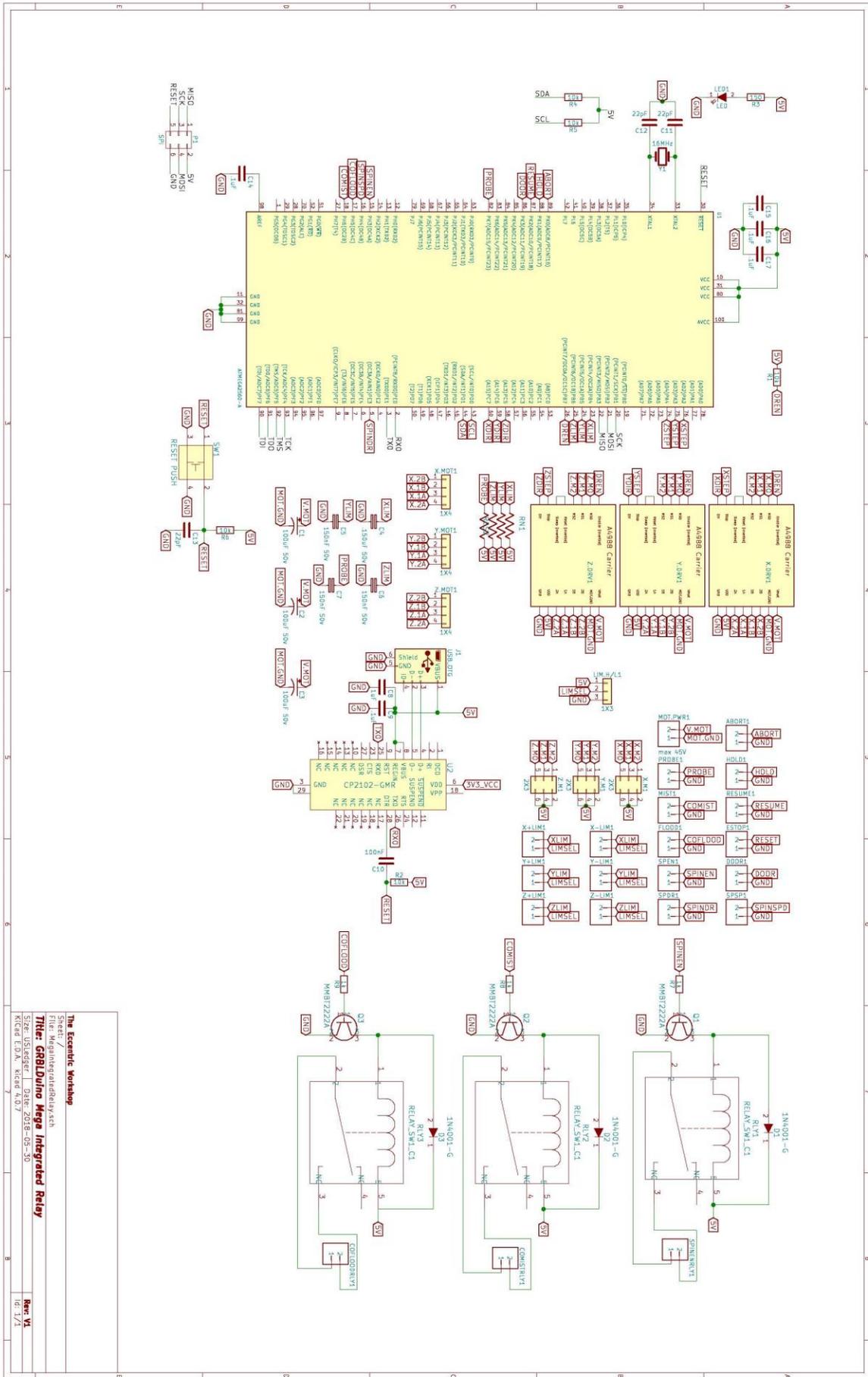


## DRV8825 Microstepping Settings

| Resolution | M0   | M1   | M2   |
|------------|------|------|------|
| Full Step  | Low  | Low  | Low  |
| 1/2 Step   | High | Low  | Low  |
| 1/4 Step   | Low  | High | Low  |
| 1/8 Step   | High | High | Low  |
| 1/16 Step  | Low  | Low  | High |
| 1/32 Step  | High | Low  | High |
| 1/32 Step  | Low  | High | High |
| 1/32 Step  | High | High | High |

## A4988 Microstepping Settings

| Resolution | M0   | M1   | M2   |
|------------|------|------|------|
| Full Step  | Low  | Low  | Low  |
| 1/2 Step   | High | Low  | Low  |
| 1/4 Step   | Low  | High | Low  |
| 1/8 Step   | High | High | Low  |
| 1/16 Step  | High | High | High |



The Eccentric Workshop  
Sheet: /usr/local/share/pcb  
Title: GRBLDuino Mega Integrated Relay  
KICAD E.D.N. KICAD 4.0.7  
Rev: V1  
16/1/21