GRBLDuino Shield V1 – GRBL v1.1 Compatible   Datasheet

GRBLDuino Shield is a GRBL v1.1 compatible 4-axis CNC Stepper Driver Shield for the Arduino Uno platform. Four holes are provided to secure the Arduino and GRBLDuino Shield together for mounting.

The GRBLDuino Shield is designed to provide easy access to the pins required for complete machine control. Terminal blocks are provided to allow for easy connections to control buttons and dual-axis limit switches.

GRBLDuino Shield is designed around Pololu DRV8825 stepper drivers. The drivers designed to be inserted into sockets on each axis to be user replaceable in the event of damage.

Input voltage range for GRBLDuino Shield 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 shield itself uses power from the host Arduino.

There is no reverse voltage protection on GRBLDuino Shield so take care when connecting the power wires.

Bill of Materials

- 1   GRBLDuino Shield PCB
- 15   2 Position Screw Terminal Blocks
- 8   8 Position Female Headers
- 1   1x3 Pin Male Pin Headers
- 4   1x4 Pin Male Pin Headers
- 1   1x6 Pin Male Pin Headers
- 2   1x8 Pin Male Pin Headers
- 1   1x10 Pin Male Pin Headers
- 2   2x4 Pin Male Pin Headers
- 4   2x3 Pin Male Pin Headers

- 12   Short 2 Pin Jumper Shunts
- 3   Long 2 Pin Jumper Shunts
- 1   Tact Switch
- 1   10k Ohm Resistor (R1)
- 1   680 Ohm Network Resistor (RN2)
- 4   150nF Ceramic Capacitors (C5-8)
- 4   100uF Electrolytic Capacitors (C1-4)

Stepper Driver Connections

GRBLDuino Shield 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. Pay attention to orientation when inserting stepper drivers as incorrect orientation will destroy the drivers (and possibly the GRBLDuino Shield).

A Axis Jumper Settings

The 4th axis (the A axis) can be driven as an independent axis or cloned from the X, Y, or Z axis. Through the A Step and A Dir jumper settings, the A axis step and direction pins can be independently slaved to any other axis step or direction, or can be driven separately through Arduino pins A3 and A4. Please be aware Coolant Enable is tied to pin A3 and is unavailable when the independent A axis is in use.

GRBLDuino Shield allows for connection of 8 machine functions: Emergency Stop, Abort, Hold, Resume, Probe, Coolant Enable, Spindle Speed, and Spindle Direction. Screw terminal blocks are provided to allow for easy connections to the control buttons and machine functions.

The two pin screw terminal blocks for E-Stop, Abort, Hold, and Resume are located along the top edge of the GRBLDuino Shield PCB. Because connecting the two terminals together activates the control function, switch wire polarity into the terminal does not matter. If you wish to perform more advanced functions, the control pin is the right terminal in each block when viewed from the top of the board.

The machine function screw terminals are located along the bottom edge of the board. Spindle Speed is GRBL PWM spindle speed control ready to connect to a spindle motor driver PWM input. Coolant Enable is tied to Arduino pin A3 and not available when the A axis is being independently driven (not a clone of X, Y, or Z). On these terminal blocks, the control pin is the left terminal in each block when viewed from the top of the board.

Limit Switch Settings

GRBLDuino Shield 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.

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 L.H/L jumper to select the center and top pints. If you prefer to have high activated limit switches, use the L.H/L jumper to select the center and bottom pins.

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

GRBLDuino Shield V1

Input Power
MOT.PWR — GND / V.MOT

X Limit Switches
X+.LIM — LIMSEL / XLIM
X-.LIM — LIMSEL / XLIM

Y Limit Switches
Y+.LIM — LIMSEL / YLIM
Y-.LIM — LIMSEL / YLIM

Z Limit Switches
Z+.LIM — LIMSEL / ZLIM
Z-.LIM — LIMSEL / ZLIM

Spindle Speed
SP.SP — GND / SPSP

Direction
SP.DR — GND / SPDR

Coolant
CO.EN — GND / COEN

Abort
ABORT — GND / ABORT

Hold
HOLD — GND / HOLD

Resume
RESUME — GND / RESUME

Emer. Stop
E.STP — GND / RESET

Probe
PROBE — GND / PROBE

A Axis Clone Select
A.DIR — XDIR YDIR ZDIR COEN 7 5 3 1 / 8 6 4 2 — ADIR
A.STEP — XSTEP YSTEP ZSTEP A4 7 5 3 1 / 8 6 4 2 — ASTEP

Arduino Uno Connections
B1 — ARDUINO_UNO_R3_SHIELDBASIC
GND, 5V, RESET
ABORT, HOLD, RESUME, COEN, A4, PROBE
IOREF, RES, 3.3U, 5U, UIN, A0, A1, A2, A3, A4, A5
GND, GND, GND, AREF, GND, D13, D12, *D11, *D10, *D9, D8, D7, *D6, *D5, D4, *D3, D2, RX, TX
XSTEP, YSTEP, ZSTEP, XDIR, YDIR, ZDIR, DREN, XLIM, YLIM, ZLIM, SPSP, SPDR, SCL, SDA

Reset Switch
RESET — RESET — GND

Driver Enable Pull-Up
5U — R1 10k — DREN

Stepper Motor Connections
X.MOT — X.B2 X.B1 X.A1 X.A2 — 4 3 2 1
Y.MOT — Y.B2 Y.B1 Y.A1 Y.A2 — 4 3 2 1
Z.MOT — Z.B2 Z.B1 Z.A1 Z.A2 — 4 3 2 1
A.MOT — A.B2 A.B1 A.A1 A.A2 — 4 3 2 1

A4988 Carrier
ADIR ASTEP AM0 AM1 AM2 DREN 5U
Dir, Step, Sleep (Inverted), Reset (Inverted), MS3, MS2, MS1, Enable (Inverted), Vmot
GND, 1B, 1A, 2A, 2B, GND, VDD
ASTEP A.A2 A.A1 A.B1 A.B2 GND 5U — C4 100uF — GND / V.MOT

ZDIR ZSTEP ZM0 ZM1 ZM2 DREN 5U
Dir, Step, Sleep (Inverted), Reset (Inverted), MS3, MS2, MS1, Enable (Inverted), Vmot
GND, 1B, 1A, 2A, 2B, GND, VDD
ZSTEP Z.A2 Z.A1 Z.B1 Z.B2 GND 5U — C3 100uF — GND / V.MOT

YDIR YSTEP YM0 YM1 YM2 DREN 5U
Dir, Step, Sleep (Inverted), Reset (Inverted), MS3, MS2, MS1, Enable (Inverted), Vmot
GND, 1B, 1A, 2A, 2B, GND, VDD
YSTEP Y.A2 Y.A1 Y.B1 Y.B2 GND 5U — C2 100uF — GND / V.MOT

XDIR XSTEP XM0 XM1 XM2 DREN 5U
Dir, Step, Sleep (Inverted), Reset (Inverted), MS3, MS2, MS1, Enable (Inverted), Vmot
GND, 1B, 1A, 2A, 2B, GND, VDD
XSTEP X.A2 X.A1 X.B1 X.B2 GND 5U — C1 100uF — GND / V.MOT

X Axis Microstep Select
XM0 5U / XM0 1 2 X.M0
XM1 5U / XM1 1 2 X.M1
XM2 5U / XM2 1 2 X.M2

Z Axis Microstep Select
ZM0 5U / ZM0 1 2 Z.M0
ZM1 5U / ZM1 1 2 Z.M1
ZM2 5U / ZM2 1 2 Z.M2

Y Axis Microstep Select
YM0 5U / Y.M0 1 2 Y.M0
YM1 5U / YM1 1 2 Y.M1
YM2 5U / YM2 1 2 Y.M2

A Axis Microstep Select
AM0 5U / A.M0 1 2 A.M0
AM1 5U / AM1 1 2 A.M1
AM2 5U / AM2 1 2 A.M2

Limit Switch and Probe Filtering
PROBE — C12 0.1uF — GND
ZLIM — C11 0.1uF — GND
YLIM — C10 0.1uF — GND
XLIM — C9 0.1uF — GND
5U — RN2 681 — XLIM YLIM ZLIM PROBE

Limit Switch Hi/Lo Activation
L.H/L — 5U LIMSEL GND — 1 2 3