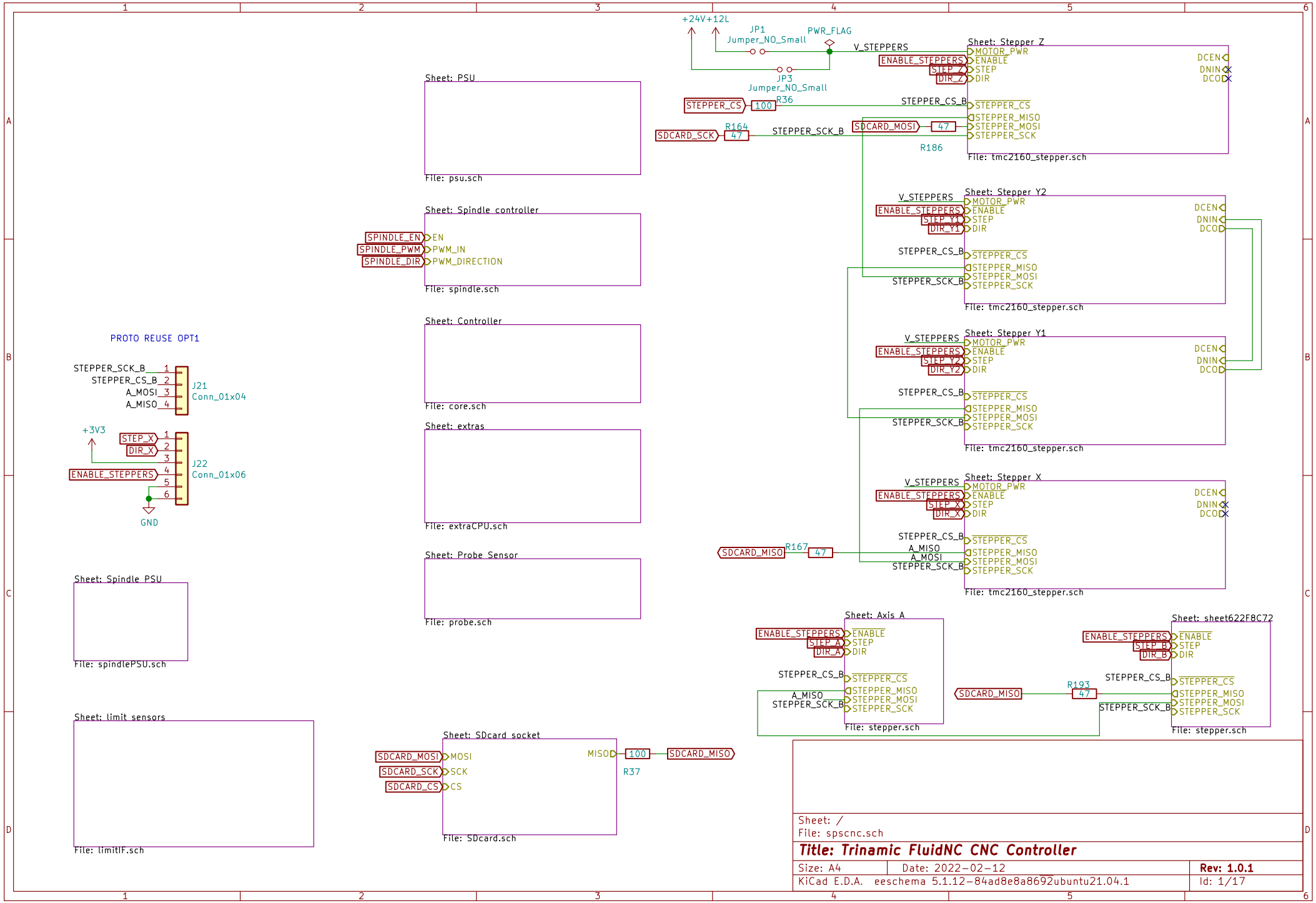
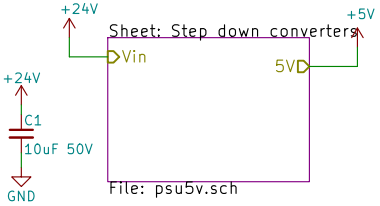
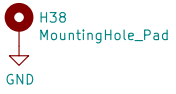
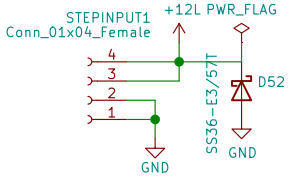

+24V+12L
JP1
Jumper_NO_Small
PWR_FLAG
V_STEPPERS
JP3
Jumper_NO_Small
Sheet: Stepper Z
MOTOR_PWR
ENABLE
STEP
DIR
ENABLE_STEPPERS
STEP_Z
DIR_Z
DCEN
DNIN
DCOD
STEPPER_CS
100
R36
STEPPER_CS_B
STEPPER_MISO
STEPPER_MOSI
STEPPER_SCK
SDCARD_MOSI
47
SDCARD_SCK
R164
47
STEPPER_SCK_B
R186
File: tmc2160_stepper.sch
Sheet: Stepper Y2
V_STEPPERS
ENABLE_STEPPERS
STEP_Y1
DIR_Y1
STEPPER_CS_B
STEPPER_SCK_B
File: tmc2160_stepper.sch
Sheet: Stepper Y1
V_STEPPERS
ENABLE_STEPPERS
STEP_Y2
DIR_Y2
STEPPER_CS_B
STEPPER_SCK_B
File: tmc2160_stepper.sch
Sheet: Stepper X
V_STEPPERS
ENABLE_STEPPERS
STEP_X
DIR_X
STEPPER_CS_B
A_MISO
A_MOSI
STEPPER_SCK_B
SDCARD_MISO
R167
47
File: tmc2160_stepper.sch
Sheet: PSU
File: psu.sch
Sheet: Spindle controller
SPINDLE_EN
SPINDLE_PWM
SPINDLE_DIR
EN
PWM_IN
PWM_DIRECTION
File: spindle.sch
Sheet: Controller
File: core.sch
Sheet: extras
File: extraCPU.sch
Sheet: Probe Sensor
File: probe.sch
PROTO REUSE OPT1
STEPPER_SCK_B
STEPPER_CS_B
A_MOSI
A_MISO
J21
Conn_01x04
+3V3
STEP_X
DIR_X
ENABLE_STEPPERS
J22
Conn_01x06
GND
Sheet: Spindle PSU
File: spindlePSU.sch
Sheet: limit sensors
File: limitIF.sch
Sheet: SDcard socket
SDCARD_MOSI
SDCARD_SCK
SDCARD_CS
MOSI
SCK
CS
MISO
100
R37
SDCARD_MISO
File: SDcard.sch
Sheet: Axis A
ENABLE_STEPPERS
STEP_A
DIR_A
ENABLE
STEP
DIR
STEPPER_CS_B
A_MISO
STEPPER_SCK_B
STEPPER_CS
STEPPER_MISO
STEPPER_MOSI
STEPPER_SCK
File: stepper.sch
Sheet: sheet622F8C72
ENABLE_STEPPERS
STEP_B
DIR_B
SDCARD_MISO
R193
47
STEPPER_CS_B
STEPPER_SCK_B
File: stepper.sch
Sheet: /
File: spscnc.sch
Title: Trinamic FluidNC CNC Controller
Size: A4
Date: 2022-02-12
Rev: 1.0.1
KiCad E.D.A. eeschema 5.1.12-84ad8e8a8692ubuntu21.04.1
Id: 1/17





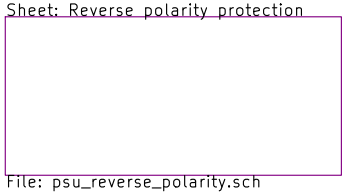


Voltage Rails:
24V General supply.
12V Supply for stepper controllers only
12L (External supply for steppers)
5V uC and some circuits
3v3 uC and support

48V only spindle, accepts 24V as well.

Power budget:
24V => TODO
12V steppers < 500mA
5V uC < 1A
3v3 < 0.5 A
12V steppers 3Ax2x4 => 24A (trace widths!!)
24V stepper alt: 12A width
24V 8A (trace widths)
PWM Spindle IO 10A traces!

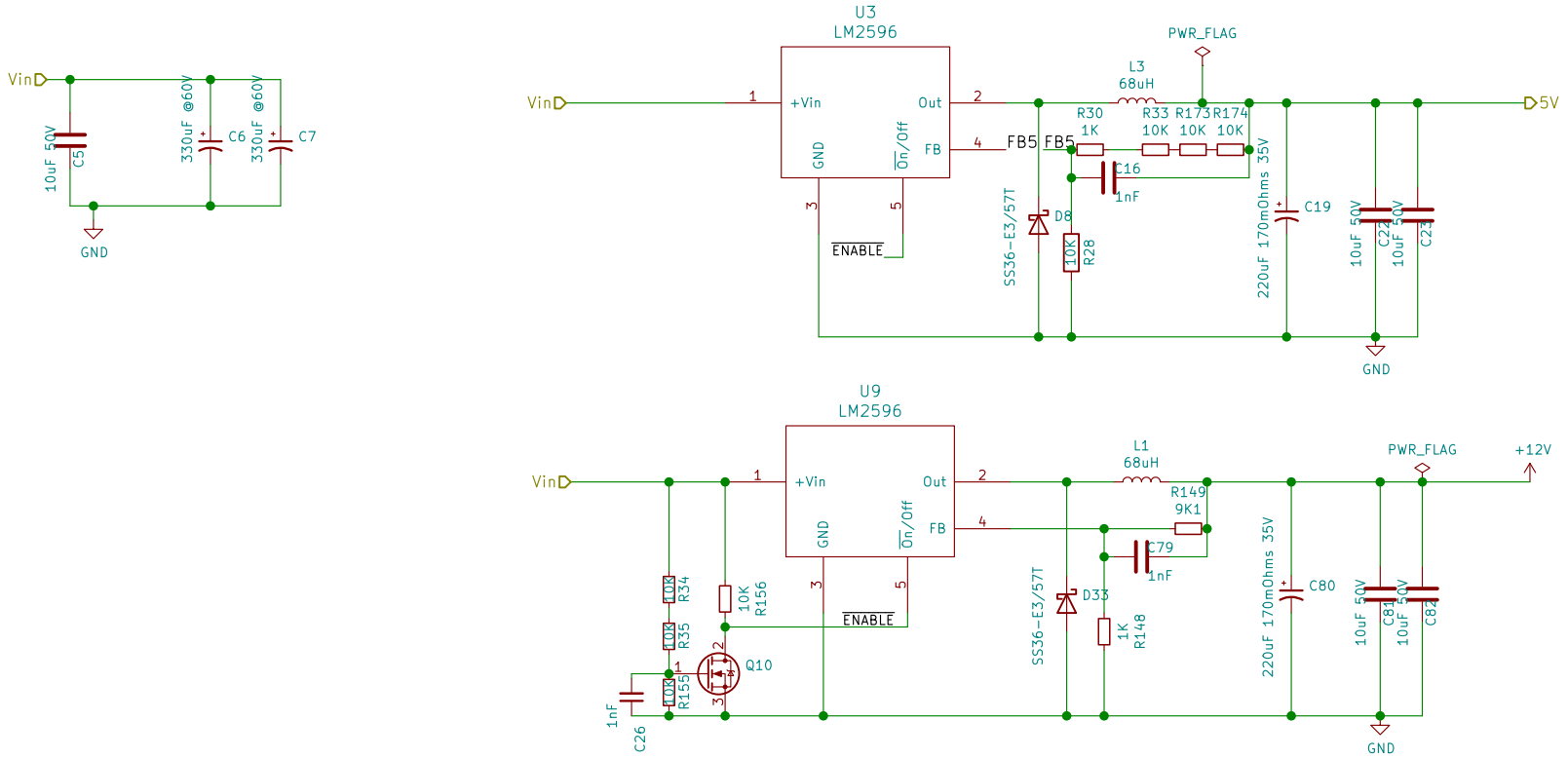
Stepper paths may allow for 20 A per coil.
Total supply 20A x 2 x 4 => 160A (1KW!!) Does not consider actual stepper motor being below 12V Nominally.



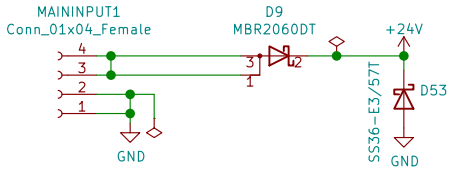
Sheet: /PSU/
File: psu.sch

Title: Trinamic FluidNC CNC Controller

Size: A4	Date: 2022-02-12	**Rev: 1.0.1**
KiCad E.D.A.	eeschema 5.1.12-84ad8e8a8692ubuntu21.04.1	Id: 2/17



Sheet: /PSU/Step down converters/		
File: psu5v.sch		
Title: Trinamic FluidNC CNC Controller		
Size: A4	Date: 2022-02-12	**Rev: 1.0.1**
KiCad E.D.A. eeschema 5.1.12-84ad8e8a8692ubuntu21.04.1		Id: 3/17



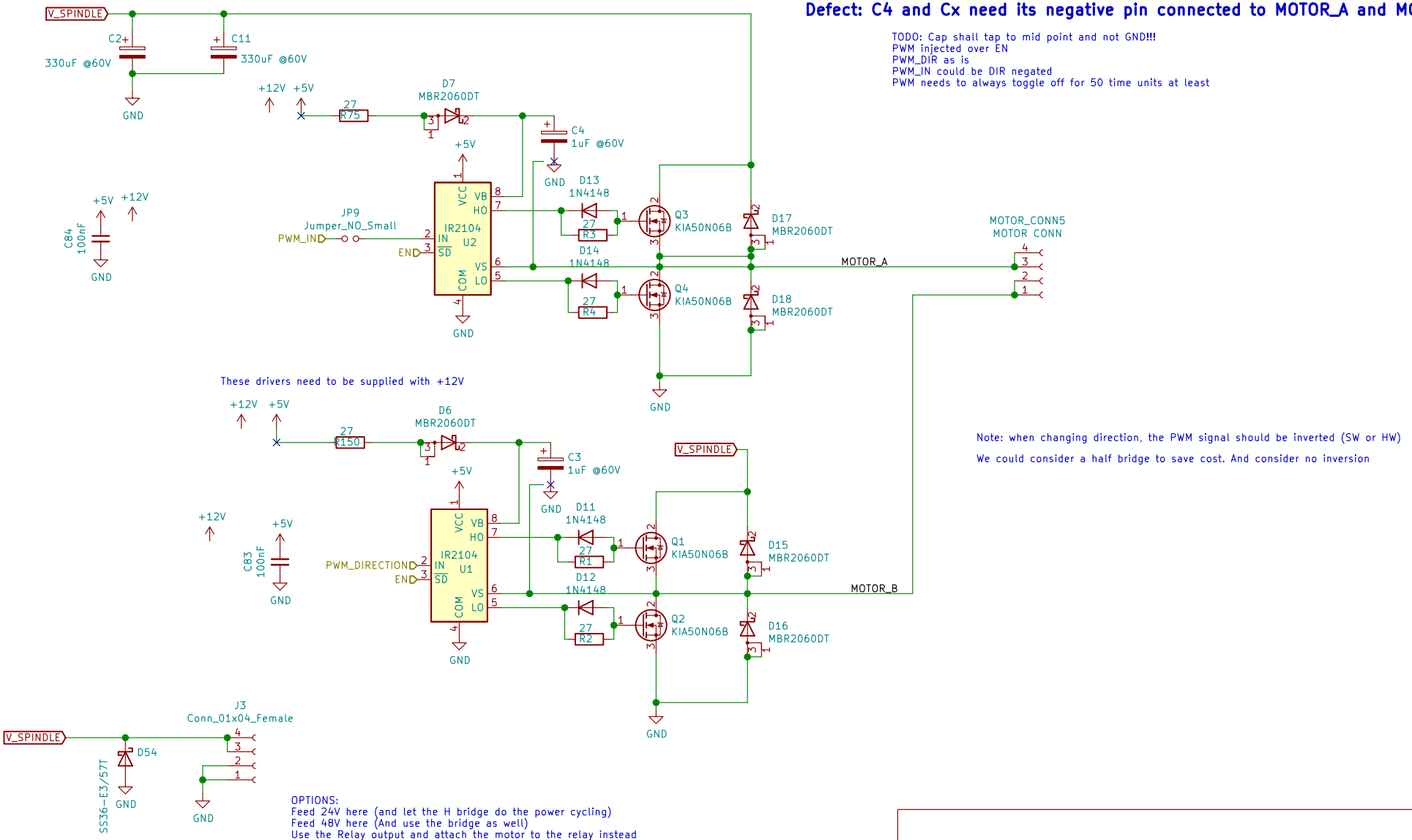
Sheet: /PSU/Reverse polarity protection/
File: psu_reverse_polarity.sch

Title: Trinamic FluidNC CNC Controller

Size: A4	Date: 2022-02-12	**Rev: 1.0.1**
KiCad E.D.A.	eeschema 5.1.12-84ad8e8a8692ubuntu21.04.1	Id: 4/17

Defect: Vcc needs to be above 10V
Defect: C4 and Cx need its negative pin connected to MOTOR_A and MOTOR_B

TODO: Cap shall tap to mid point and not GND!!!
PWM injected over EN
PWM_DIR as is
PWM_IN could be DIR negated
PWM needs to always toggle off for 50 time units at least



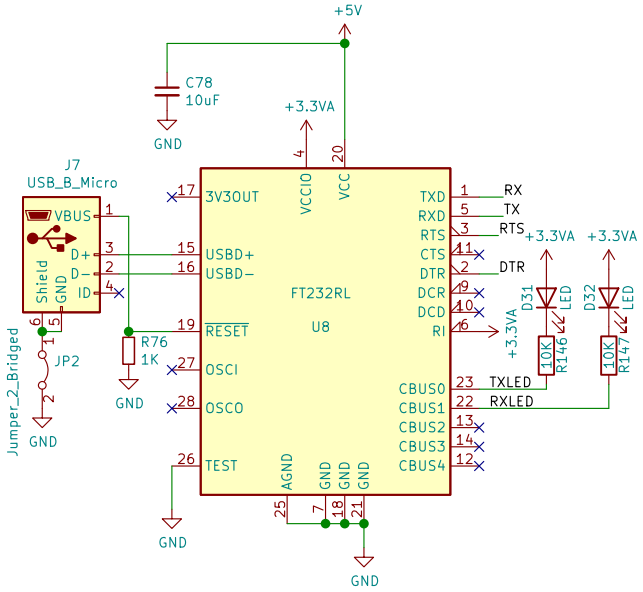
Corrections implemented in 1.0.1 prototypes.

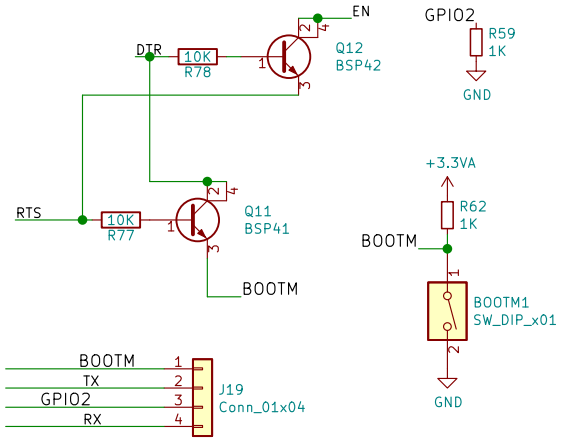
Sheet: /Spindle controller/
File: spindle.sch

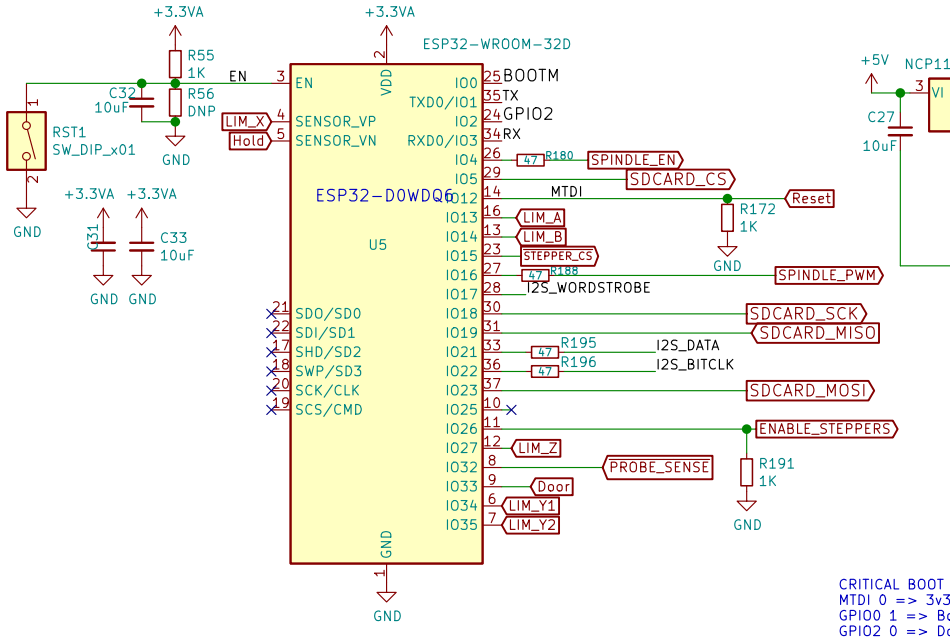
Title: Trinamic FluidNC CNC Controller

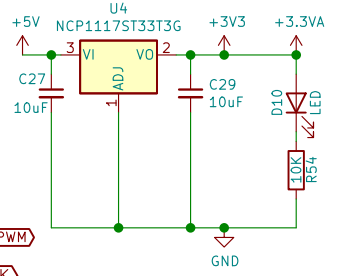
Size: A4	Date: 2022-02-12	**Rev: 1.0.2**
KiCad E.D.A.	eeschema 5.1.12-84ad8e8a8692ubuntu21.04.1	Id: 5/17

Programming and bootmode

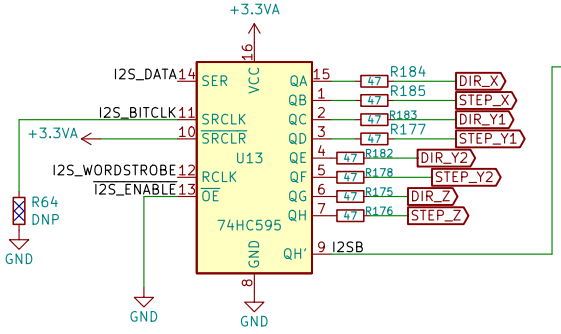


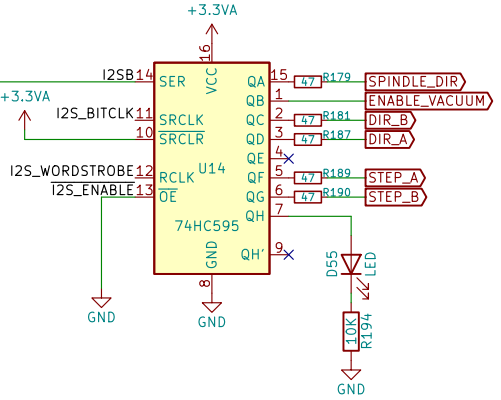


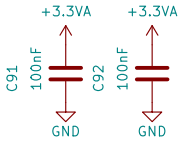




CRITICAL BOOT MODE:
MTDI 0 => 3v3 SPI (GPIO12)
GPIO0 1 => Boot APP
GPIO2 0 => Download
MTDO 0 => Silent UART / SDIO Sample Fall GPIO15
GPIO5 SDIO Launch Falling edge.



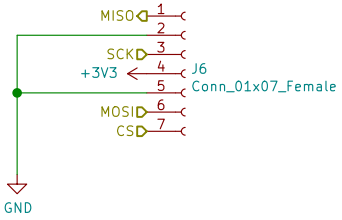




Sheet: /Controller/
File: core.sch

Title: Trinamic FluidNC CNC Controller

Size: A4	Date: 2022-02-12	**Rev: 1.0.1**
KiCad E.D.A.	eeschema 5.1.12-84ad8e8a8692ubuntu21.04.1	Id: 6/17



Sheet: /SDcard socket/
File: SDcard.sch

Title: Trinamic FluidNC CNC Controller

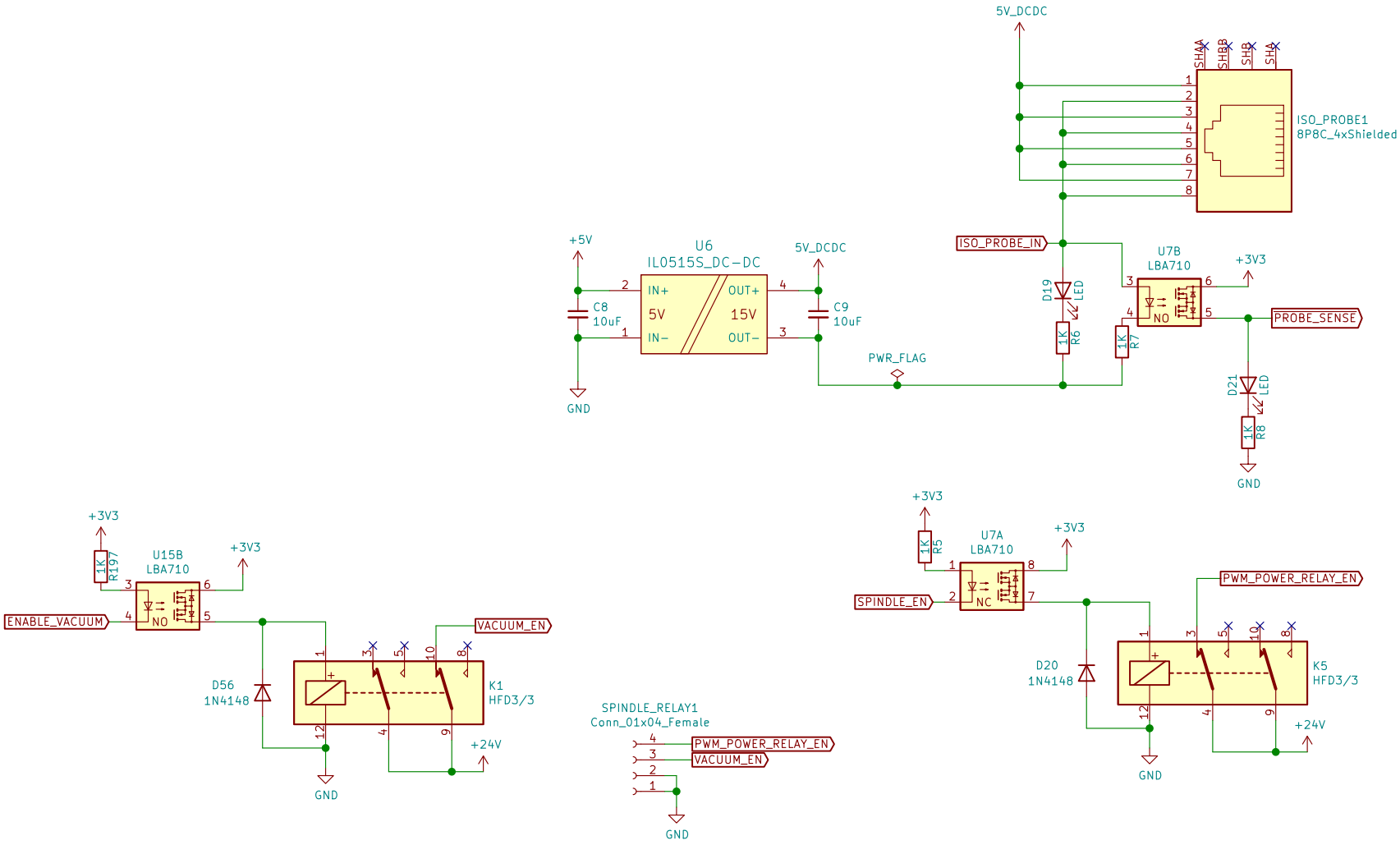
Size: A4	Date: 2022-02-12	**Rev: 1.0.1**
KiCad E.D.A.	eeschema 5.1.12-84ad8e8a8692ubuntu21.04.1	Id: 7/17

A power step up circuit
can be assembled here.

Sheet: /Spindle PSU/
File: spindlePSU.sch

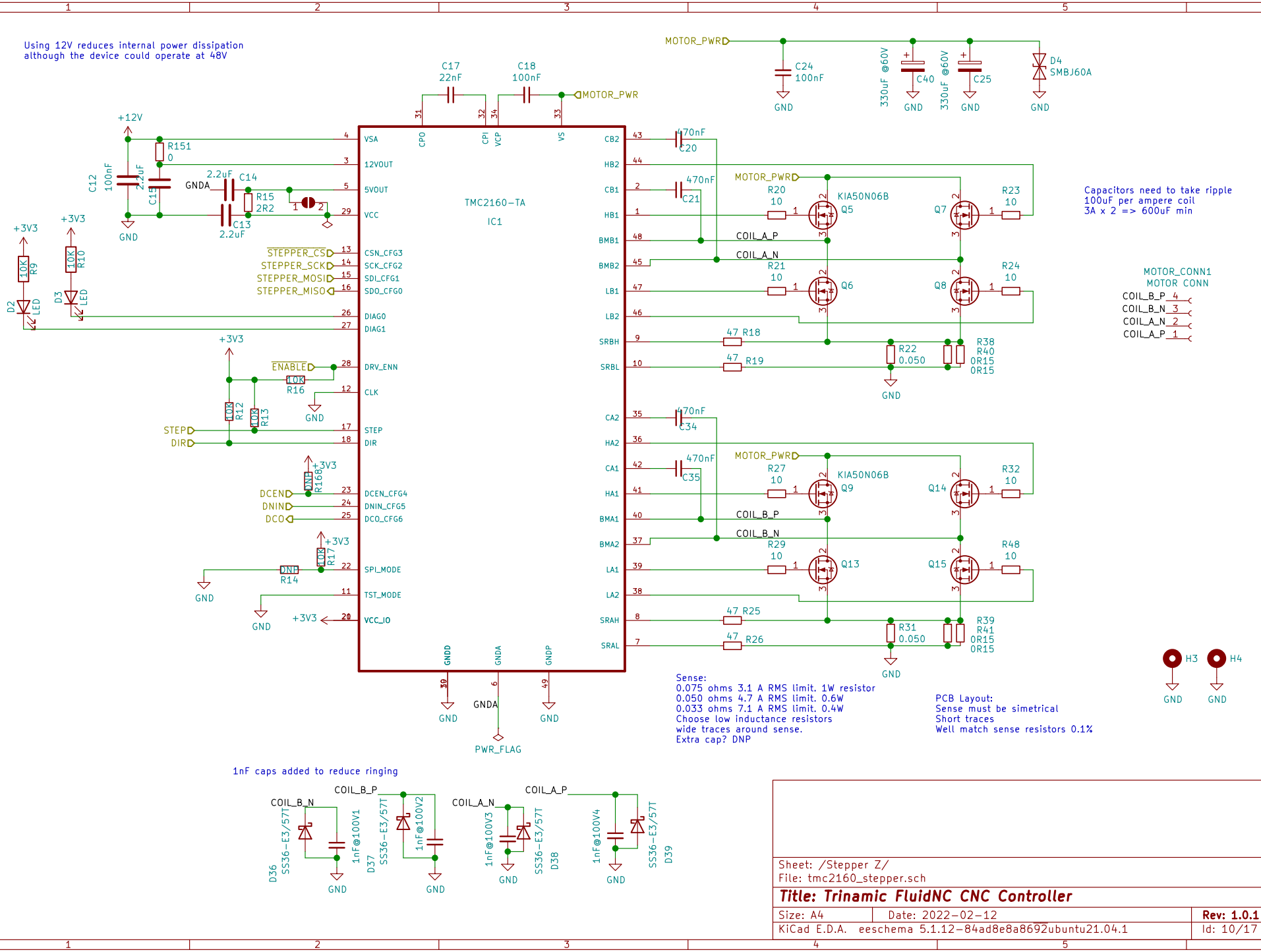
Title: Trinamic FluidNC CNC Controller

Size: A4	Date: 2022-02-12	**Rev: 1.0.1**
KiCad E.D.A. eeschema 5.1.12-84ad8e8a8692ubuntu21.04.1		Id: 8/17



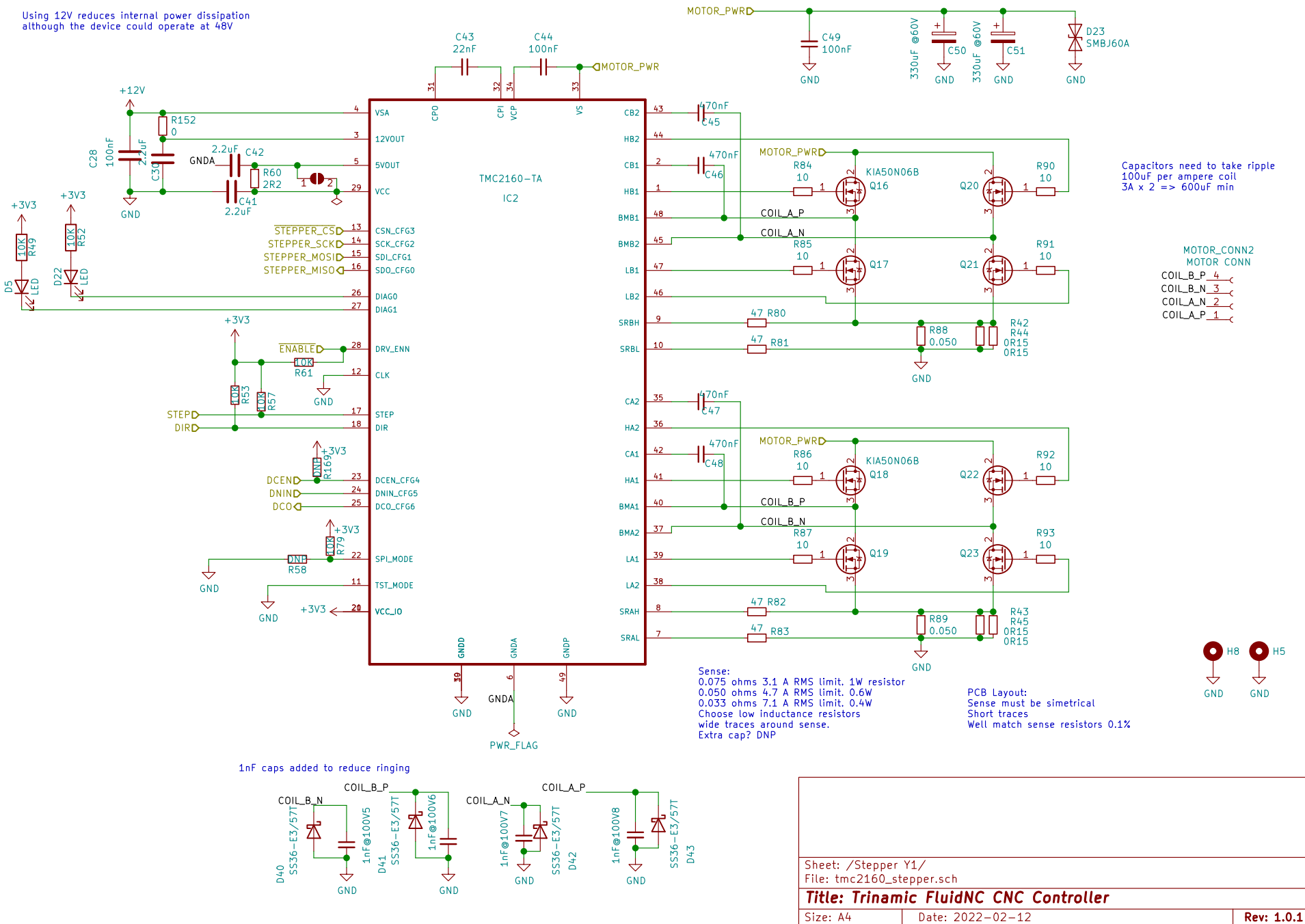
This connector drives External 24V relays which enable the 230V circuits.

Sheet: /Probe Sensor/		
File: probe.sch		
Title: Trinamic FluidNC CNC Controller		
Size: A4	Date: 2022-02-12	**Rev: 1.0.1**
KiCad E.D.A. eeschema 5.1.12-84ad8e8a8692ubuntu21.04.1		Id: 9/17



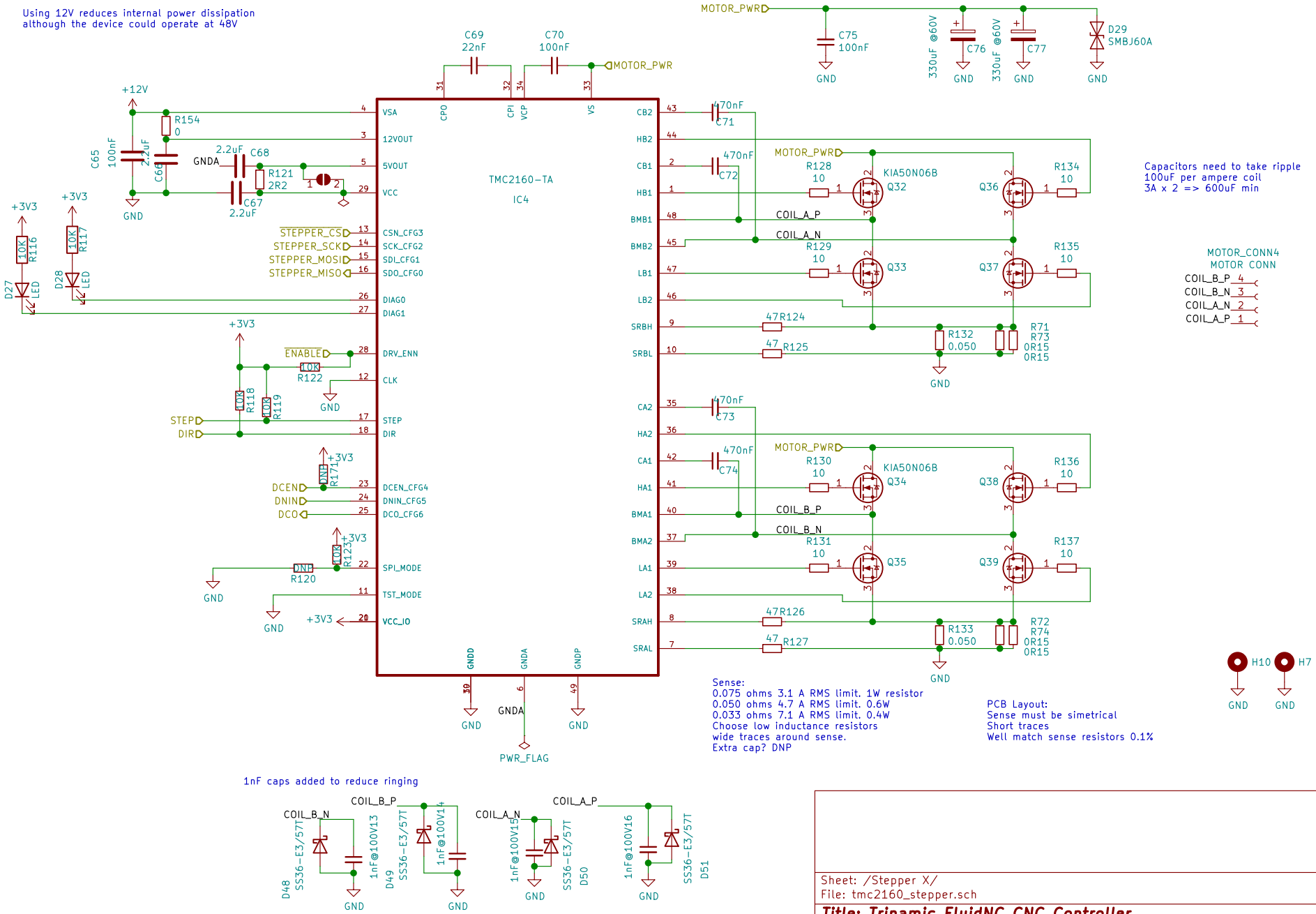
Sheet: /Stepper Z/	
File: tmc2160_stepper.sch	
Title: Trinamic FluidNC CNC Controller	
Size: A4	Date: 2022-02-12
KiCad E.D.A. eeschema 5.1.12-84ad8e8a8692ubuntu21.04.1	Id: 10/17

Rev: 1.0.1



Sheet: /Stepper Y1/	
File: tmc2160_stepper.sch	
Title: Trinamic FluidNC CNC Controller	
Size: A4	Date: 2022-02-12
KiCad E.D.A. eeschema 5.1.12-84ad8e8a8692ubuntu21.04.1	Id: 11/17

Rev: 1.0.1

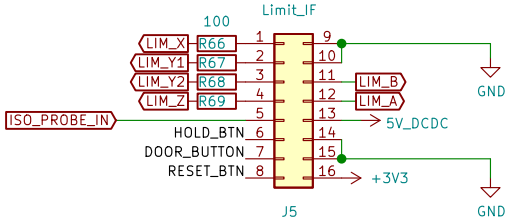


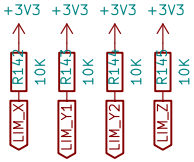
Sheet: /Stepper X/
File: tmc2160_stepper.sch

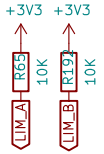
Title: Trinamic FluidNC CNC Controller

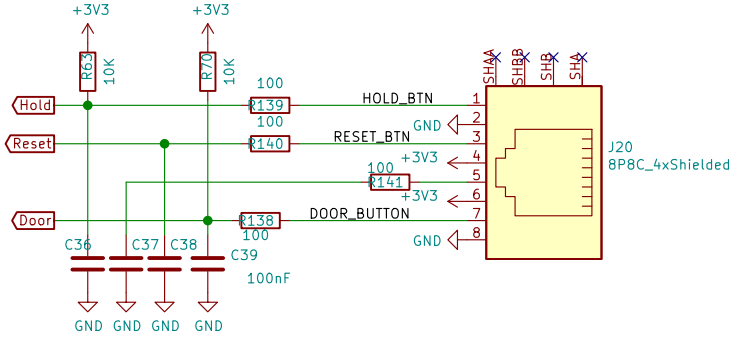
Size: A4	Date: 2022-02-12	**Rev: 1.0.1**
KiCad E.D.A.	eeschema 5.1.12-84ad8e8a8692ubuntu21.04.1	Id: 12/17

The system is designed for NC switches.
This allows detecting if the sensor is not in place
In particular, LIM_A not being connected may affect the flash behavior (MTDO)







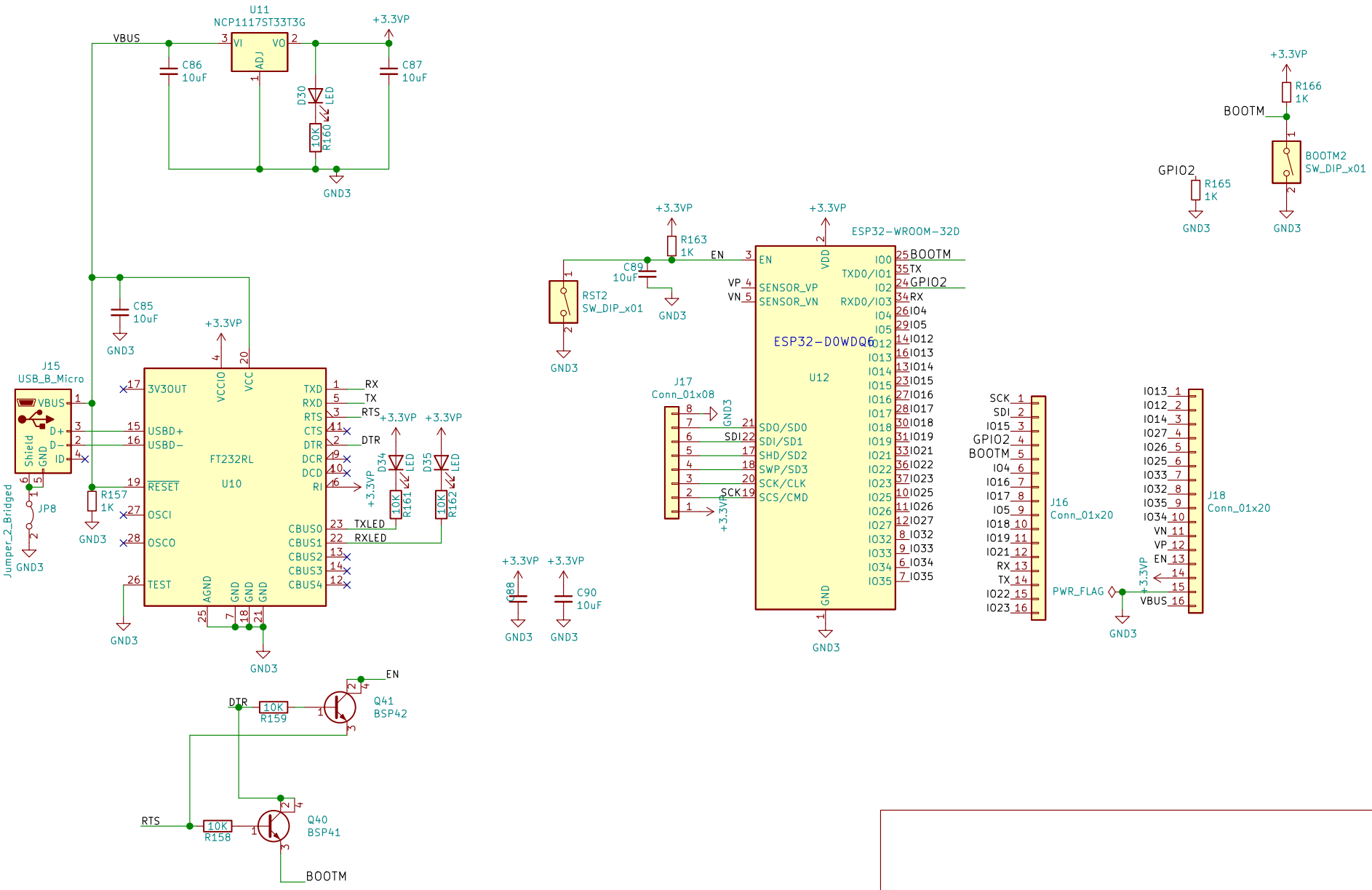


Limit sensor connectors

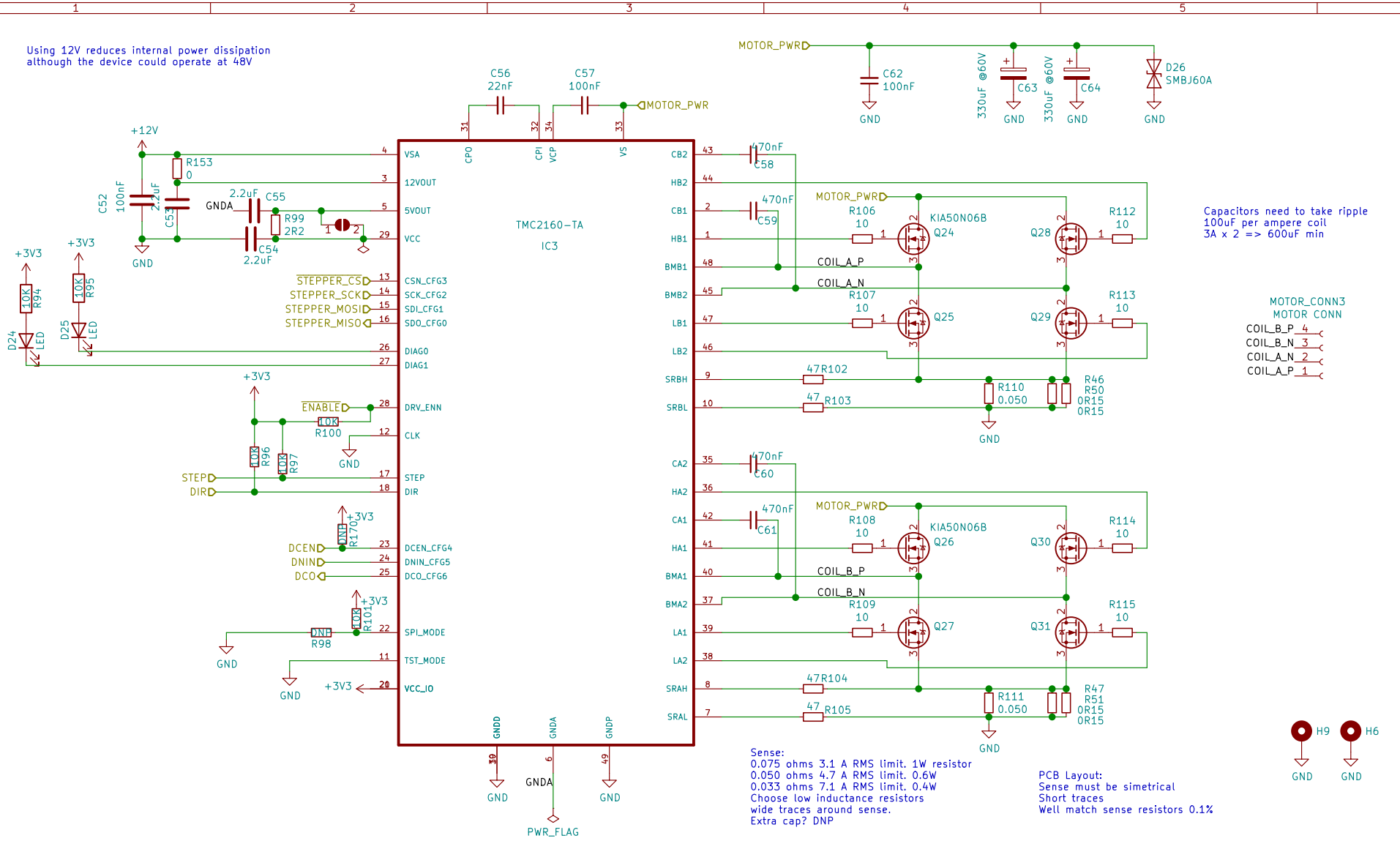
Sheet: /limit sensors/
File: limitIF.sch

Title: Trinamic FluidNC CNC Controller

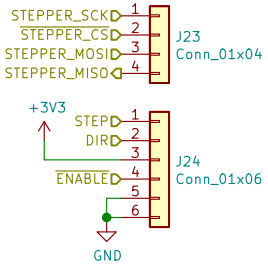
Size: A4	Date: 2022-02-12	**Rev: 1.0.1**
KiCad E.D.A.	eeschema 5.1.12-84ad8e8a8692ubuntu21.04.1	Id: 13/17



Sheet: /extras/		
File: extraCPU.sch		
Title: Trinamic FluidNC CNC Controller		
Size: A4	Date: 2022-02-12	**Rev: 1.0.1**
KiCad E.D.A. eeschema 5.1.12-84ad8e8a8692ubuntu21.04.1		Id: 14/17



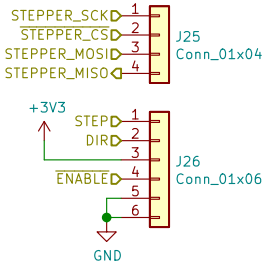
Sheet: /Stepper Y2/		
File: tmc2160_stepper.sch		
Title: Trinamic FluidNC CNC Controller		
Size: A4	Date: 2022-02-12	**Rev: 1.0.1**
KiCad E.D.A. eeschema 5.1.12-84ad8e8a8692ubuntu21.04.1		Id: 15/17



Optional module.

When getting prototypes from JLC, the second module can be reused from another prototype.

Sheet: /Axis A/		
File: stepper.sch		
Title:		
Size: A4	Date: 2022-02-12	**Rev: 1.0.1**
KiCad E.D.A.	eeschema 5.1.12-84ad8e8a8692ubuntu21.04.1	Id: 16/17



Optional module.

When getting prototypes from JLC, the second module can be reused from another prototype.

Sheet: /sheet622F8C72/		
File: stepper.sch		
Title:		
Size: A4	Date: 2022-02-12	**Rev: 1.0.1**
KiCad E.D.A. eeschema 5.1.12-84ad8e8a8692ubuntu21.04.1		Id: 17/17