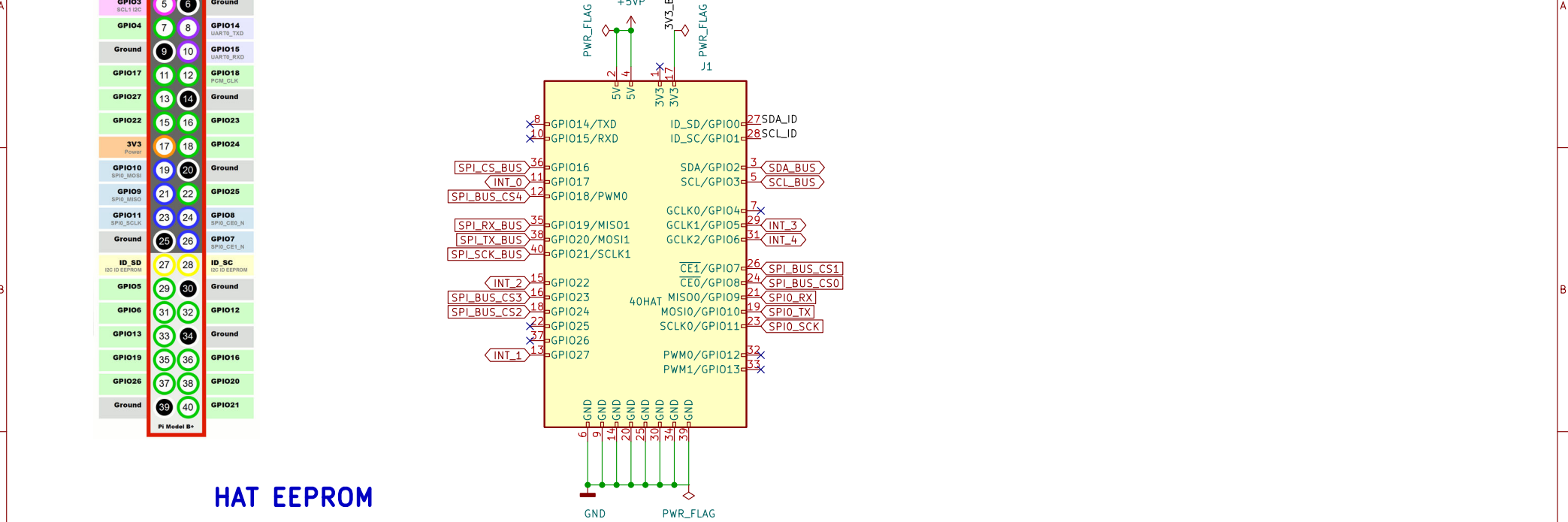
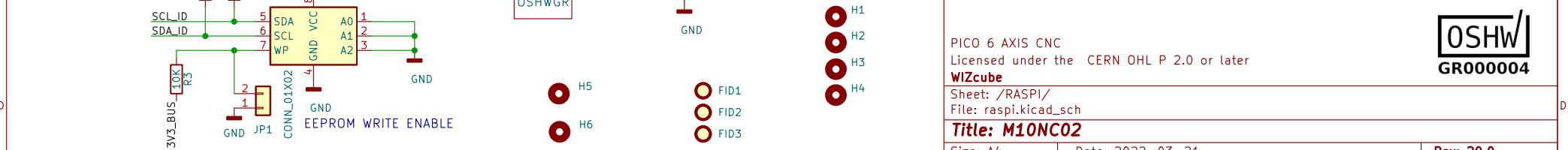


1	2	3	4	5	6
---	---	---	---	---	---



jumper as shown to enable writing, or to hook up a spare IO pin to do so.



OSHW
GR000004

Title: M10NC02	
Size: A4	Date: 2022-03-21
KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu21.10.1	

Title: M10NC02		
Size: A4	Date: 2022-03-21	Rev: 20.0
KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu21.10.1		Id: 2/9

PICO 6 AXIS CNC-20.0

README FIRST

GPIO16-GPIO21 used by WIZNET
 GPIO16, GPIO18, GPIO19 shared with WIZNET, CANBUS, SD, SPI on the BUS to control other M10 module through SPI
 ALL have different CS pins and INTERRUPT pins

CANBUS IS THE LATEST STANDARD. SPEED UP TO 5MHZ.
 MAYBE THIS IS ALSO A SOLUTION FOR FAST I/O. WE CHECK THIS BY EXPERIMENTING.

BELOW SIGNALS ARE CONNECTED TO RASPI 40 PIN CONNECTOR

INT_0
 INT_1
 INT_2
 INT_3
 INT_4
 SPL_BUS_CS0
 SPL_BUS_CS1
 SPL_BUS_CS2
 SPL_BUS_CS3
 SPL_BUS_CS4

Power
 Ground
 UART (default)
 UART
 GPIO, PIO, and PWM
 ADC
 SPI
 I2C
 System Control
 Debugging
 Connected to W5100S in board

Wiznet EVB Pico

Raspberry Pi

POWER INDICATOR LED

BUZZER

RESET

I2C Pullups Soldered by Default

NOT TIME CRITICAL OUTPUTS VIA ONE 74HCT595

TIME CRITICAL INPUTS DIRECT TO CPU FROM I/O MODULE THE SAME MODULE WILL SEND THESE VIA SPI TO CPU

TIME CRITICAL OUTPUTS VIA TWO CASCADED 74HCT595

Legend:

- 1 - LIMX. X AXIS LIMIT SWITCH
- 2 - LIMY. Y AXIS LIMIT SWITCH
- 3 - LIMZ. Z AXIS LIMIT SWITCH
- 4 - LIMA. A AXIS LIMIT SWITCH
- 5 - LIMB. B AXIS LIMIT SWITCH
- 6 - LIMC. C AXIS LIMIT SWITCH
- 7 - PRB. PROBE
- 8 - RESET

Legend:

- 1 - STPX. X AXIS STEP
- 2 - STPY. Y AXIS STEP
- 3 - STPZ. Z AXIS STEP
- 4 - STPA. A AXIS STEP
- 5 - STPB. B AXIS STEP
- 6 - STPC. C AXIS STEP
- 7 - DIRX. X AXIS DIRECTION
- 8 - DIRY. Y AXIS DIRECTION
- 9 - DIRZ. Z AXIS DIRECTION
- 10 - DIRA. A AXIS DIRECTION
- 11 - DIRB. B AXIS DIRECTION
- 12 - DIRC. C AXIS DIRECTION
- 13 - SD_CS
- 14 - RS485_RE_DE
- 15 - TMC_CS

Legend:

- 1 - ENX. X AXIS ENABLE
- 2 - ENY. Y AXIS ENABLE
- 3 - ENZ. Z AXIS ENABLE
- 4 - ENA. A AXIS ENABLE
- 5 - ENB. B AXIS ENABLE
- 6 - ENC. C AXIS ENABLE
- 7 - SPL_BUS_CS0
- 8 - SPL_BUS_CS1
- 9 - SPL_BUS_CS2
- 10 - SPL_BUS_CS3
- 11 - SPL_BUS_CS4
- 12 - CAN_CS
- 13 - SD_CS
- 14 - RS485_RE_DE
- 15 - TMC_CS

Legend:

- 1 - ENX. X AXIS ENABLE
- 2 - ENY. Y AXIS ENABLE
- 3 - ENZ. Z AXIS ENABLE
- 4 - ENA. A AXIS ENABLE
- 5 - ENB. B AXIS ENABLE
- 6 - ENC. C AXIS ENABLE
- 7 - SPL_BUS_CS0
- 8 - SPL_BUS_CS1
- 9 - SPL_BUS_CS2
- 10 - SPL_BUS_CS3
- 11 - SPL_BUS_CS4
- 12 - CAN_CS
- 13 - SD_CS
- 14 - RS485_RE_DE
- 15 - TMC_CS

Legend:

- 1 - ENX. X AXIS ENABLE
- 2 - ENY. Y AXIS ENABLE
- 3 - ENZ. Z AXIS ENABLE
- 4 - ENA. A AXIS ENABLE
- 5 - ENB. B AXIS ENABLE
- 6 - ENC. C AXIS ENABLE
- 7 - SPL_BUS_CS0
- 8 - SPL_BUS_CS1
- 9 - SPL_BUS_CS2
- 10 - SPL_BUS_CS3
- 11 - SPL_BUS_CS4
- 12 - CAN_CS
- 13 - SD_CS
- 14 - RS485_RE_DE
- 15 - TMC_CS

Legend:

- 1 - ENX. X AXIS ENABLE
- 2 - ENY. Y AXIS ENABLE
- 3 - ENZ. Z AXIS ENABLE
- 4 - ENA. A AXIS ENABLE
- 5 - ENB. B AXIS ENABLE
- 6 - ENC. C AXIS ENABLE
- 7 - SPL_BUS_CS0
- 8 - SPL_BUS_CS1
- 9 - SPL_BUS_CS2
- 10 - SPL_BUS_CS3
- 11 - SPL_BUS_CS4
- 12 - CAN_CS
- 13 - SD_CS
- 14 - RS485_RE_DE
- 15 - TMC_CS

Legend:

- 1 - ENX. X AXIS ENABLE
- 2 - ENY. Y AXIS ENABLE
- 3 - ENZ. Z AXIS ENABLE
- 4 - ENA. A AXIS ENABLE
- 5 - ENB. B AXIS ENABLE
- 6 - ENC. C AXIS ENABLE
- 7 - SPL_BUS_CS0
- 8 - SPL_BUS_CS1
- 9 - SPL_BUS_CS2
- 10 - SPL_BUS_CS3
- 11 - SPL_BUS_CS4
- 12 - CAN_CS
- 13 - SD_CS
- 14 - RS485_RE_DE
- 15 - TMC_CS

Legend:

- 1 - ENX. X AXIS ENABLE
- 2 - ENY. Y AXIS ENABLE
- 3 - ENZ. Z AXIS ENABLE
- 4 - ENA. A AXIS ENABLE
- 5 - ENB. B AXIS ENABLE
- 6 - ENC. C AXIS ENABLE
- 7 - SPL_BUS_CS0
- 8 - SPL_BUS_CS1
- 9 - SPL_BUS_CS2
- 10 - SPL_BUS_CS3
- 11 - SPL_BUS_CS4
- 12 - CAN_CS
- 13 - SD_CS
- 14 - RS485_RE_DE
- 15 - TMC_CS

Legend:

- 1 - ENX. X AXIS ENABLE
- 2 - ENY. Y AXIS ENABLE
- 3 - ENZ. Z AXIS ENABLE
- 4 - ENA. A AXIS ENABLE
- 5 - ENB. B AXIS ENABLE
- 6 - ENC. C AXIS ENABLE
- 7 - SPL_BUS_CS0
- 8 - SPL_BUS_CS1
- 9 - SPL_BUS_CS2
- 10 - SPL_BUS_CS3
- 11 - SPL_BUS_CS4
- 12 - CAN_CS
- 13 - SD_CS
- 14 - RS485_RE_DE
- 15 - TMC_CS

Legend:

- 1 - ENX. X AXIS ENABLE
- 2 - ENY. Y AXIS ENABLE
- 3 - ENZ. Z AXIS ENABLE
- 4 - ENA. A AXIS ENABLE
- 5 - ENB. B AXIS ENABLE
- 6 - ENC. C AXIS ENABLE
- 7 - SPL_BUS_CS0
- 8 - SPL_BUS_CS1
- 9 - SPL_BUS_CS2
- 10 - SPL_BUS_CS3
- 11 - SPL_BUS_CS4
- 12 - CAN_CS
- 13 - SD_CS
- 14 - RS485_RE_DE
- 15 - TMC_CS

Legend:

- 1 - ENX. X AXIS ENABLE
- 2 - ENY. Y AXIS ENABLE
- 3 - ENZ. Z AXIS ENABLE
- 4 - ENA. A AXIS ENABLE
- 5 - ENB. B AXIS ENABLE
- 6 - ENC. C AXIS ENABLE
- 7 - SPL_BUS_CS0
- 8 - SPL_BUS_CS1
- 9 - SPL_BUS_CS2
- 10 - SPL_BUS_CS3
- 11 - SPL_BUS_CS4
- 12 - CAN_CS
- 13 - SD_CS
- 14 - RS485_RE_DE
- 15 - TMC_CS

Legend:

- 1 - ENX. X AXIS ENABLE
- 2 - ENY. Y AXIS ENABLE
- 3 - ENZ. Z AXIS ENABLE
- 4 - ENA. A AXIS ENABLE
- 5 - ENB. B AXIS ENABLE
- 6 - ENC. C AXIS ENABLE
- 7 - SPL_BUS_CS0
- 8 - SPL_BUS_CS1
- 9 - SPL_BUS_CS2
- 10 - SPL_BUS_CS3
- 11 - SPL_BUS_CS4
- 12 - CAN_CS
- 13 - SD_CS
- 14 - RS485_RE_DE
- 15 - TMC_CS

Legend:

- 1 - ENX. X AXIS ENABLE
- 2 - ENY. Y AXIS ENABLE
- 3 - ENZ. Z AXIS ENABLE
- 4 - ENA. A AXIS ENABLE
- 5 - ENB. B AXIS ENABLE
- 6 - ENC. C AXIS ENABLE
- 7 - SPL_BUS_CS0
- 8 - SPL_BUS_CS1
- 9 - SPL_BUS_CS2
- 10 - SPL_BUS_CS3
- 11 - SPL_BUS_CS4
- 12 - CAN_CS
- 13 - SD_CS
- 14 - RS485_RE_DE
- 15 - TMC_CS

Legend:

- 1 - ENX. X AXIS ENABLE
- 2 - ENY. Y AXIS ENABLE
- 3 - ENZ. Z AXIS ENABLE
- 4 - ENA. A AXIS ENABLE
- 5 - ENB. B AXIS ENABLE
- 6 - ENC. C AXIS ENABLE
- 7 - SPL_BUS_CS0
- 8 - SPL_BUS_CS1
- 9 - SPL_BUS_CS2
- 10 - SPL_BUS_CS3
- 11 - SPL_BUS_CS4
- 12 - CAN_CS
- 13 - SD_CS
- 14 - RS485_RE_DE
- 15 - TMC_CS

Legend:

- 1 - ENX. X AXIS ENABLE
- 2 - ENY. Y AXIS ENABLE
- 3 - ENZ. Z AXIS ENABLE
- 4 - ENA. A AXIS ENABLE
- 5 - ENB. B AXIS ENABLE
- 6 - ENC. C AXIS ENABLE
- 7 - SPL_BUS_CS0
- 8 - SPL_BUS_CS1
- 9 - SPL_BUS_CS2
- 10 - SPL_BUS_CS3
- 11 - SPL_BUS_CS4
- 12 - CAN_CS
- 13 - SD_CS
- 14 - RS485_RE_DE
- 15 - TMC_CS

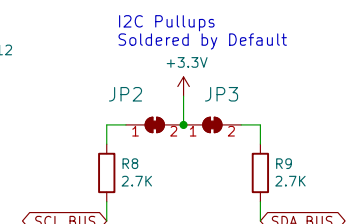
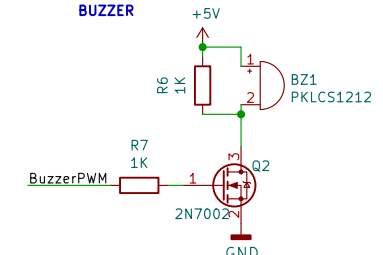
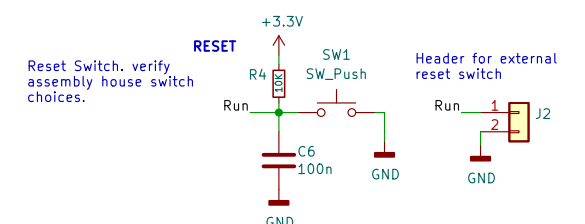
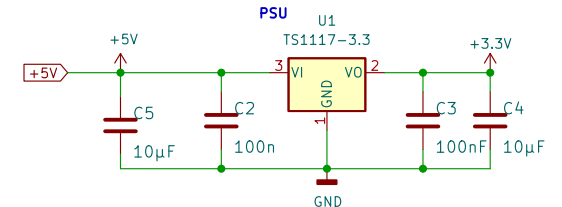
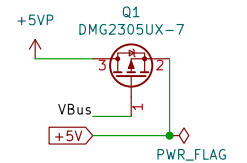
Legend:

- 1 - ENX. X AXIS ENABLE
- 2 - ENY. Y AXIS ENABLE
- 3 - ENZ. Z AXIS ENABLE
- 4 - ENA. A AXIS ENABLE
- 5 - ENB. B AXIS ENABLE
- 6 - ENC. C AXIS ENABLE
- 7 - SPL_BUS_CS0
- 8 - SPL_BUS_CS1
- 9 - SPL_BUS_CS2
- 10 - SPL_BUS_CS3
- 11 - SPL_BUS_CS4
- 12 - CAN_CS
- 13 - SD_CS
- 14 - RS485_RE_DE
- 15 - TMC_CS

Legend:

- 1 - ENX. X AXIS ENABLE
- 2 - ENY. Y AXIS ENABLE
- 3 - ENZ. Z AXIS ENABLE
- 4 - ENA

PMOSFET to allow powering PICO from external +5V while still connected via USB. Per Raspberry PI Pico datasheet.



TIME CRITICAL INPUTS
DIRECT TO CPU FROM I/O MODULE
THE SAME MODULE WILL SEND THESE VIA SPI TO CPU

- 1 - LIMX. X AXIS LIMIT SWITCH
- 2 - LIMY. Y AXIS LIMIT SWITCH
- 3 - LIMZ. Z AXIS LIMIT SWITCH
- 4 - LIMA. A AXIS LIMIT SWITCH
- 5 - LIMB. B AXIS LIMIT SWITCH
- 6 - LIMC. C AXIS LIMIT SWITCH
- 7 - PRB. PROBE
- 8 - RESET

TIME CRITICAL OUTPUTS
VIA TWO CASCADED 74HCT595
1 - STPX, X AXIS STEP

- ```

1 - STPX. X AXIS STEP
2 - STPY. Y AXIS STEP
3 - STPZ. Z AXIS STEP
4 - STPA. A AXIS STEP
5 - STPB. B AXIS STEP
6 - STPC. C AXIS STEP
7 - DIRX. X AXIS DIRECTION
8 - DIRY. Y AXIS DIRECTION
9 - DIRZ. Z AXIS DIRECTION
10 - DIRA. A AXIS DIRECTION
11 - DIRB. B AXIS DIRECTION
12 - DIRC. C AXIS DIRECTION

```

NOT TIME CRITICAL OUTPUTS  
VIA ONE 74HCT595

- ```

VIA ONE 74HC1595
1 - ENX. X AXIS ENABLE
2 - ENY. Y AXIS ENABLE
3 - ENZ. Z AXIS ENABLE
4 - ENA. A AXIS ENABLE
5 - ENB. B AXIS ENABLE
6 - ENC. C AXIS ENABLE
7 - SPI_BUS_CS0
8 - SPI_BUS_CS1
9 - SPI_BUS_CS2
10 - SPI_BUS_CS3
11 - SPI_BUS_CS4
12 - CAN_CS
13 - SD_CS
14 - RS485_RE_DE
15 - TMC_CS

```

PICO 6 AXIS CNC
Licensed under the CERN OHL P 2.0 or later

WIZcube

Sheet: /PICO/

File: pico.kicad_sch

Title: M10NC02

Size: A4	Date: 2022-03-29
----------	------------------

KiCad E.D.A.	kiCad 6.0.4-6f826c9f35~116~ubuntu21.10.1
--------------	--

OSHW
GB000004

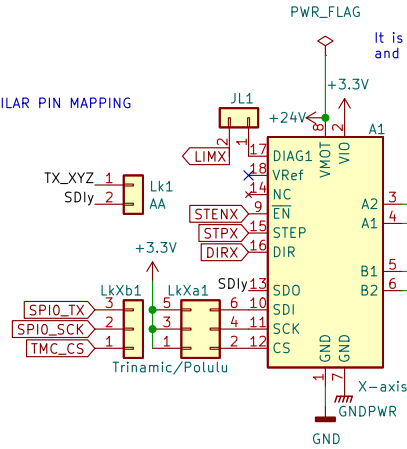
Rev: 20.0

Id: 3/9

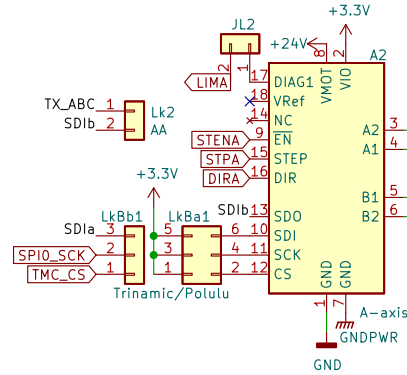
PICO 6 AXIS CNC-20.0

SUPPORTED STEPSTICK:
A4489
DVR2285
TMC2100
TMC2130
TMC5160
TMC2208
TMC2209

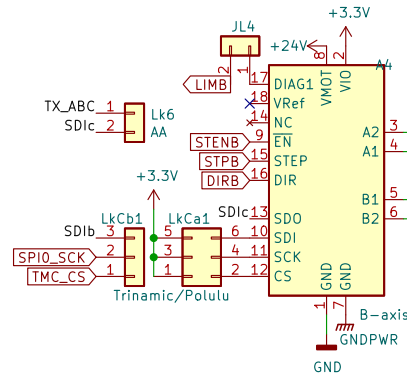
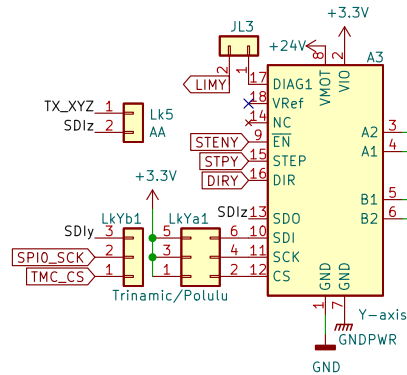
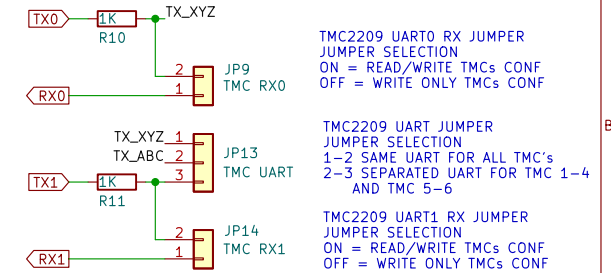
OTHER STEPSTICK WITH SIMILAR PIN MAPPING



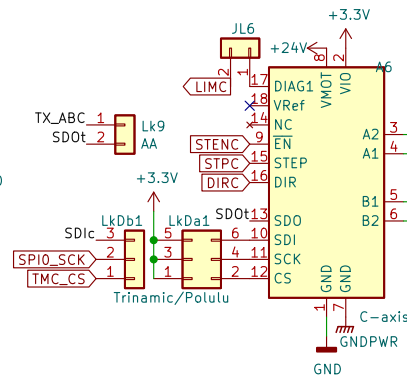
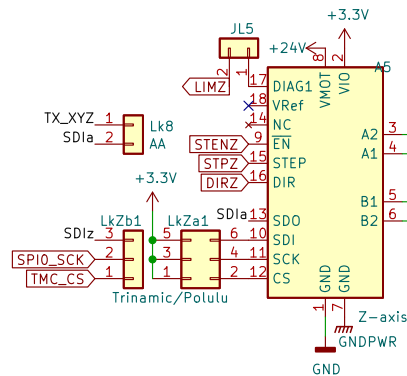
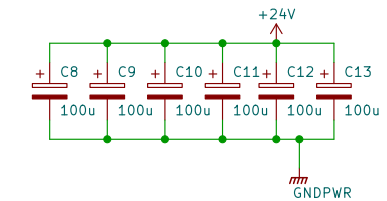
It is explained why that must stay in +3V3
and not in 3V3 BUS in page 2



TMC2130 SPI RX JUMPER
JUMPER SELECTION
ON = SPI RX
OFF = NO SPI RX



EACH ONE UNDER EVERY STEPSTICK



PICO 6 AXIS CNC
Licensed under the CERN OHL P 2.0 or later

WIZcube

Sheet: /STEPSTICK/
File: stepstick.kicad_sch

Title: M10NC02

Size: A4 Date: 2022-03-21

KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu21.10.1



Rev: 20.0

Id: 4/9

Shift registers are used to get around the GPIO limitations of the RP2040.



Title: M10NC02	
Size: A4	Date: 2022-03-21
KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu21.10.1	

OSHW/

GR000004

KiCad E.D.A.	kiCad 6.0.4-6f826c9f35~116-ubuntu21.10.1
--------------	--

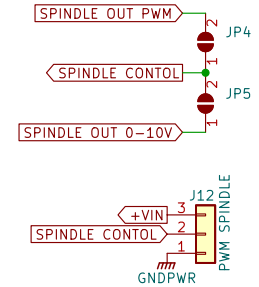
Id: 5/9

PICO 6 AXIS CNC-20.0

PWM STAGE

SPINDLE OUT PWM/0-10V

SPINDLE CONTROL
SOLDER SELECTION
1 (0-10V)
2 PWM



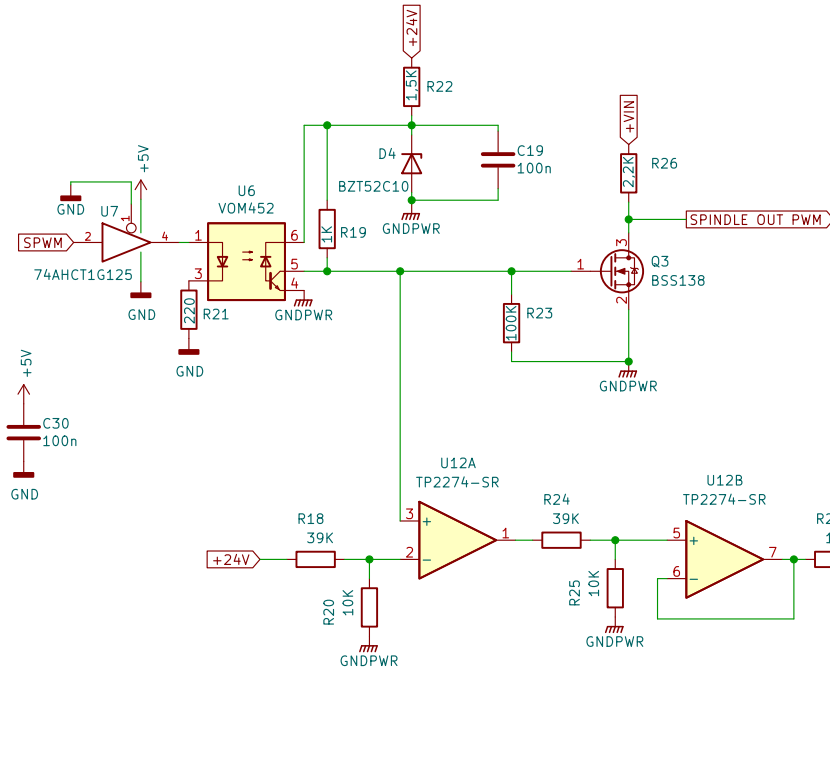
SPINDLE POWER SUPPLY

SPINDLE POWER SUPPLY
SOLDER SELECTION
BRIDGED +24V/GND1
NOT BRIDGED EXT. POWER SUPPLY/GND2

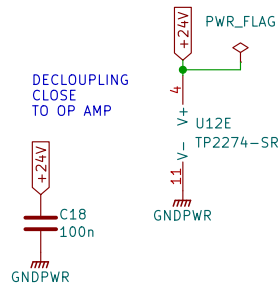


0-10V STAGE

SPINDLE OUT 0-10V



DECLOUPLING
CLOSE
TO OP AMP



PICO 6 AXIS CNC
Licensed under the CERN OHL P 2.0 or later

WIZcube

Sheet: /SPINDLE/
File: spindle.kicad_sch

Title: M10NC02

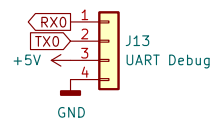
Size: A4 Date: 2022-03-28
KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu21.10.1



Rev: 20.0
Id: 6/9

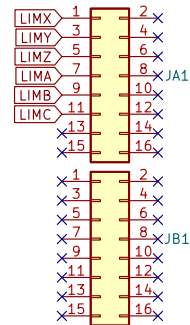
PICO 6 AXIS CNC-20.0

UART DEBUG CONNECTOR



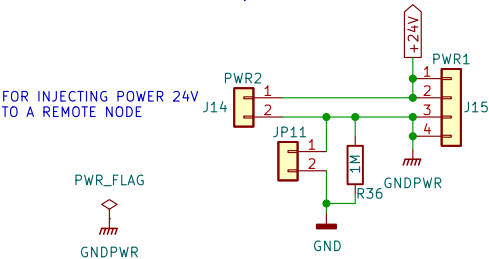
I/O DIRECT CONNECTION

CONNECTORS FOR M10CUBE
DIRECT INPUT MODULE
ON CONNECTOR JB SIGNALS
ARE SEEKING PICO PINS



+24V POWER

From my experience in industrial controllers I made this design.
Connectors caring the CANBUS will be externally mounted. We do not have the space for bulky connector on board
That is RJ45 (I have in my lad RJ45 Waterproof panel mounted to test) or M12 (CANOPEN weaterproof connector).
Then if we need to inject power there this PWR2 JST-EH 2.5mm connector will do the job
Having this solution we can be more flexible.
What do you think?



PICO 6 AXIS CNC
Licensed under the CERN OHL P 2.0 or later

WIZcube

Sheet: /CONNECTOR/
File: connector.kicad_sch

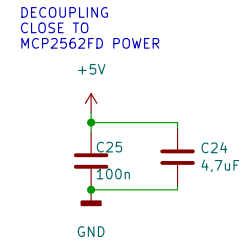
Title: M10NC02

Size: A4 Date: 2022-03-21
KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu21.10.1



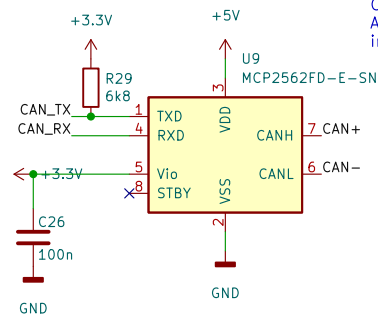
Rev: 20.0
Id: 7/9

HIGH SPEED CAN FD. Flexible Data Rate up to 5 Mbps

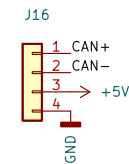


Again R802 was on Canis.
I will have a look on specs too.
May be because he needed to make
experiments without the 2518 chip

CAN controller



OPTOPNAL CANBUS TERMINATION



OSHW
GR000004

Title: M10NC02

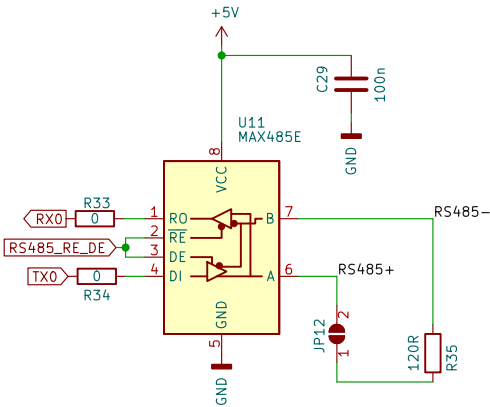
Title: M10NC02	
Size: A4	Date: 2022-03-21
KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu21.10.1	

Rev: 20.0
Id: 8/9

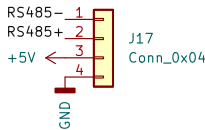
PICO 6 AXIS CNC-20.0

FOR BETTER IMUNITY INFINEON
ISL3159E CAN BE USED INSTEAD OF MAX485
WITH ±15kV IEC61000 ESD on RS-485
up to 40Mbps required by high speed PROFIBUS applications

For remote control communication with other industrial euipment (eg VFD)
isolation may be needed. Use VOM452 chip (as in spindle stage)
or better PS9821-2 (smart metering)



RS485 + POWER TO REMOTE PICO CNC



PICO 6 AXIS CNC
Licensed under the CERN OHL P 2.0 or later
WIZcube



Sheet: /RS485/
File: rs485.kicad_sch

Title: M10NC02

Size: A4 Date: 2022-03-21
KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu21.10.1

Rev: 20.0
Id: 9/9