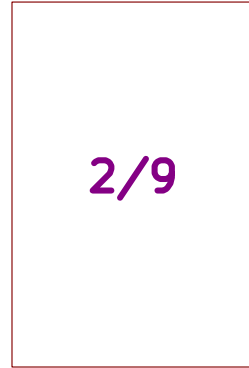


# PICO 6 AXIS CNC-20.0

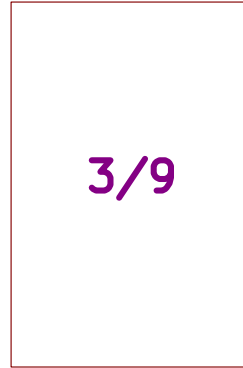
RASPI



2/9

File: raspi.kicad\_sch

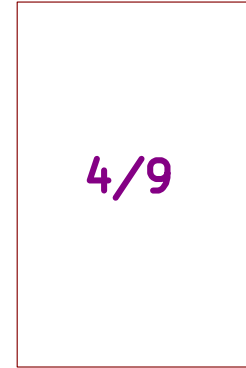
PICO



3/9

File: pico.kicad\_sch

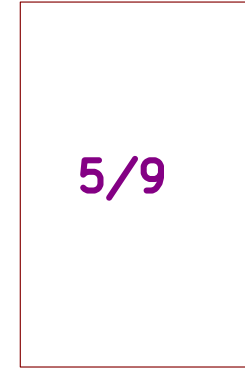
STEPSTICK



4/9

File: stepstick.kicad\_sch

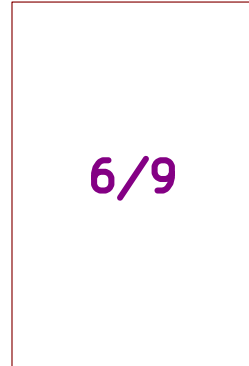
SERIAL



5/9

File: serial.kicad\_sch

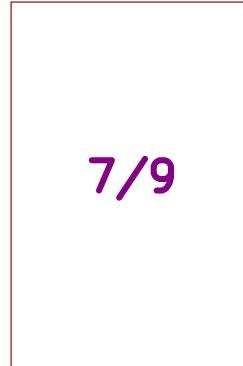
SPINDLE



6/9

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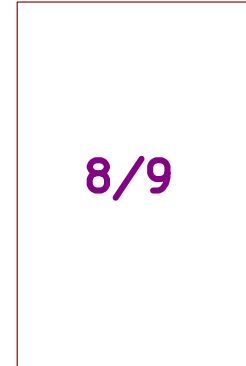
CONNECTOR



7/9

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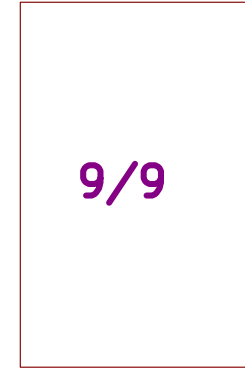
CANBUS



8/9

File: canbus.kicad\_sch

RS485



9/9

File: rs485.kicad\_sch

According to OSHA <https://www.osha.org/a-resolution-to-redefine-spi-signal-names/>

New signal names:

- SDO – Serial Data Out. An output signal on a device where data is sent out to another SPI device.
- SDI – Serial Data In. An input signal on a device where data is received from another SPI device.
- CS – Chip Select. Activated by the controller to initiate communication with a given peripheral.
- PICO (peripheral in/controller out). For devices that can be either a controller or a peripheral; the signal on which the device sends output when acting as the controller, and receives input when acting as the peripheral.
- POCI (peripheral out/controller in). For devices that can be either a controller or a peripheral; the signal on which the device receives input when acting as the controller, and sends output when acting as the peripheral.
- SDIO – Serial Data In/Out. A bi-directional serial signal.

Deprecated signal names:

- MOSI – Master Out Slave In
- MISO – Master In Slave Out
- SS – Slave Select
- MOMI – Master Out Master In
- SOSI – Slave Out Slave In

Signal names unchanged:

- SCK – Serial Clock. The clock for the bus generated by the controller.

PICO 6 AXIS CNC  
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**WIZcube**



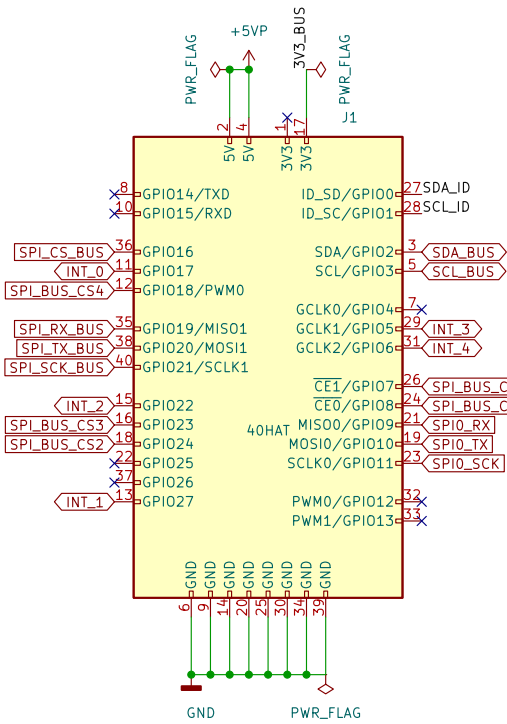
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**Title: M10NC02**

Size: A4 Date: 2022-04-10  
KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu21.10.1

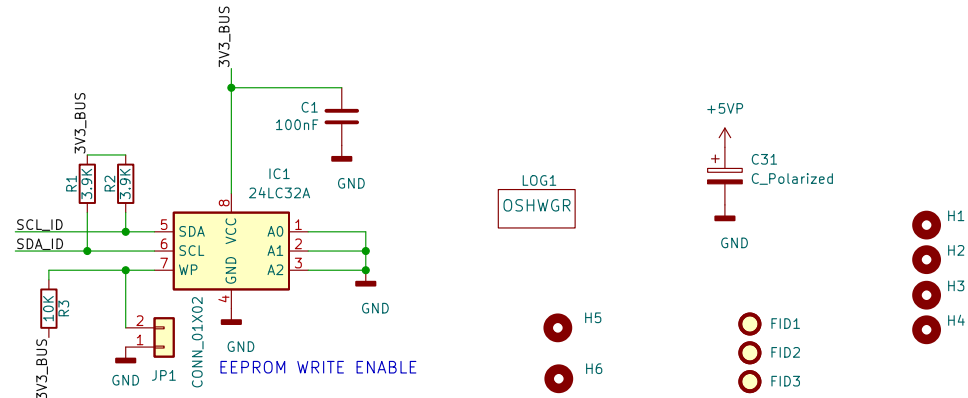
Rev: 20.0  
Id: 1/9

# RASPBERRY PI HAT STAGE-20.0



## HAT EEPROM

The HAT spec requires this EEPROM with system information to be in place in order to be called a HAT. It should be set up as write protected (WP pin held high), so it may be desirable to either put a jumper as shown to enable writing, or to hook up a spare IO pin to do so.




RASPBERRY PI HAT STAGE  
Licensed under the CERN OHL P 2.0 or later

**WIZcube**

Sheet: /RASPI/  
File: raspi.kicad\_sch

**Title: M10NC02**



**GR000004**

Size: A4	Date: 2022-04-10	Rev: 20.0
KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu21.10.1		Id: 2/9

# WIZNET PICO CLONE STAGE-20.0

README FIRST

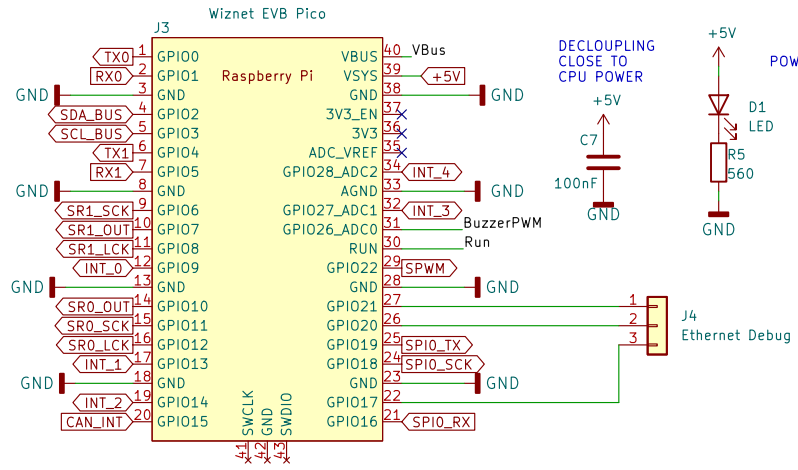
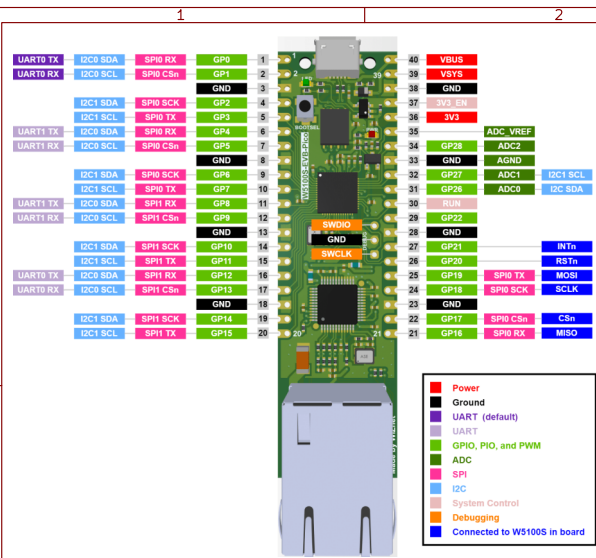
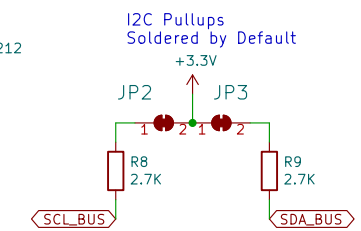
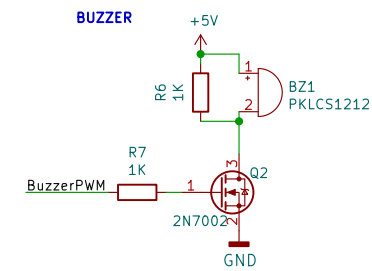
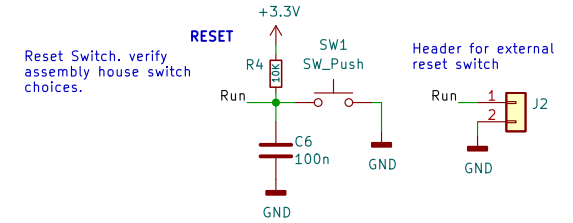
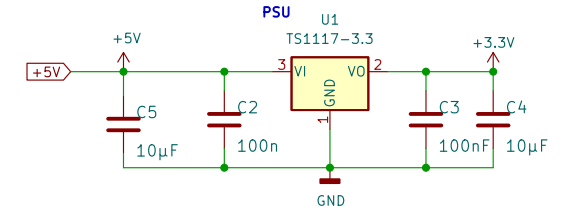
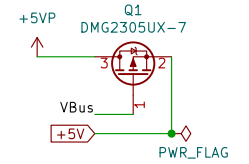
GPIO16–GPIO21 used by WIZNET  
 GPIO16, GPIO18, GPIO19 shared with WIZNET, CANBUS, SD, SPI on the BUS to control other M10 module through SPI  
 ALL have different CS pins and INTERRUPT pins

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
- SPI\_BUS\_CS0
- SPI\_BUS\_CS1
- SPI\_BUS\_CS2
- SPI\_BUS\_CS3
- SPI\_BUS\_CS4

PMOSFET to allow powering PICO 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
- 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

- 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

WIZNET PICO CLONE STAGE  
 Licensed under the CERN OHL P 2.0 or later

**WIZcube**

Sheet: /PICO/  
 File: pico.kicad\_sch

**Title: M10NC02**

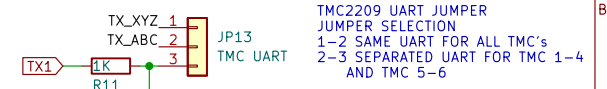
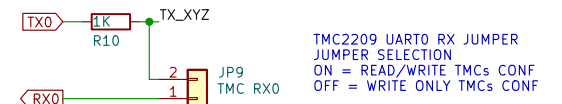
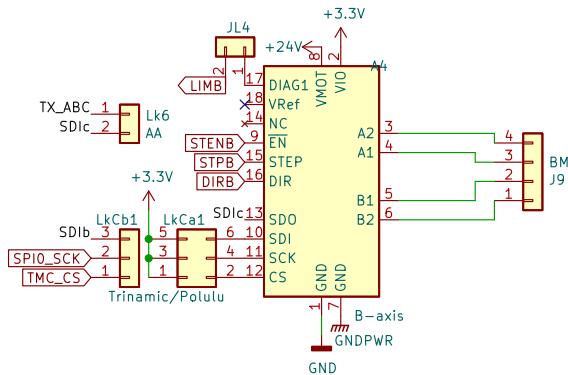
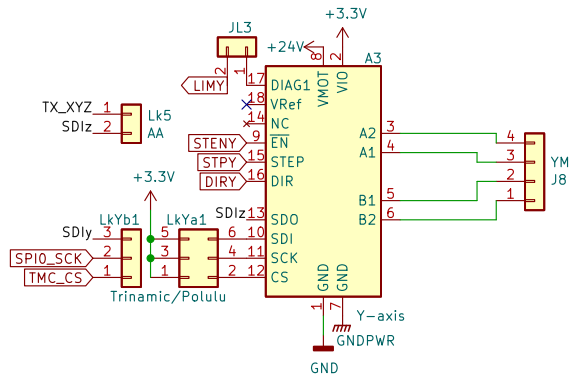
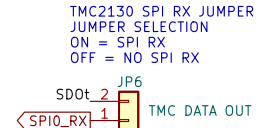
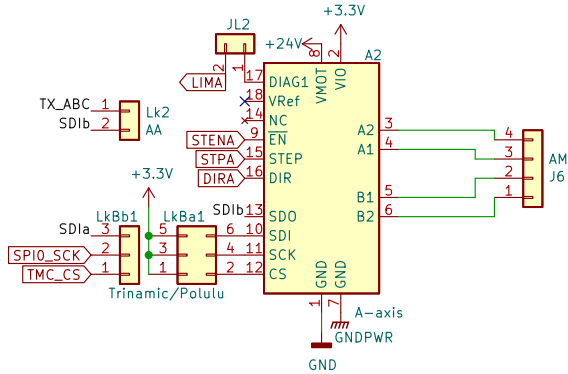
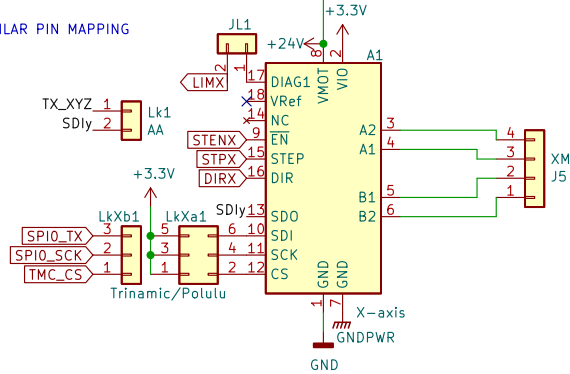
Size: A4	Date: 2022-04-10
KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu21.10.1	
Rev: 20.0	
Id: 3/9	



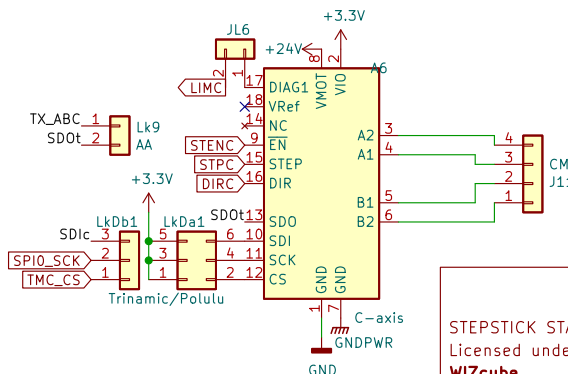
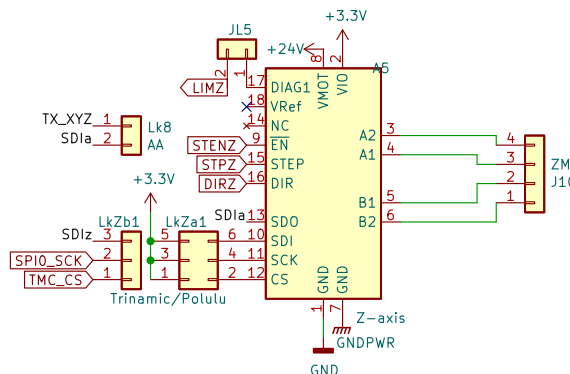
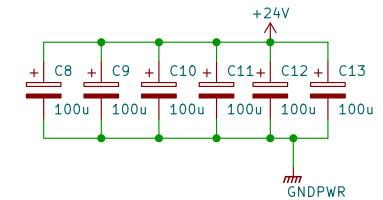
# STEPSTICK STAGE-20.0

SUPPORTED STEPSTICK:  
 A4489  
 DVR2285  
 TMC2100  
 TMC2130  
 TMC5160  
 TMC2208  
 TMC2209  
 OTHER STEPSTICK WITH SIMILAR PIN MAPPING

PWR\_FLAG  
 +3.3V  
 It is explained why that must stay in +3V3  
 and not in 3V3 BUS in page 2



EACH ONE UNDER EVERY STEPSTICK



STEPSTICK STAGE  
 Licensed under the CERN OHL P 2.0 or later



WIZcube  
 Sheet: /STEPSTICK/  
 File: stepstick.kicad\_sch

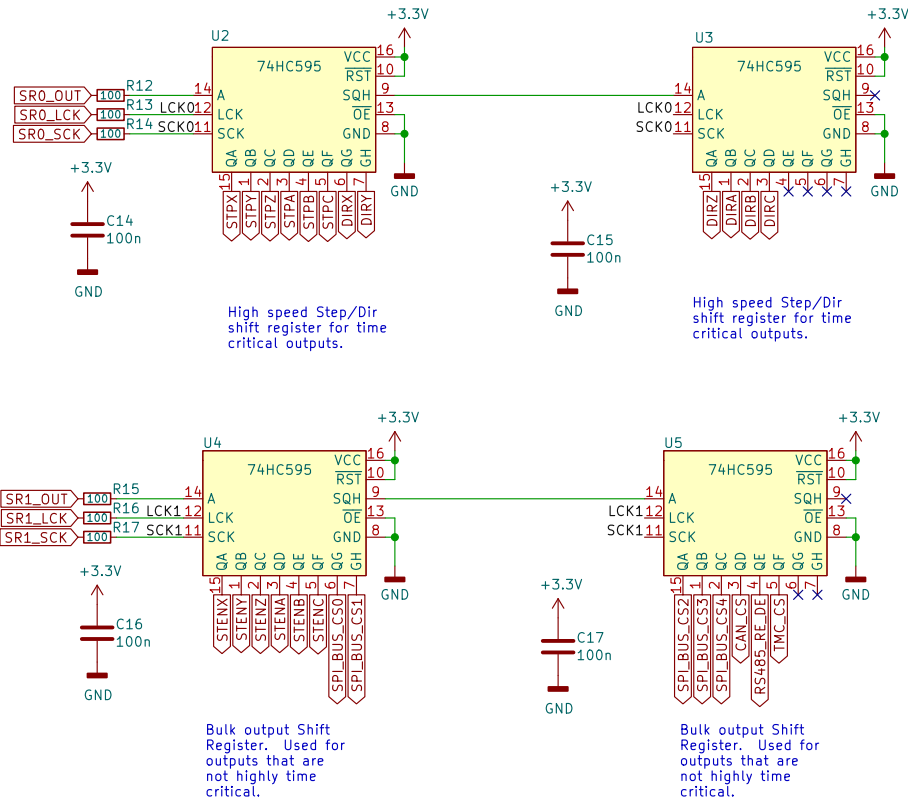
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Size: A4 Date: 2022-04-10  
 KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu21.10.1

Rev: 20.0  
 Id: 4/9

# SERIAL STAGE-20.0

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



SERIAL STAGE  
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**WIZcube**

Sheet: /SERIAL/  
File: serial.kicad\_sch

**Title: M10NC02**

Size: A4 Date: 2022-04-10  
KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu21.10.1



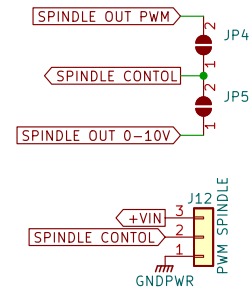
**Rev: 20.0**  
Id: 5/9

# SPINDLE STAGE-20.0

## PWM STAGE

## SPINDLE OUT PWM/0-10V

SPINDLE CONTROL  
SOLDER SELECTION  
1 0-10V  
2 PWM

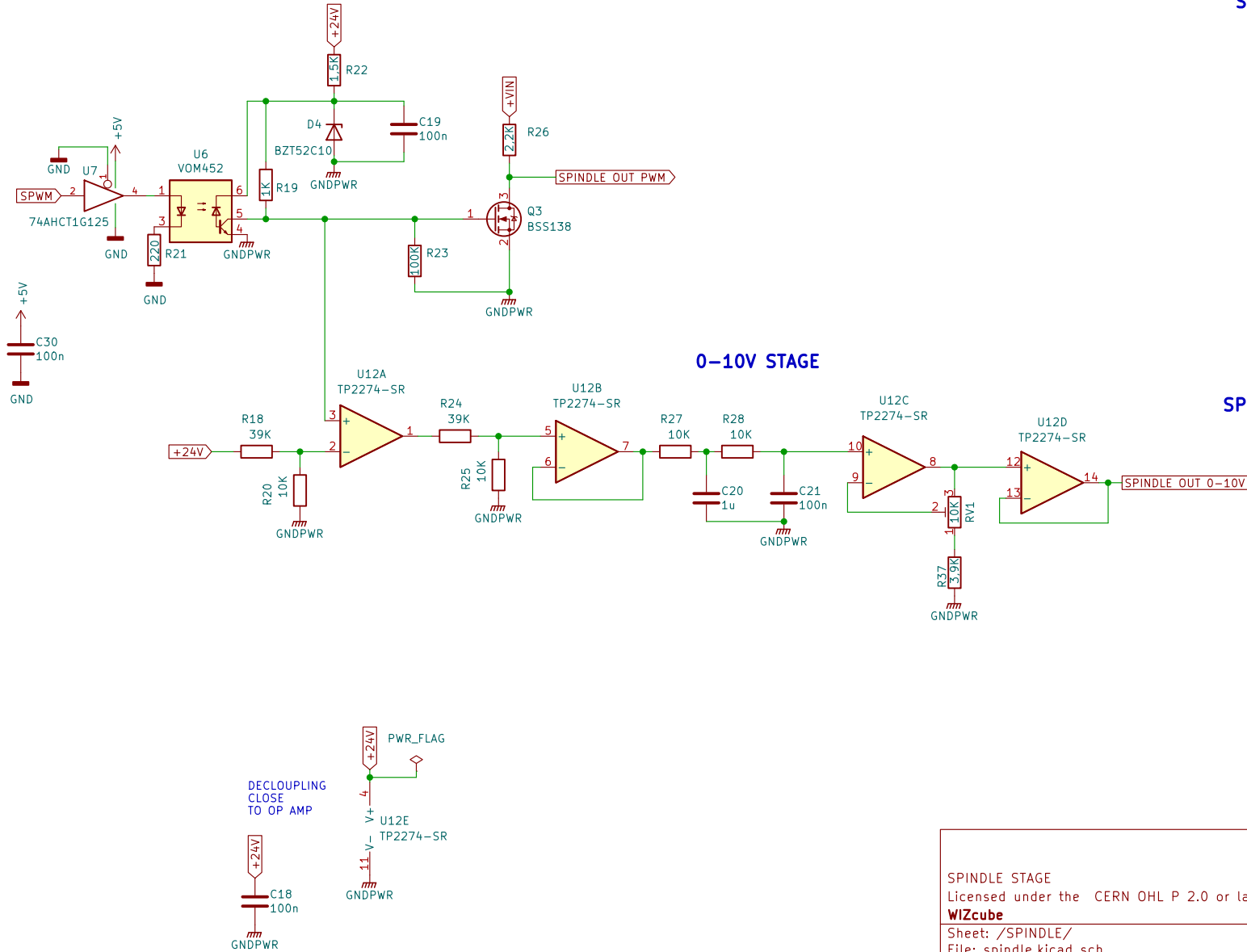


## SPINDLE POWER SUPPLY

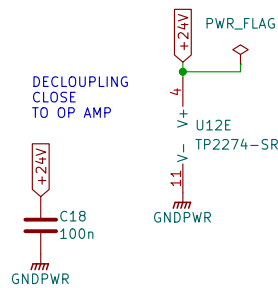
SPINDLE POWER SUPPLY  
SOLDER SELECTION  
BRIDGED +24V/GND1  
NOT BRIDGED EXT. POWER SUPPLY/GND2



## 0-10V STAGE



DECLOUPLING  
CLOSE  
TO OP AMP



SPINDLE STAGE  
Licensed under the CERN OHL P 2.0 or later

WIZcube

Sheet: /SPINDLE/  
File: spindle.kicad\_sch

Title: M10NC02

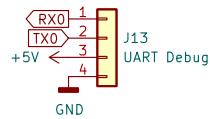
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KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu21.10.1



Rev: 20.0  
Id: 6/9

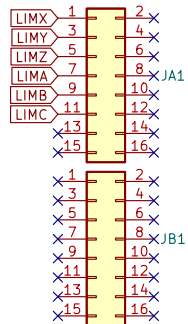
# CONNECTOR STAGE-20.0

UART DEBUG CONNECTOR



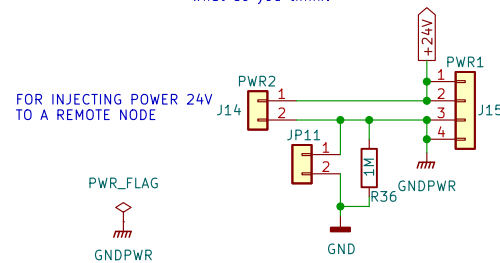
## I/O DIRECT CONNECTION

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?



CONNECTOR STAGE  
Licensed under the CERN OHL P 2.0 or later



Sheet: /CONNECTOR/  
File: connector.kicad\_sch

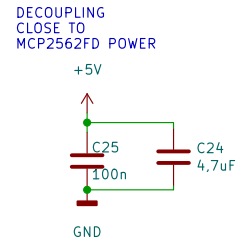
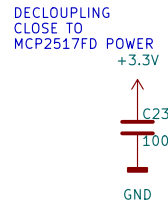
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Size: A4 Date: 2022-04-10  
KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu21.10.1

Rev: 20.0  
Id: 7/9

# CAN BUS STAGE-20.0

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

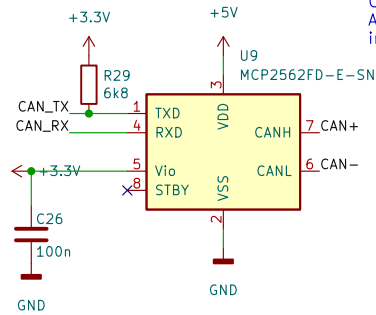
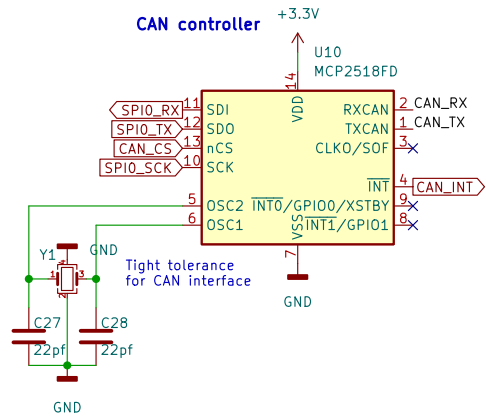


Test point connector removed. Not needed.

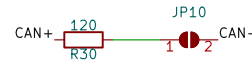
Again R802 was on Canis.  
I will have a look on specs too.  
May be because he needed to make  
experiments without the 2518 chip

CAN transceiver  
Chip MCP2562FD contains Protection  
Against High-Voltage Transients  
in Automotive Environments

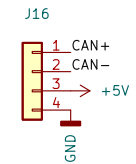
## CAN controller



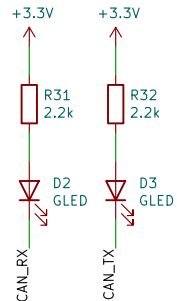
## OPTOPNAL CANBUS TERMINATION



A simplified version is placed with this JST-PH 2mm connector.  
In any case if we need to inject +24V power it can be done  
in combination with PWR2 connector  
These two combined will bring all signals to an external RJ45 or M12 connector  
according to Libresollar (RJ45) or CANOPEN (M12) standard.  
Have in mind that two connectors may axis to daisy chain.  
But in most cases the T approach is used. That way the communication  
will not brake when a node is removed.  
We can do both by havig the above approach and we see.  
There is always a revision in future time



## CAN indicator LEDs



CAN BUS STAGE  
Licensed under the CERN OHL P 2.0 or later

WIZcube

Sheet: /CANBUS/  
File: canbus.kicad\_sch

Title: M10NC02

Size: A4 Date: 2022-04-10  
KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu21.10.1



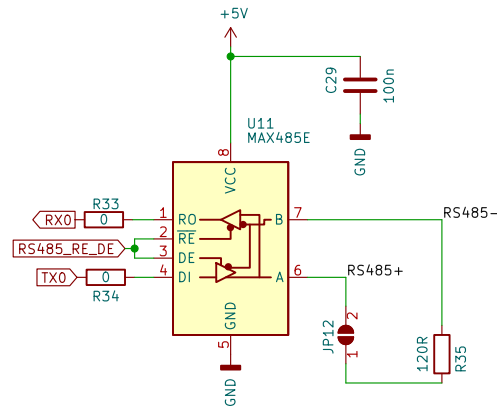
Rev: 20.0  
Id: 8/9



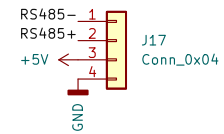
# RS485 STAGE-20.0

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



RS485 STAGE  
 Licensed under the CERN OHL P 2.0 or later

**WIZcube**

Sheet: /RS485/  
 File: rs485.kicad\_sch

**Title: M10NC02**

Size: A4 Date: 2022-04-10  
 KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu21.10.1



**Rev: 20.0**  
 Id: 9/9