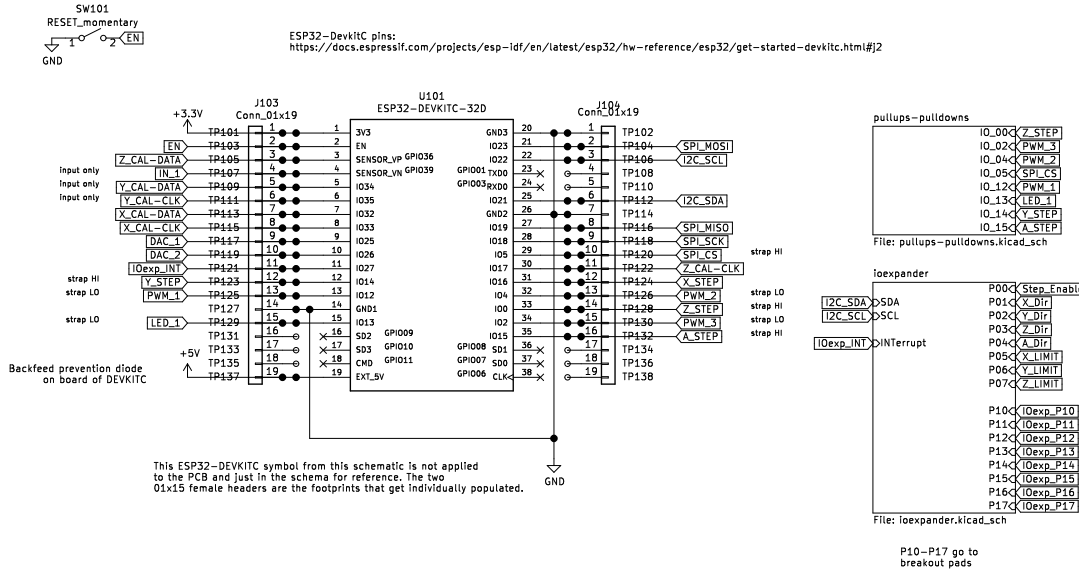
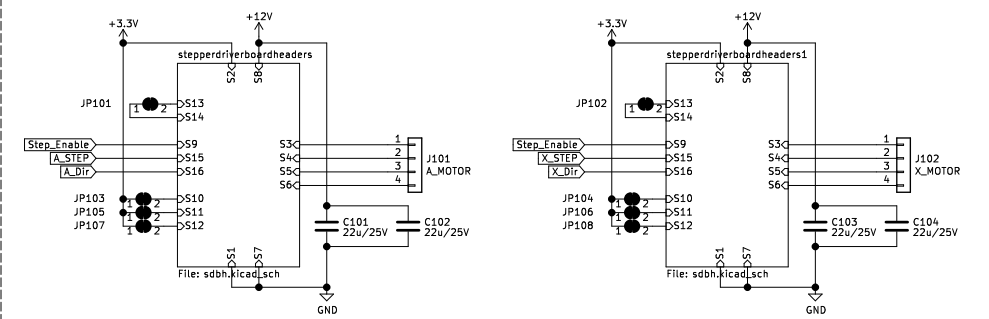


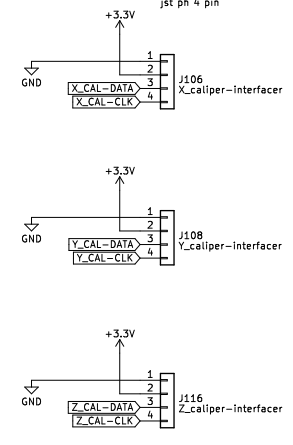
ESP32 Microcontroller + I/O expander chip



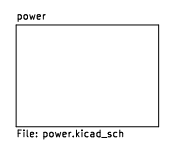
Stepper motor drivers



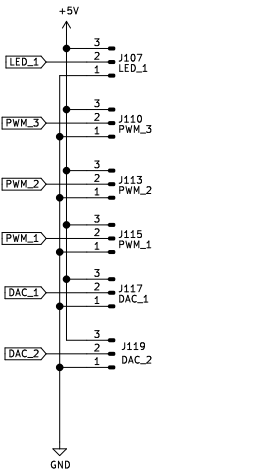
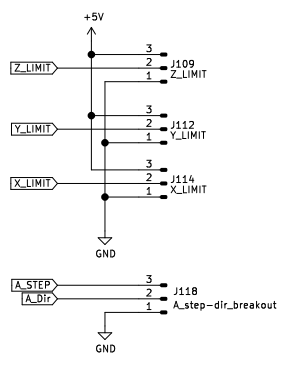
Digital caliper connectors



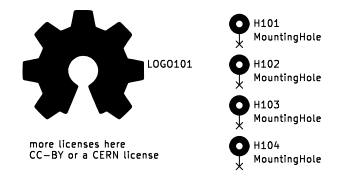
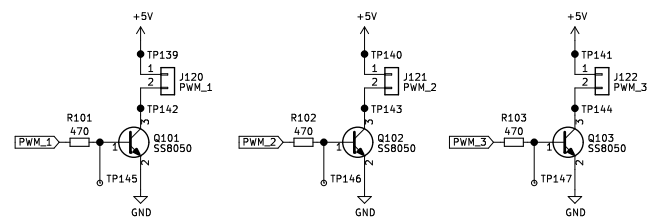
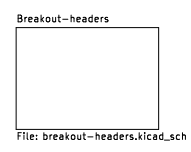
Power input, indicators, converters



Pin Headers



Breakout pads and testpoints



S1D $\frac{1}{\leftarrow}$
 S2D $\frac{2}{\leftarrow}$
 S3D $\frac{3}{\leftarrow}$
 S4D $\frac{4}{\leftarrow}$ J201
 S5D $\frac{5}{\leftarrow}$ stepper-module_pins-1-8
 S6D $\frac{6}{\leftarrow}$
 S7D $\frac{7}{\leftarrow}$
 S8D $\frac{8}{\leftarrow}$

 S16D $\frac{1}{\leftarrow}$
 S15D $\frac{2}{\leftarrow}$
 S14D $\frac{3}{\leftarrow}$
 S13D $\frac{4}{\leftarrow}$ J202
 S12D $\frac{5}{\leftarrow}$ stepper-module_pins-16-9
 S11D $\frac{6}{\leftarrow}$
 S10D $\frac{7}{\leftarrow}$
 S9D $\frac{8}{\leftarrow}$

S1D TP201 TestPoint_Small	S16D TP202 TestPoint_Small
S2D TP203 TestPoint_Small	S15D TP204 TestPoint_Small
S3D TP205 TestPoint_Small	S14D TP206 TestPoint_Small
S4D TP207 TestPoint_Small	S13D TP208 TestPoint_Small
S5D TP209 TestPoint_Small	S12D TP210 TestPoint_Small
S6D TP211 TestPoint_Small	S11D TP212 TestPoint_Small
S7D TP213 TestPoint_Small	S10D TP214 TestPoint_Small
S8D TP215 TestPoint_Small	S9D TP216 TestPoint_Small

S1D $\frac{1}{\leftarrow}$
 S2D $\frac{2}{\leftarrow}$
 S3D $\frac{3}{\leftarrow}$
 S4D $\frac{4}{\leftarrow}$ J301
 S5D $\frac{5}{\leftarrow}$ stepper-module_pins-1-8
 S6D $\frac{6}{\leftarrow}$
 S7D $\frac{7}{\leftarrow}$
 S8D $\frac{8}{\leftarrow}$

 S16D $\frac{1}{\leftarrow}$
 S15D $\frac{2}{\leftarrow}$
 S14D $\frac{3}{\leftarrow}$
 S13D $\frac{4}{\leftarrow}$ J302
 S12D $\frac{5}{\leftarrow}$ stepper-module_pins-16-9
 S11D $\frac{6}{\leftarrow}$
 S10D $\frac{7}{\leftarrow}$
 S9D $\frac{8}{\leftarrow}$

S1D TP301 TestPoint_Small	S16D TP302 TestPoint_Small
S2D TP303 TestPoint_Small	S15D TP304 TestPoint_Small
S3D TP305 TestPoint_Small	S14D TP306 TestPoint_Small
S4D TP307 TestPoint_Small	S13D TP308 TestPoint_Small
S5D TP309 TestPoint_Small	S12D TP310 TestPoint_Small
S6D TP311 TestPoint_Small	S11D TP312 TestPoint_Small
S7D TP313 TestPoint_Small	S10D TP314 TestPoint_Small
S8D TP315 TestPoint_Small	S9D TP316 TestPoint_Small

S1D $\frac{1}{2}$ ←
 S2D $\frac{2}{3}$ ←
 S3D $\frac{3}{4}$ ←
 S4D $\frac{4}{5}$ ← J401
 S5D $\frac{5}{6}$ ← stepper-module_pins-1-8
 S6D $\frac{6}{7}$ ←
 S7D $\frac{7}{8}$ ←
 S8D $\frac{8}{9}$ ←

 S16D $\frac{1}{2}$ ←
 S15D $\frac{2}{3}$ ←
 S14D $\frac{3}{4}$ ←
 S13D $\frac{4}{5}$ ← J402
 S12D $\frac{5}{6}$ ← stepper-module_pins-16-9
 S11D $\frac{6}{7}$ ←
 S10D $\frac{7}{8}$ ←
 S9D $\frac{8}{9}$ ←

S1D	TP401 TestPoint_Small	S16D	TP402 TestPoint_Small
S2D	TP403 TestPoint_Small	S15D	TP404 TestPoint_Small
S3D	TP405 TestPoint_Small	S14D	TP406 TestPoint_Small
S4D	TP407 TestPoint_Small	S13D	TP408 TestPoint_Small
S5D	TP409 TestPoint_Small	S12D	TP410 TestPoint_Small
S6D	TP411 TestPoint_Small	S11D	TP412 TestPoint_Small
S7D	TP413 TestPoint_Small	S10D	TP414 TestPoint_Small
S8D	TP415 TestPoint_Small	S9D	TP416 TestPoint_Small

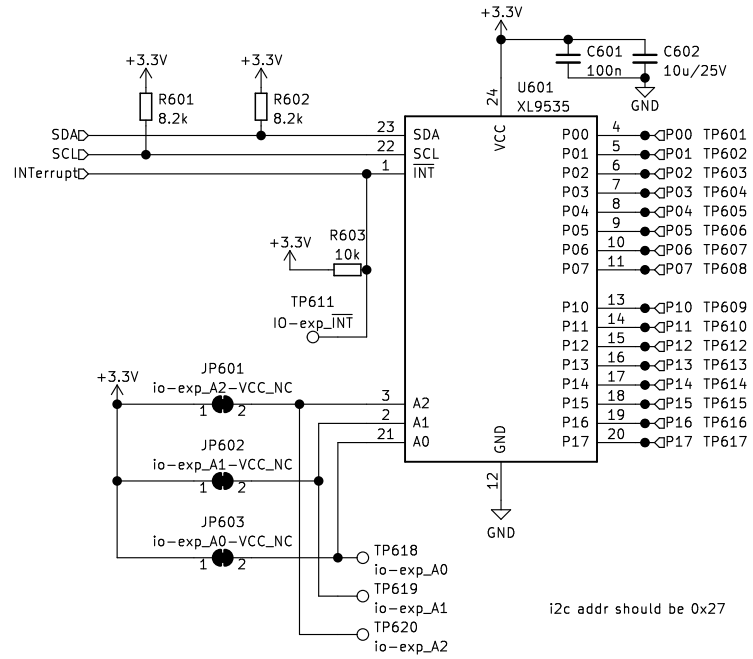
S1D $\frac{1}{\leftarrow}$
 S2D $\frac{2}{\leftarrow}$
 S3D $\frac{3}{\leftarrow}$
 S4D $\frac{4}{\leftarrow}$ J501
 S5D $\frac{5}{\leftarrow}$ stepper-module_pins-1-8
 S6D $\frac{6}{\leftarrow}$
 S7D $\frac{7}{\leftarrow}$
 S8D $\frac{8}{\leftarrow}$

 S16D $\frac{1}{\leftarrow}$
 S15D $\frac{2}{\leftarrow}$
 S14D $\frac{3}{\leftarrow}$
 S13D $\frac{4}{\leftarrow}$ J502
 S12D $\frac{5}{\leftarrow}$ stepper-module_pins-16-9
 S11D $\frac{6}{\leftarrow}$
 S10D $\frac{7}{\leftarrow}$
 S9D $\frac{8}{\leftarrow}$

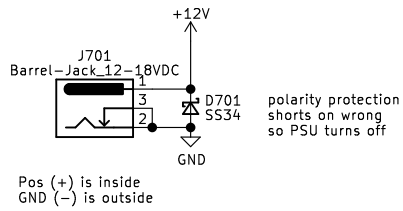
S1D TP501 TestPoint_Small	S16D TP502 TestPoint_Small
S2D TP503 TestPoint_Small	S15D TP504 TestPoint_Small
S3D TP505 TestPoint_Small	S14D TP506 TestPoint_Small
S4D TP507 TestPoint_Small	S13D TP508 TestPoint_Small
S5D TP509 TestPoint_Small	S12D TP510 TestPoint_Small
S6D TP511 TestPoint_Small	S11D TP512 TestPoint_Small
S7D TP513 TestPoint_Small	S10D TP514 TestPoint_Small
S8D TP515 TestPoint_Small	S9D TP516 TestPoint_Small

ESPHome: PCF8574 component looks compatible (PCF8575: true for 16-pin)

Per pin:
Source current: 10 mA
Sink current: 25 mA (max. 100 mA in each octal)

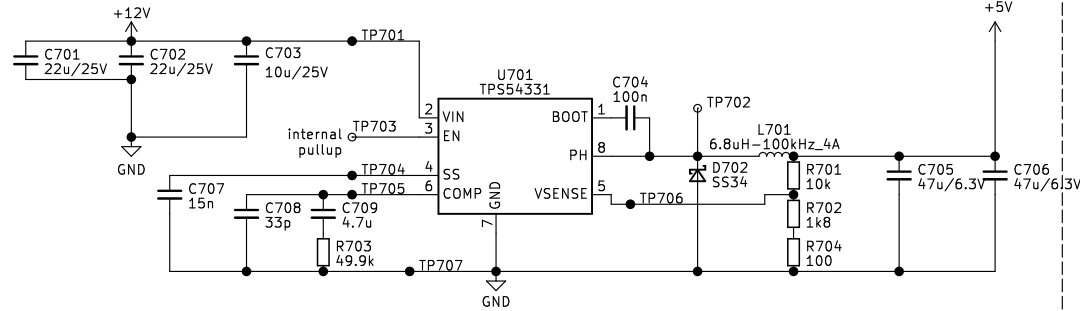


12-18V input



12V -> 5V

need: 3 A
25 LEDs: 1.5 A
ESP: 0.8 A
calipers

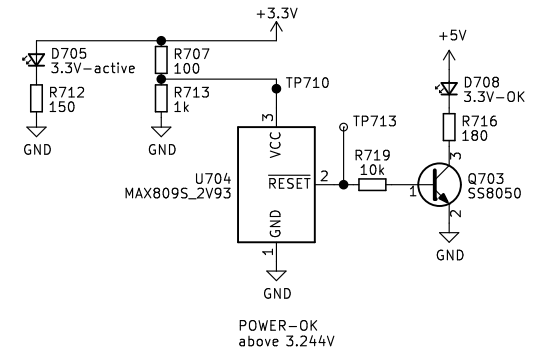
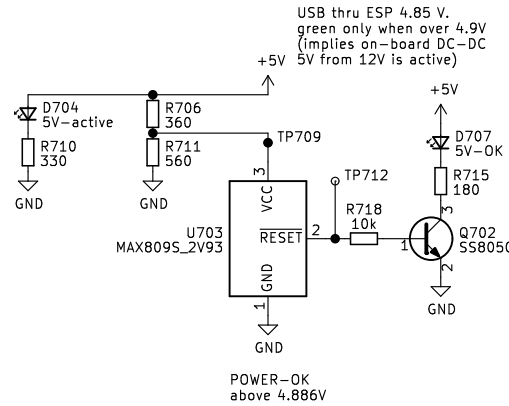
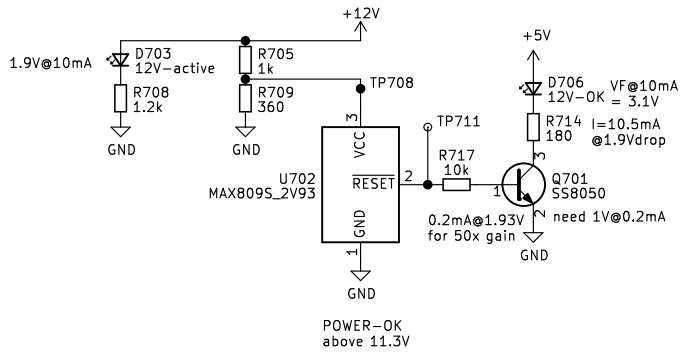


5V -> 3.3V
(or get from ESP)

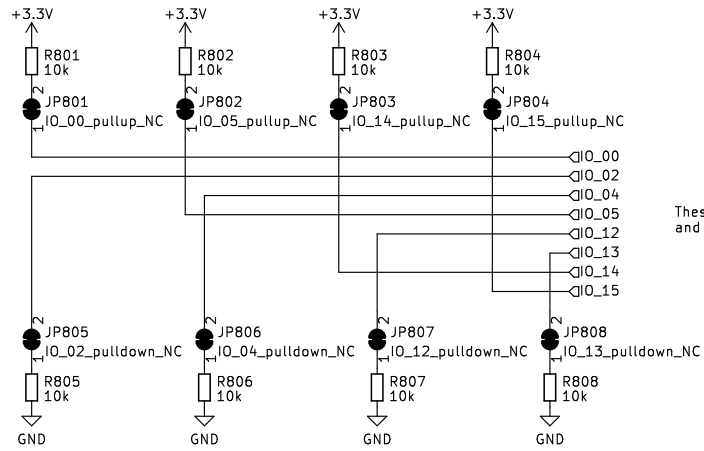
Yes, from ESP's AMS1117 (1A output)

165 mA i/o-exp
500 mA ESP32-WROOM-32
14 mA CP2102N USB TTL
32 mA 4x A4988 stepperdrivers (less for TMC2225 et al.)

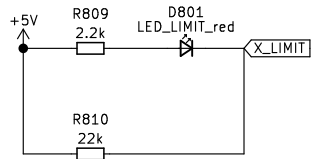
Voltage-OK LEDs



To find values for voltage dividers:
Play around with the calculator "under load" with Load of 2.93V/0.0002A=14650R.
For each side, try R values between 100-1k from E series table.
<https://www.digikey.com/en/resources/conversion-calculators/conversion-calculator-voltage-divider>



These pullups/pulldowns ensure that strapping pins are at correct levels at startup, and more resistant to connected devices (and their pullups/downs).



The LIMIT global labels are also connected to the I/O expander directly, and the limit switches directly. This circuit pulls-up the io-expander pins when the LIMIT-switches are open. When they close, X_LIMIT gets shorted to ground resulting in LOW on IO-exp and lit LED. To light the LED from software, set IO-exp pin to output LOW.

