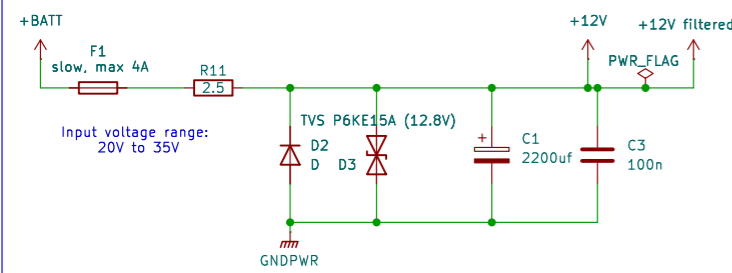
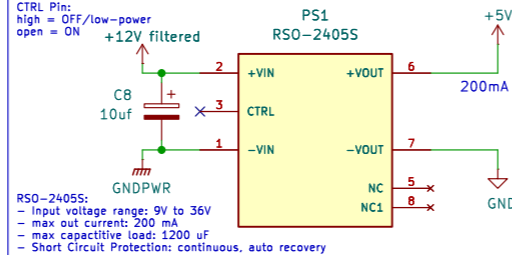


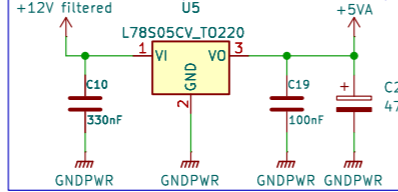
12V Supply (voltage filter)



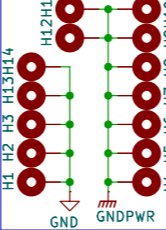
5V Isolated Supply (dc-dc converter)



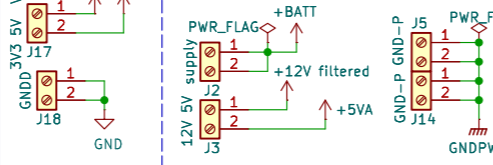
5V Supply (linear regulator)



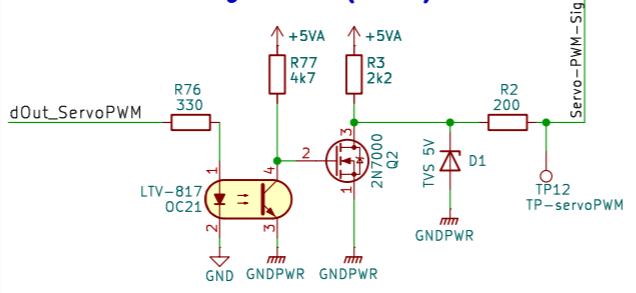
Mountholes



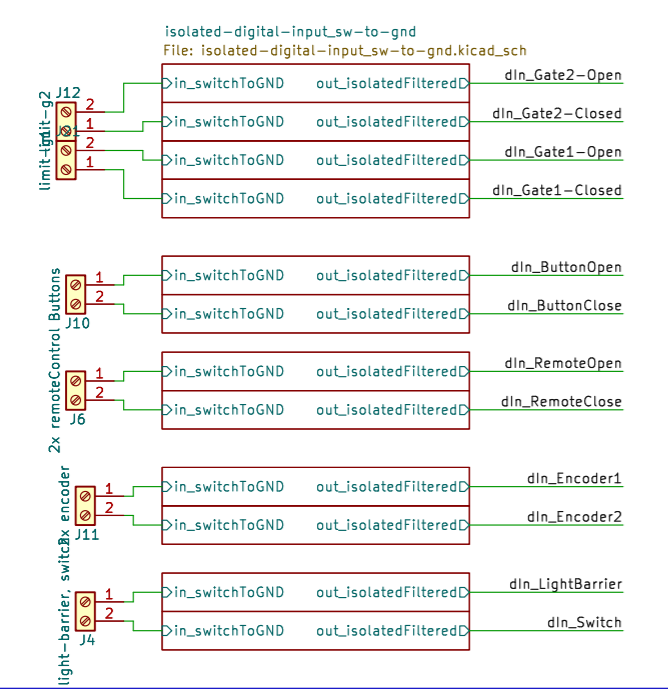
Power terminals



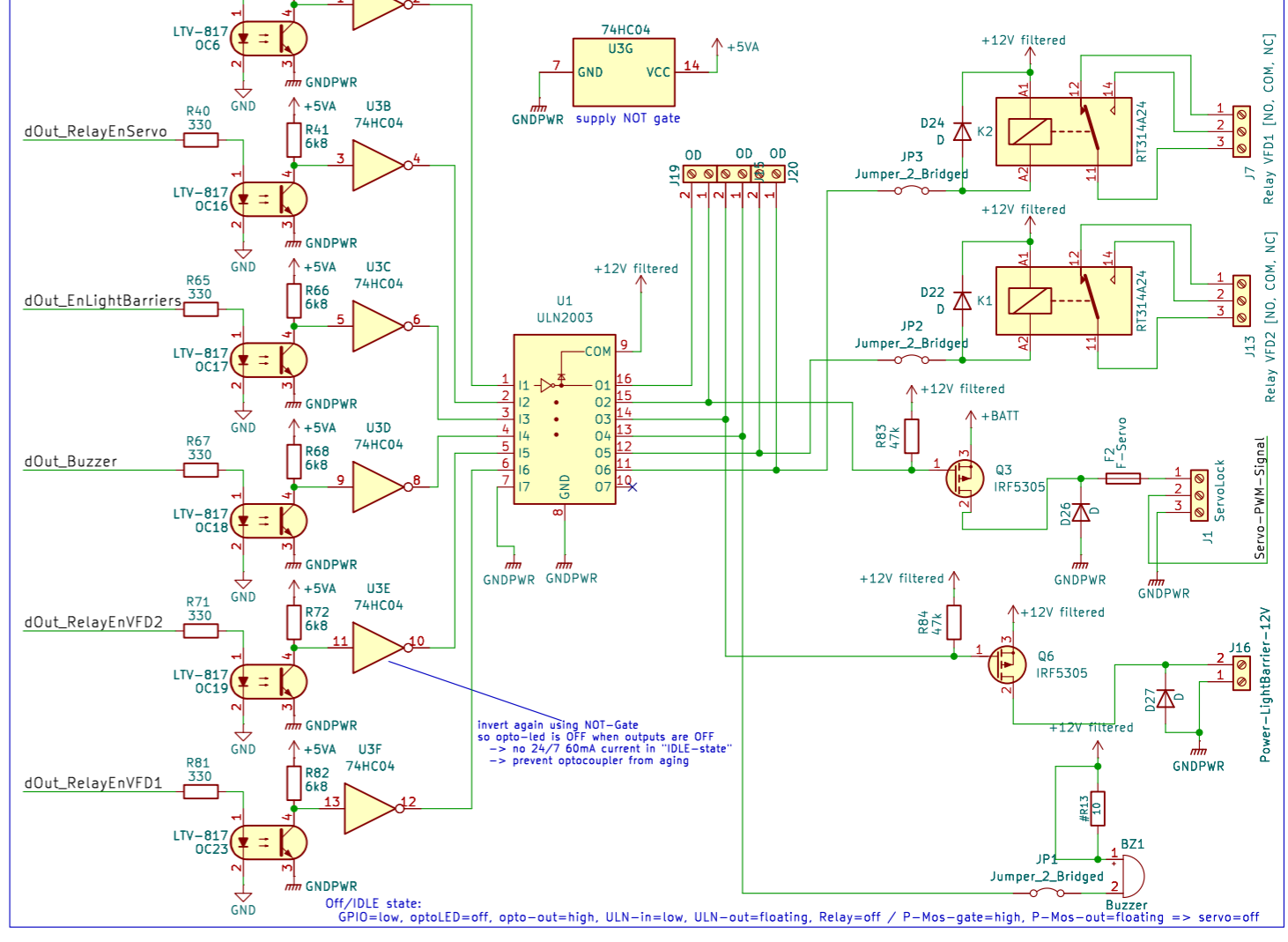
Isolated PWM Signal out (Servo)



Digital inputs (switch to GND, 12V pullup)



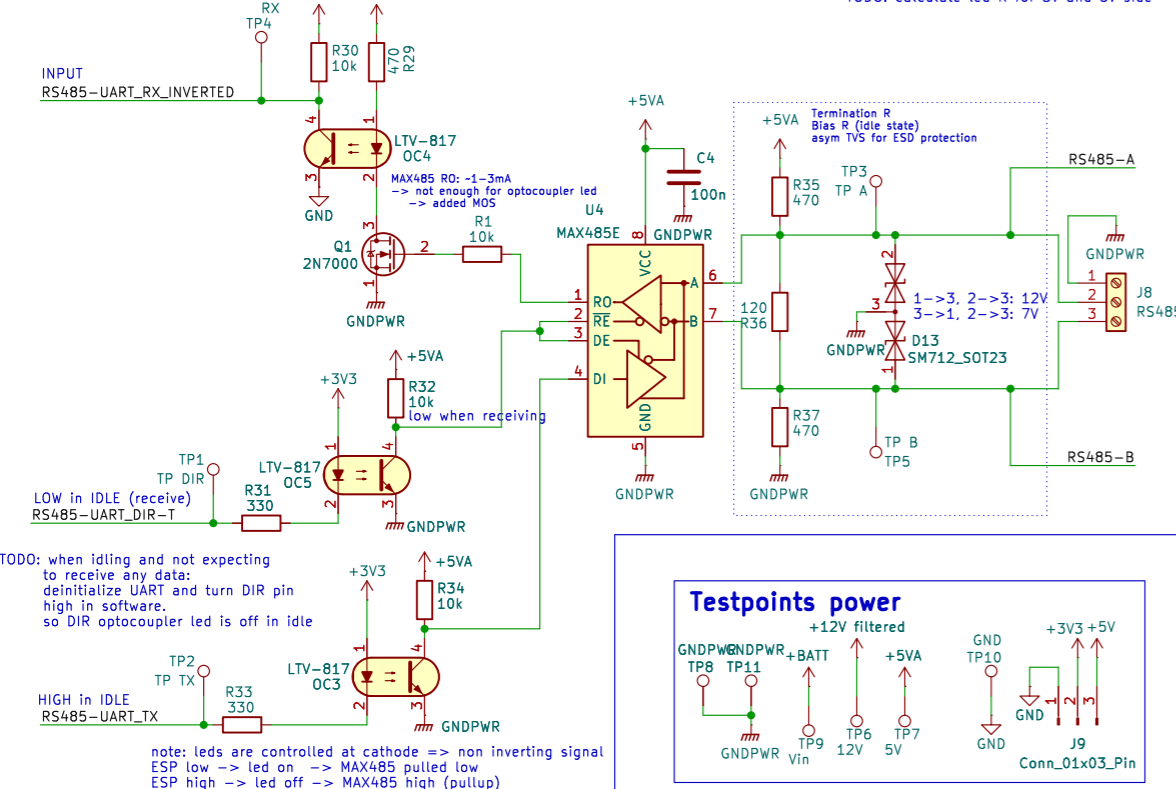
DIGITAL OUTPUTS – 5x open drain + 2x Relay, 2x high-side, Buzzer (VFD supply, Servo supply, LightBarrier supply, led, buzzer)



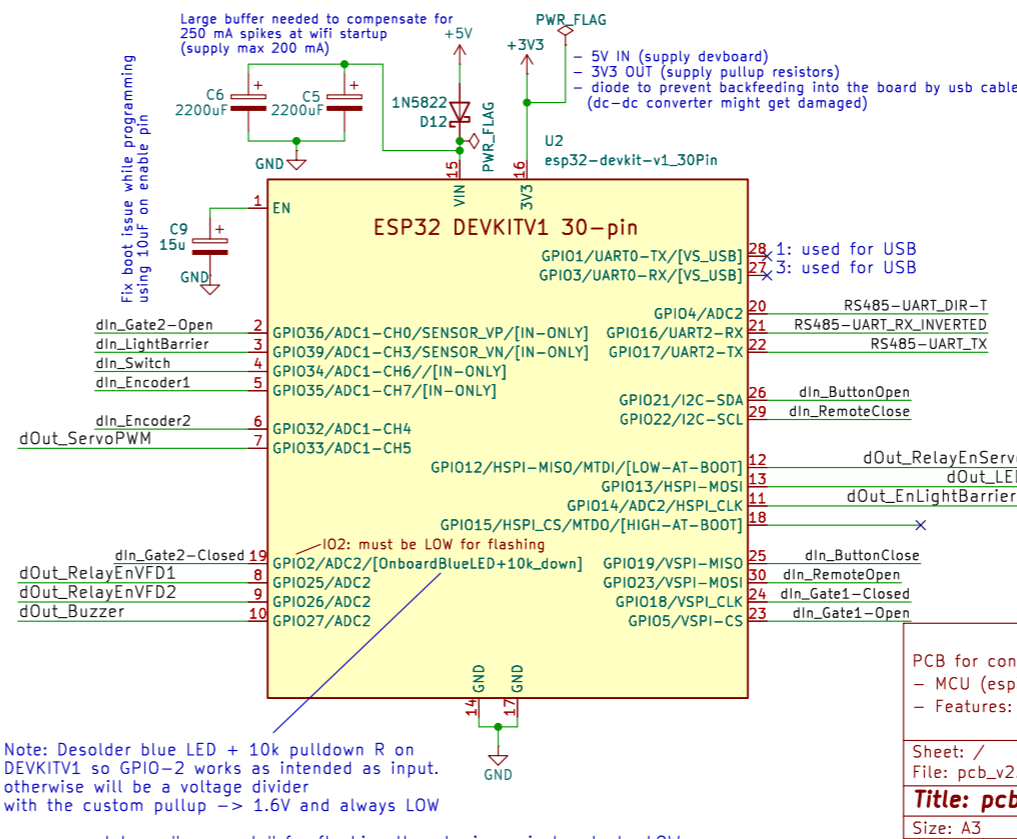
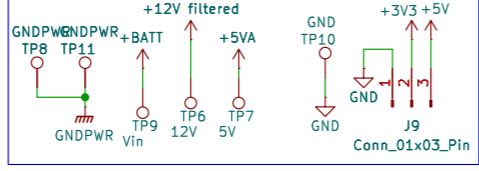
Invert again using NOT-Gate so opto-led is OFF when outputs are OFF
 -> no 24/7 60mA current in "IDLE-state"
 -> prevent optocoupler from aging

Off/IDLE state:
 GPIO=low, optoLED=off, opto-out=high, ULN-in=low, ULN-out=floating, Relay=off / P-Mos-gate=high, P-Mos-out=floating => servo=off

UART <-> RS485



Testpoints power



Note: Desolder blue LED + 10k pull-down R on DEVKITV1 so GPIO-2 works as intended as input. otherwise will be a voltage divider with the custom pullup -> 1.6V and always LOW

remove module or "open gate" for flashing though since pin has to be LOW

Changelog since Tag "pcb-for-V2-milled":

- Swap gpio assignment for limit-switches to match the engraved text
- Add note about GPIO-2 (issues with using it as input)

TODO Next version:

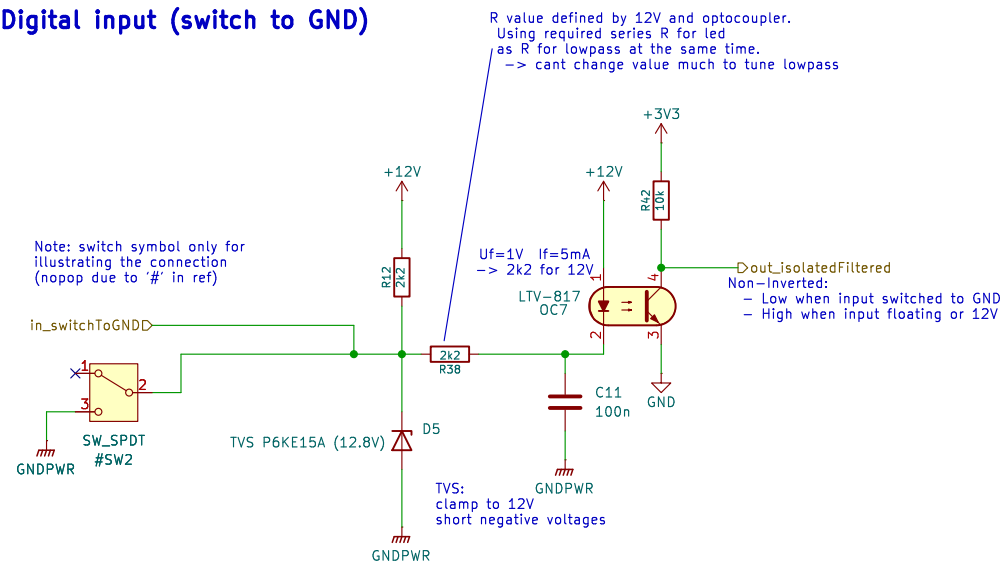
- [] re-assign pins: use GPIO-2 as output instead of input due to onboard led and pulldown plus it has to be LOW when flashing

TODO Pre-milling

- [x] test if light barriers pull down when obstructed or free -> DONE: they pull to GND when obstructed -> no circuit necessary, connect both in parallel
- [x] measure light barrier standby current, if high add circuit to enable only when closing -> DONE: Photoelectric switch 12-24V NPN version <https://www.aliexpress.com/item/1005001615723145.html>
 - current when obstructed: 6mA
 - current when continuous: <1mA (0.000A)
 - pulls low when obstructed
 - wires: brown=12V, blue=GND, black=collector
- > circuit for cutting power added anyways
- [x] test esp32 board with isolated supply + diode
 - when starting wifi at boot draws ~250 mA power insufficient -> boot loop
 - when adding 2 x 2200 uF C after diode to buffer the peak it works reliably
 - when running with wifi on draws ~125 mA continuous
 - => add additional C (done) + prepare footprint for second DC DC converter in parallel?
- [x] test digital input circuit (lowpass+optocoupler work?)
 - works well, lowpass turning off (open switch, pulls up to 12V) is faster than expected though due to RC charging up over led, see notes schematic sub-sheet
- [x] test / evaluate optocoupler LED R with 3v3 => 330 Ohm -> 5 mA

PCB for controlling a custom sliding gate:
 - MCU (esp32) fully isolated due to extreme EMI from near VFDs and long cables
 - Features: RS485, 12x digital-in, 6x openDrain-out (2x PMOS 12V, 2x Relay, 1x Buzzer)

Digital input (switch to GND)



Notes made during testing this circuit:

- Lowpass is extremely asymmetric due to C additionally directly charging up over optocoupler led.
-> better split R into two (one part between C and LED as well)?
- R_filter = 3k3, C = 10uF:
 - 3.8ms delay turning on (switch closes to GND)
 - 0.1ms delay turning off (switch opens)
- R = 2k2, C = 10uF
 - 2.5ms delay turning on
 - 0.5ms delay turning off
- switch bouncing is filtered well when using >= 1uF

Sheet: /isolated-digital-input_sw-to-gnd/
File: isolated-digital-input_sw-to-gnd.kicad_sch

Title:

Size: A4

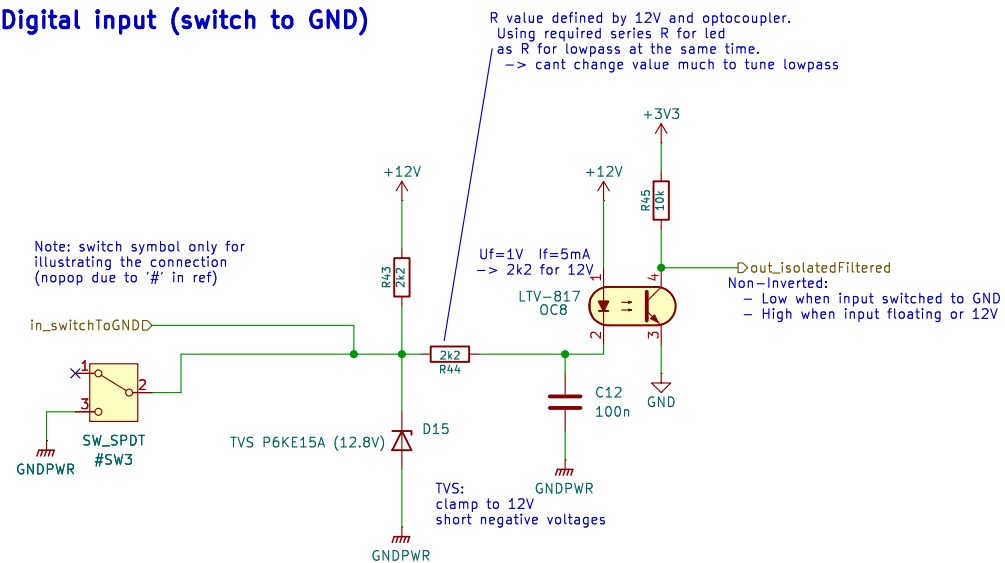
Date:

KiCad E.D.A. 8.0.7

Rev:

Id: 2/13

Digital input (switch to GND)



Notes made during testing this circuit:

- Lowpass is extremely asymmetric due to C additionally directly charging up over optocoupler led.
-> better split R into two (one part between C and LED as well)?
- R_filter = 3k3, C = 10uF:
 - 3.8ms delay turning on (switch closes to GND)
 - 0.1ms delay turning off (switch opens)
- R = 2k2, C = 10uF
 - 2.5ms delay turning on
 - 0.5ms delay turning off
- switch bouncing is filtered well when using >= 1uF

Sheet: /isolated-digital-input_sw-to-gnd1/
File: isolated-digital-input_sw-to-gnd.kicad_sch

Title:

Size: A4

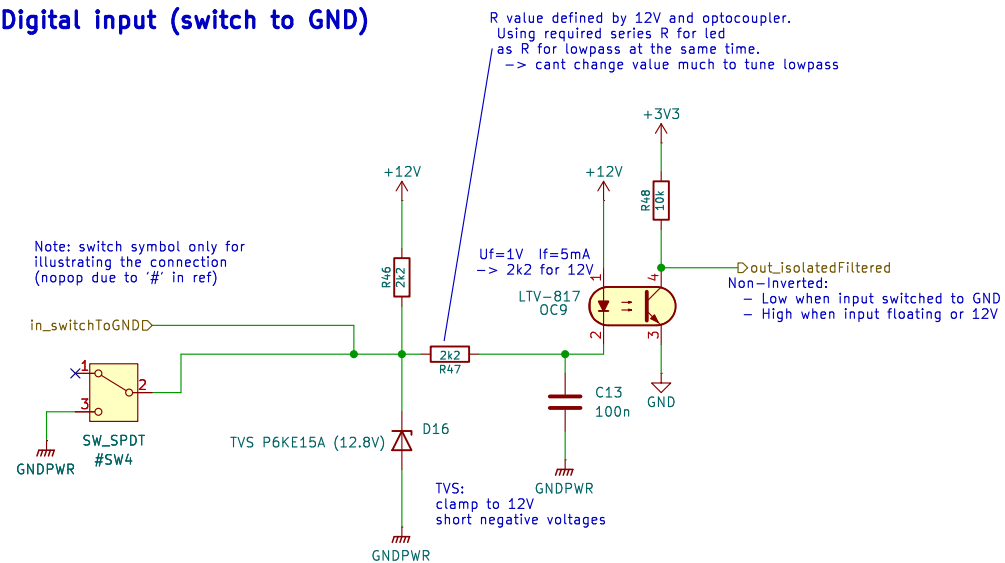
Date:

KiCad E.D.A. 8.0.7

Rev:

Id: 3/13

Digital input (switch to GND)



Notes made during testing this circuit:

- Lowpass is extremely asymmetric due to C additionally directly charging up over optocoupler led.
-> better split R into two (one part between C and LED as well)?
- R_filter = 3k3, C = 10uF:
 - 3.8ms delay turning on (switch closes to GND)
 - 0.1ms delay turning off (switch opens)
- R = 2k2, C = 10uF
 - 2.5ms delay turning on
 - 0.5ms delay turning off
- switch bouncing is filtered well when using >= 1uF

Sheet: /isolated-digital-input_sw-to-gnd2/
File: isolated-digital-input_sw-to-gnd.kicad_sch

Title:

Size: A4

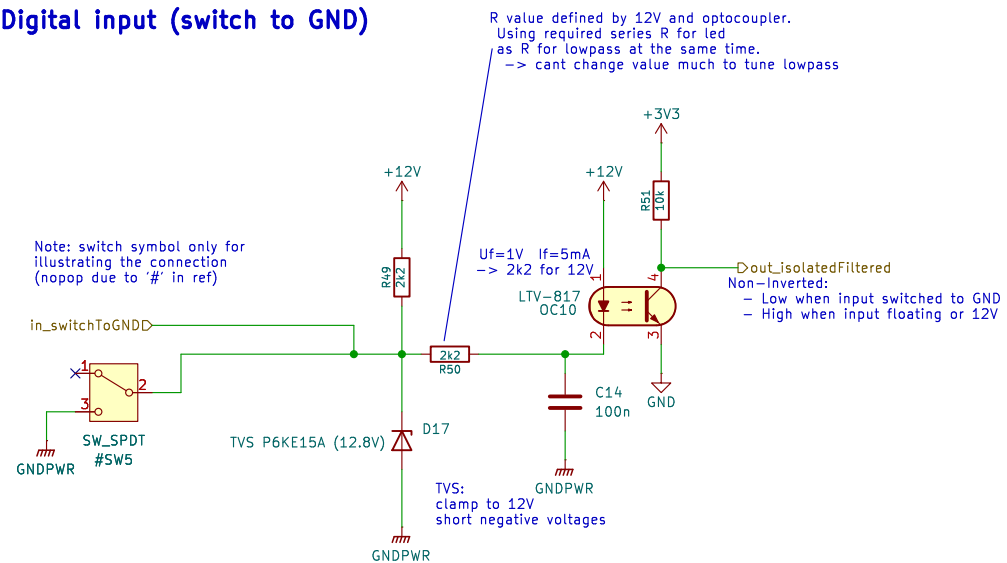
Date:

KiCad E.D.A. 8.0.7

Rev:

Id: 4/13

Digital input (switch to GND)



Notes made during testing this circuit:

- Lowpass is extremely asymmetric due to C additionally directly charging up over optocoupler led.
-> better split R into two (one part between C and LED as well)?
- R_filter = 3k3, C = 10uF:
 - 3.8ms delay turning on (switch closes to GND)
 - 0.1ms delay turning off (switch opens)
- R = 2k2, C = 10uF
 - 2.5ms delay turning on
 - 0.5ms delay turning off
- switch bouncing is filtered well when using >= 1uF

Sheet: /isolated-digital-input_sw-to-gnd3/
File: isolated-digital-input_sw-to-gnd.kicad_sch

Title:

Size: A4

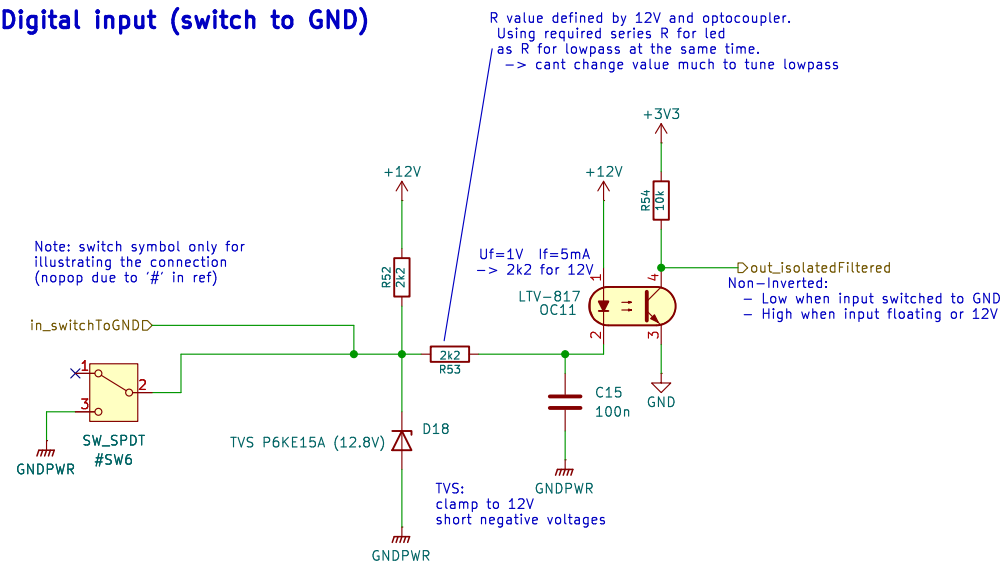
Date:

KiCad E.D.A. 8.0.7

Rev:

Id: 5/13

Digital input (switch to GND)



Notes made during testing this circuit:

- Lowpass is extremely asymmetric due to C additionally directly charging up over optocoupler led.
-> better split R into two (one part between C and LED as well?)
- R_filter = 3k3, C = 10uF:
 - 3.8ms delay turning on (switch closes to GND)
 - 0.1ms delay turning off (switch opens)
- R = 2k2, C = 10uF
 - 2.5ms delay turning on
 - 0.5ms delay turning off
- switch bouncing is filtered well when using >= 1uF

Sheet: /isolated-digital-input_sw-to-gnd4/
File: isolated-digital-input_sw-to-gnd.kicad_sch

Title:

Size: A4

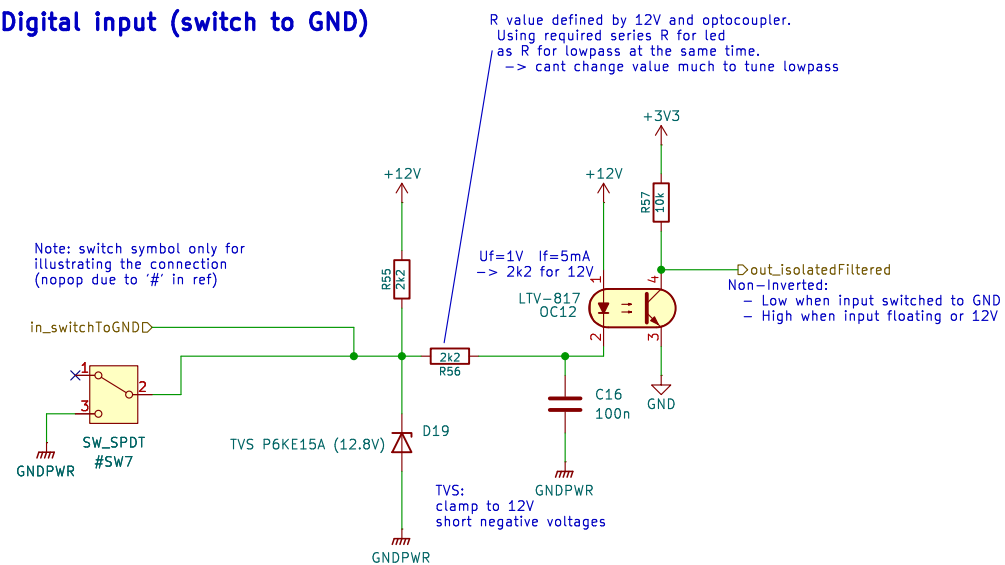
Date:

KiCad E.D.A. 8.0.7

Rev:

Id: 6/13

Digital input (switch to GND)



Notes made during testing this circuit:

- Lowpass is extremely asymmetric due to C additionally directly charging up over optocoupler led.
-> better split R into two (one part between C and LED as well?)
- R_filter = 3k3, C = 10uF:
 - 3.8ms delay turning on (switch closes to GND)
 - 0.1ms delay turning off (switch opens)
- R = 2k2, C = 10uF
 - 2.5ms delay turning on
 - 0.5ms delay turning off
- switch bouncing is filtered well when using >= 1uF

Sheet: /isolated-digital-input_sw-to-gnd5/
File: isolated-digital-input_sw-to-gnd.kicad_sch

Title:

Size: A4

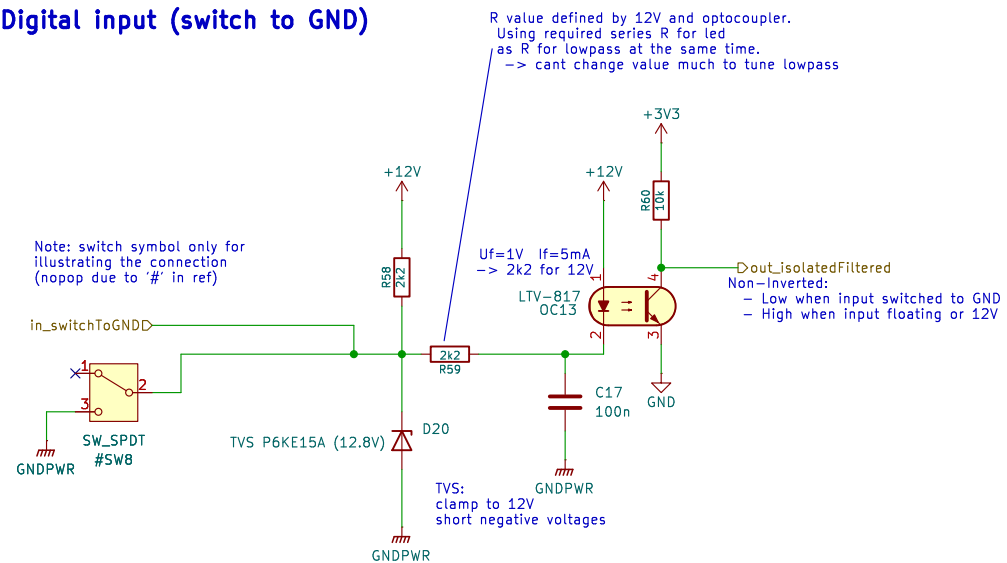
Date:

KiCad E.D.A. 8.0.7

Rev:

Id: 7/13

Digital input (switch to GND)



Notes made during testing this circuit:

- Lowpass is extremely asymmetric due to C additionally directly charging up over optocoupler led. -> better split R into two (one part between C and LED as well)?
- R_filter = 3k3, C = 10uF:
 - 3.8ms delay turning on (switch closes to GND)
 - 0.1ms delay turning off (switch opens)
- R = 2k2, C = 10uF
 - 2.5ms delay turning on
 - 0.5ms delay turning off
- switch bouncing is filtered well when using >= 1uF

Sheet: /isolated-digital-input_sw-to-gnd6/
File: isolated-digital-input_sw-to-gnd.kicad_sch

Title:

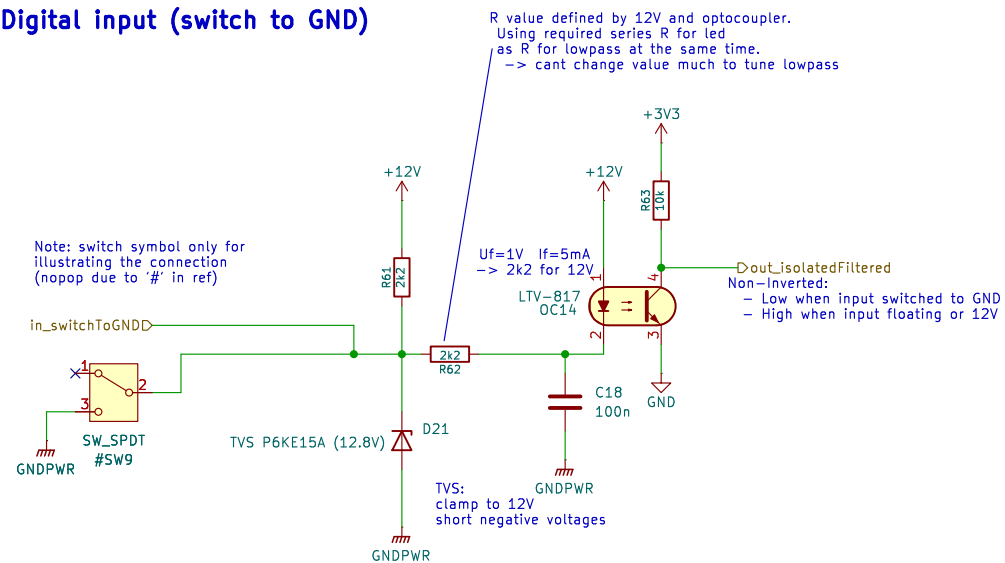
Size: A4
KiCad E.D.A. 8.0.7

Date:

Rev:

Id: 8/13

Digital input (switch to GND)



Notes made during testing this circuit:

- Lowpass is extremely asymmetric due to C additionally directly charging up over optocoupler led.
-> better split R into two (one part between C and LED as well)?
- R_filter = 3k3, C = 10uF:
 - 3.8ms delay turning on (switch closes to GND)
 - 0.1ms delay turning off (switch opens)
- R = 2k2, C = 10uF
 - 2.5ms delay turning on
 - 0.5ms delay turning off
- switch bouncing is filtered well when using >= 1uF

Sheet: /isolated-digital-input_sw-to-gnd7/
File: isolated-digital-input_sw-to-gnd.kicad_sch

Title:

Size: A4

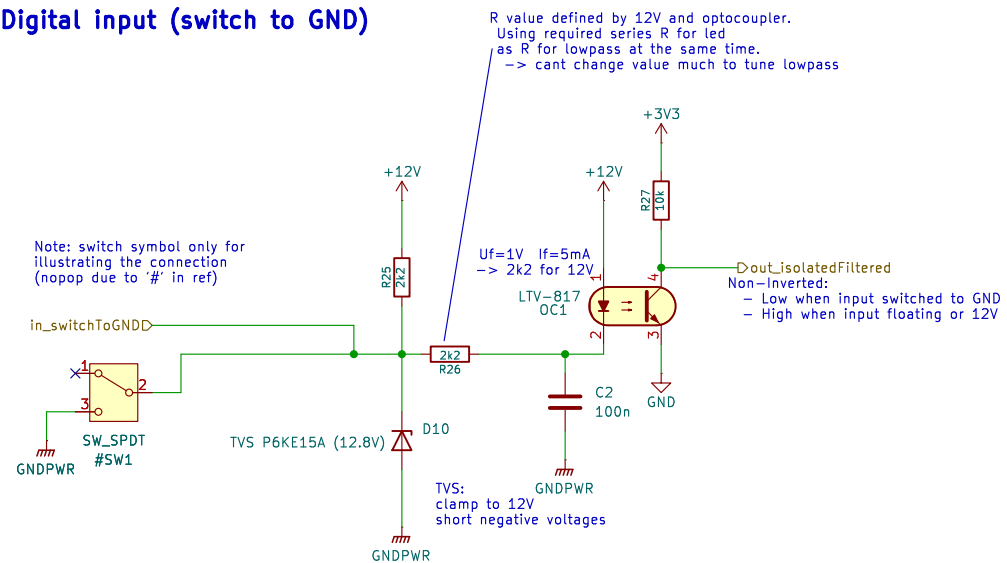
Date:

KiCad E.D.A. 8.0.7

Rev:

Id: 9/13

Digital input (switch to GND)



Notes made during testing this circuit:

- Lowpass is extremely asymmetric due to C additionally directly charging up over optocoupler led.
-> better split R into two (one part between C and LED as well)?
- R_filter = 3k3, C = 10uF:
 - 3.8ms delay turning on (switch closes to GND)
 - 0.1ms delay turning off (switch opens)
- R = 2k2, C = 10uF
 - 2.5ms delay turning on
 - 0.5ms delay turning off
- switch bouncing is filtered well when using >= 1uF

Sheet: /isolated-digital-input_sw-to-gnd8/
File: isolated-digital-input_sw-to-gnd.kicad_sch

Title:

Size: A4

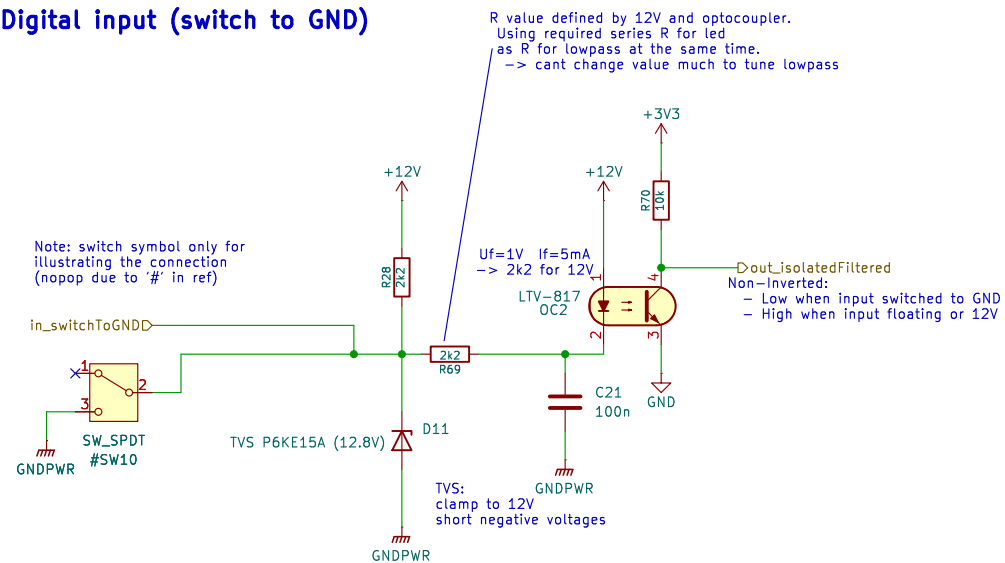
Date:

KiCad E.D.A. 8.0.7

Rev:

Id: 10/13

Digital input (switch to GND)



Notes made during testing this circuit:

- Lowpass is extremely asymmetric due to C additionally directly charging up over optocoupler led.
-> better split R into two (one part between C and LED as well)?
- R_filter = 3k3, C = 10uF:
 - 3.8ms delay turning on (switch closes to GND)
 - 0.1ms delay turning off (switch opens)
- R = 2k2, C = 10uF
 - 2.5ms delay turning on
 - 0.5ms delay turning off
- switch bouncing is filtered well when using >= 1uF

Sheet: /isolated-digital-input_sw-to-gnd9/
File: isolated-digital-input_sw-to-gnd.kicad_sch

Title:

Size: A4

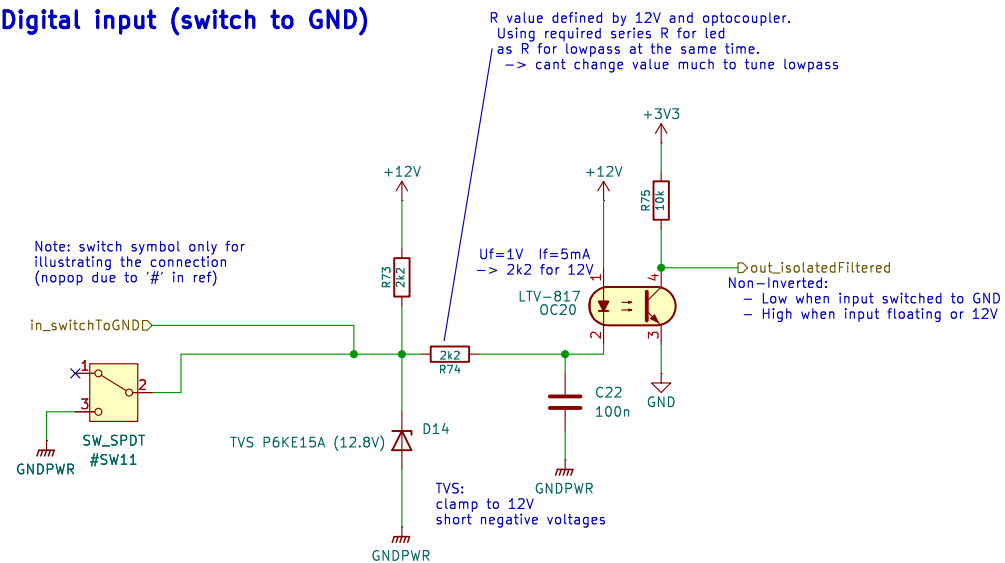
Date:

KiCad E.D.A. 8.0.7

Rev:

Id: 11/13

Digital input (switch to GND)



Notes made during testing this circuit:

- Lowpass is extremely asymmetric due to C additionally directly charging up over optocoupler led.
-> better split R into two (one part between C and LED as well?)
- R_filter = 3k3, C = 10uF:
- 3.8ms delay turning on (switch closes to GND)
- 0.1ms delay turning off (switch opens)
- R = 2k2, C = 10uF
- 2.5ms delay turning on
- 0.5ms delay turning off
- switch bouncing is filtered well when using >= 1uF

Sheet: /isolated-digital-input_sw-to-gnd10/
File: isolated-digital-input_sw-to-gnd.kicad_sch

Title:

Size: A4

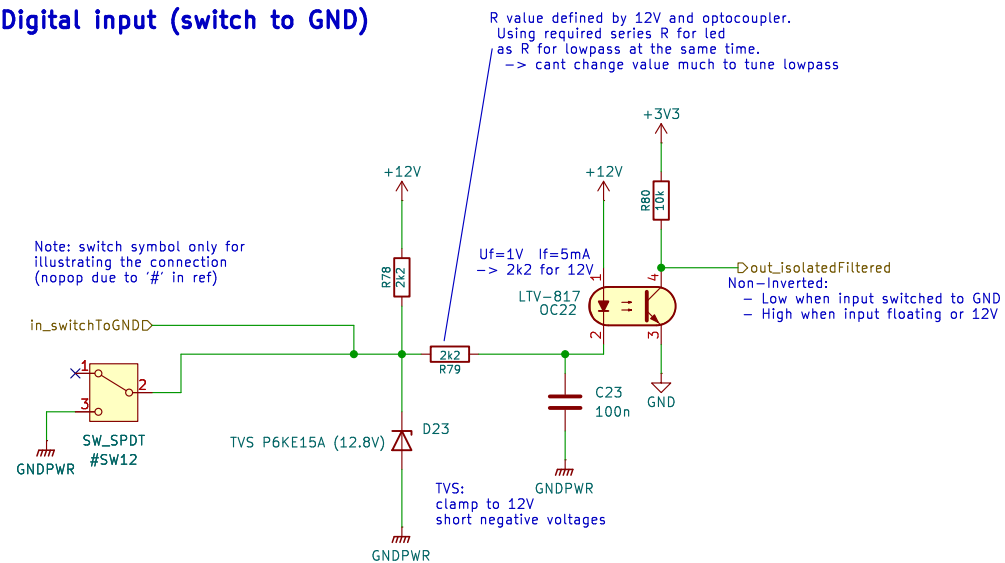
Date:

KiCad E.D.A. 8.0.7

Rev:

Id: 12/13

Digital input (switch to GND)



Notes made during testing this circuit:

- Lowpass is extremely asymmetric due to C additionally directly charging up over optocoupler led.
-> better split R into two (one part between C and LED as well)?
- R_filter = 3k3, C = 10uF:
 - 3.8ms delay turning on (switch closes to GND)
 - 0.1ms delay turning off (switch opens)
- R = 2k2, C = 10uF
 - 2.5ms delay turning on
 - 0.5ms delay turning off
- switch bouncing is filtered well when using >= 1uF

Sheet: /isolated-digital-input_sw-to-gnd11/
File: isolated-digital-input_sw-to-gnd.kicad_sch

Title:

Size: A4
KiCad E.D.A. 8.0.7

Date:

Rev:

Id: 13/13