TouchSynth – MCU-controlled analog mono synth (CH32V003/V002)

power

Power, references and ladder bias

Datei: power.kicad_sch

mcu

MCU, programming header and MIDI in

Datei: mcu.kicad_sch

touch_led

Touch pads, multiplexers, LEDs and trim DAC

Datei: touch_led.kicad_sch

vcf

CV_CUT, expo converter, ladder filter, mixer

Datei: vcf.kicad_sch

resonance

CV_RES and resonance VCA

Datei: resonance.kicad_sch

vca

CV_VCA, VCA, line out and audio loopback

Datei: vca.kicad_sch

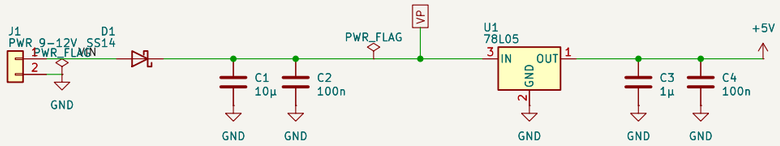
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File: touchsynth.kicad_sch

Title: TouchSynth

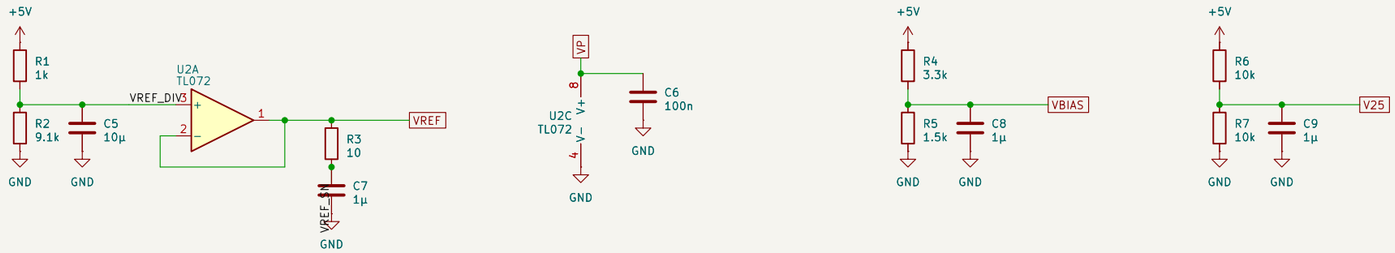
Size: A4	Date: 2026-09-27	**Rev: 0.1**
KiCad E.D.A. 10.0.6		Id: 1/8

Power, references and ladder bias

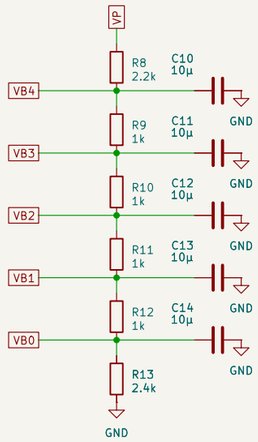
Input, reverse protection, 5 V



References: VREF 4.5 V (buffered), VBIAS 1.5 V, V25 2.5 V



Ladder bias chain (from V+; VB0…VB4 = 2.4…6.4 V at V+ = 8.6 V)



Test points



Generated by hw/gen_sch2.py (layouts.py) from hw/design.py

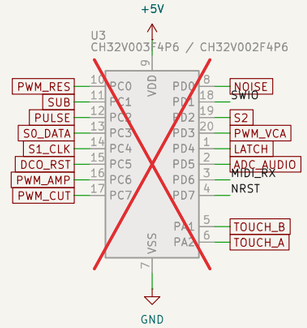
Sheet: /power/
File: power.kicad_sch

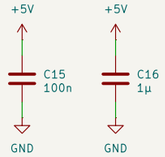
Title: TouchSynth — Power, references and ladder bias

Size: A3	Date: 2026-09-27	**Rev: 0.1**
KiCad E.D.A. 10.0.6		Id: 2/8

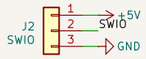
MCU, programming header and MIDI in

MCU: CH32V003F4P6 or CH32V002F4P6 (TSSOP-20, hand-soldered, not placed by JLCPCB)



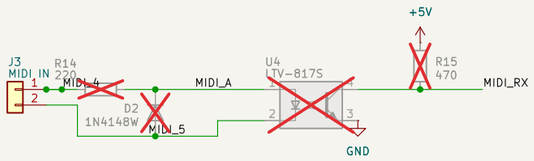


Programming (WCH-LinkE, SWIO)





MIDI in (not populated in rev 0.1)



Generated by hw/gen_sch2.py (layouts.py) from hw/design.py

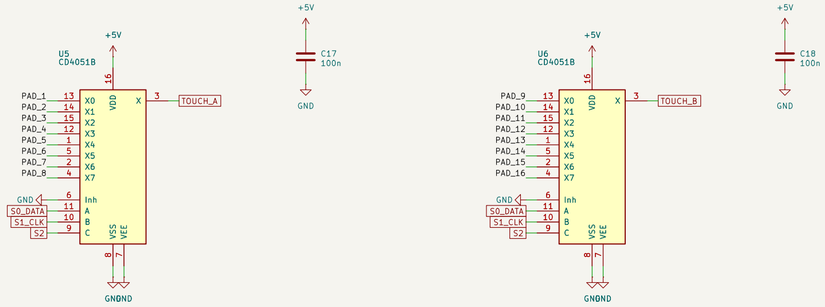
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Title: TouchSynth — MCU, programming header and MIDI in

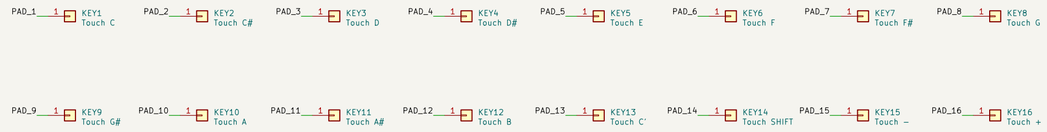
Size: A3	Date: 2026-09-27	**Rev: 0.1**
KiCad E.D.A. 10.0.6		Id: 3/8

Touch pads, multiplexers, LEDs and trim DAC

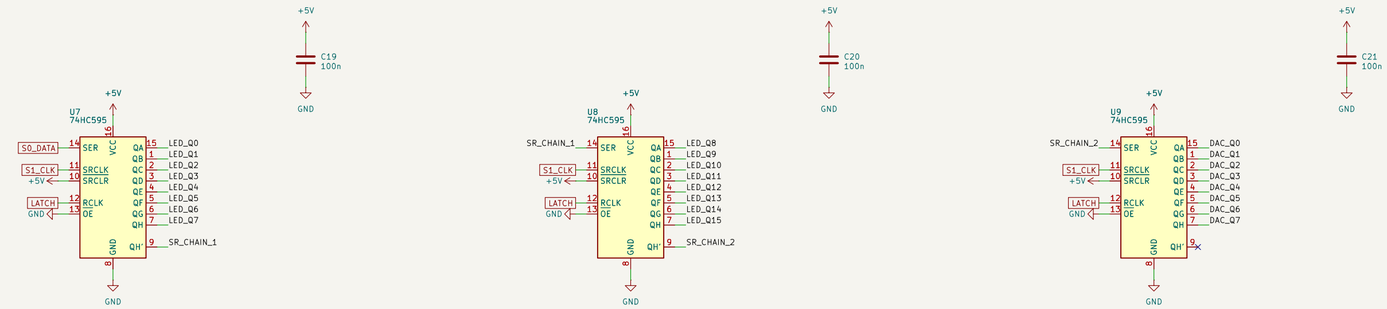
Touch multiplexers (select S0…S2 shared with the 74HC595 data / clock)



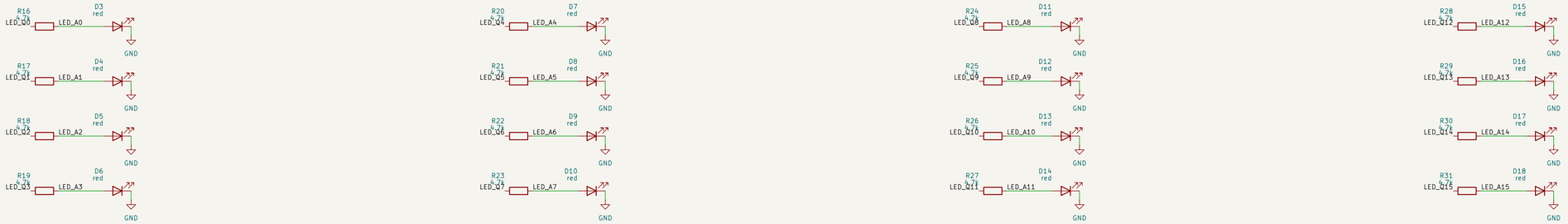
Touch pads (copper under solder mask)



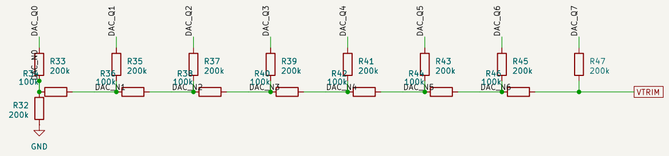
Shift registers (daisy-chained: LEDs 0–7, LEDs 8–15, trim DAC)



LEDs (4.7k series resistors, ~0.6 mA each)



VCA trim DAC: 8-bit R-2R ladder (R = 100k, 2R = 200k), output impedance 100k



Generated by hw/gen_sch2.py (layouts.py) from hw/design.py

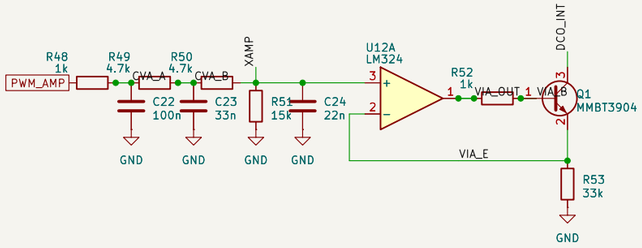
Sheet: /touch_led/
File: touch_led.kicad_sch

Title: TouchSynth — Touch pads, multiplexers, LEDs and trim DAC

Size: A2	Date: 2026-09-27	**Rev: 0.1**
KiCad E.D.A. 10.0.6		Id: 4/8

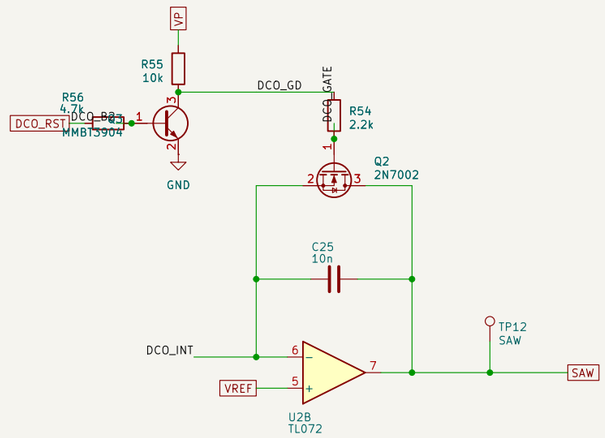
DCO and CV_AMP

CV_AMP: PWM filter and V–to–I converter (charge current proportional to the note frequency)





Integrator (TL072) with 2N7002 reset and NPN gate level shifter



Generated by hw/gen_sch2.py (layouts.py) from hw/design.py

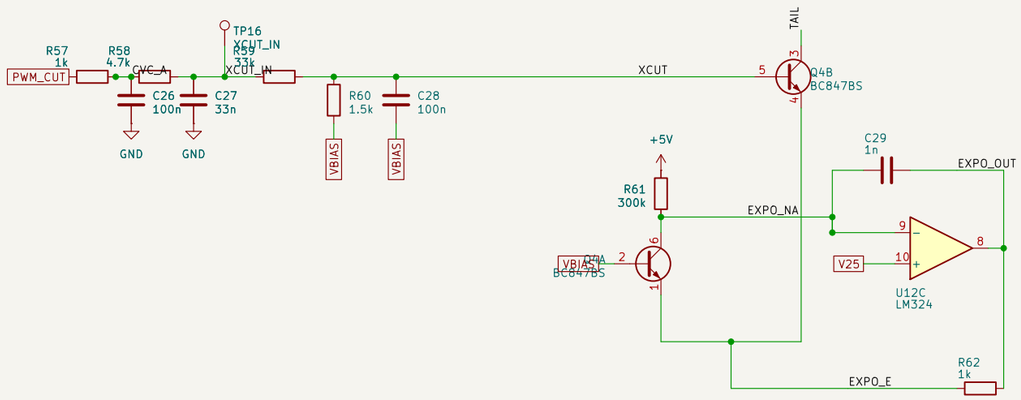
Sheet: /dco/
File: dco.kicad_sch

Title: TouchSynth — DCO and CV_AMP

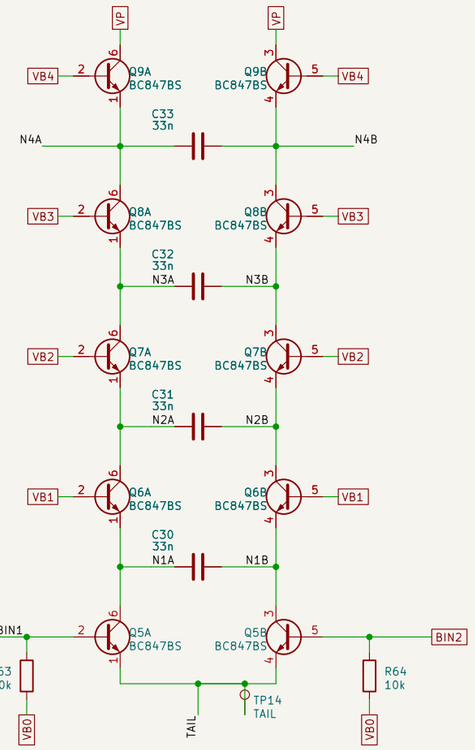
Size: A3	Date: 2026–09–27	**Rev: 0.1**
KiCad E.D.A. 10.0.6		Id: 5/8

CV_CUT, expo converter, ladder filter, mixer

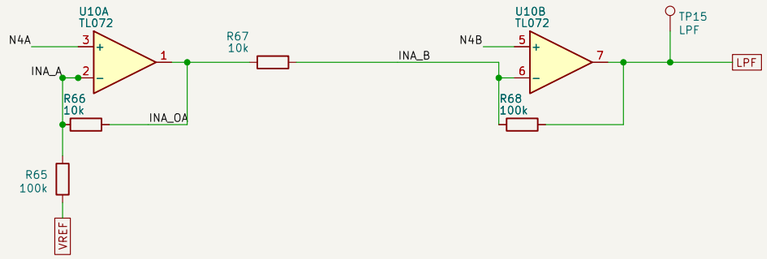
CV_CUT: PWM filter and exponential converter (tail current of the ladder)

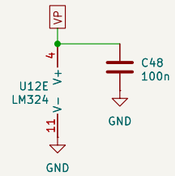


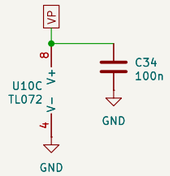
Transistor ladder (4 poles, 4 x 33 nF), bias from VB0...VB4, mixer



Output instrumentation amplifier across the top capacitor (G = 11, referenced to VREF)







Generated by hw/gen_sch2.py (layouts.py) from hw/design.py

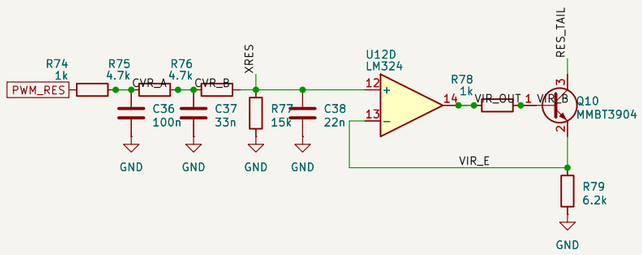
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File: vcf.kicad_sch

Title: TouchSynth — CV_CUT, expo converter, ladder filter, mixer

Size: A3	Date: 2026-09-27	**Rev: 0.1**
KiCad E.D.A. 10.0.6		Id: 6/8

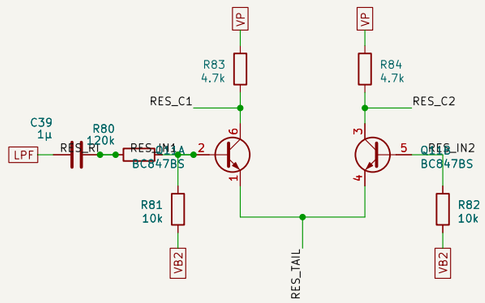
CV_RES and resonance VCA

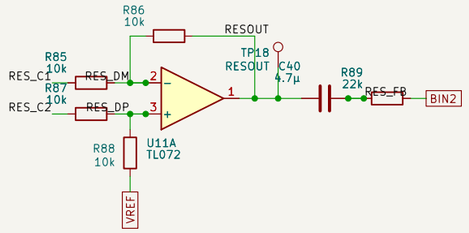
CV_RES: PWM filter and V–to–I converter (tail current of the resonance VCA)





Resonance VCA: differential pair, difference amplifier, AC–coupled feedback into the ladder (BIN2)





Generated by hw/gen_sch2.py (layouts.py) from hw/design.py

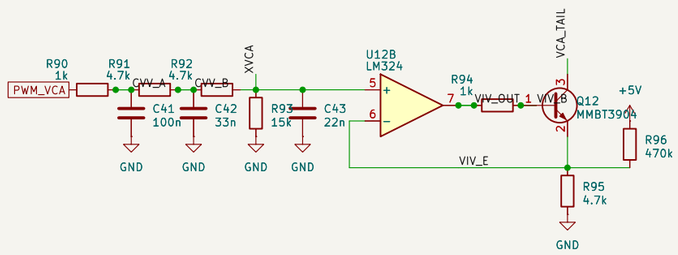
Sheet: /resonance/
File: resonance.kicad_sch

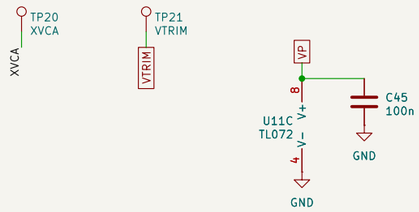
Title: TouchSynth — CV_RES and resonance VCA

Size: A3	Date: 2026–09–27	**Rev: 0.1**
KiCad E.D.A. 10.0.6		Id: 7/8

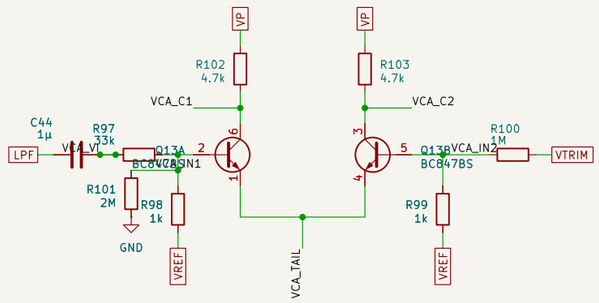
CV_VCA, VCA, line out and audio loopback

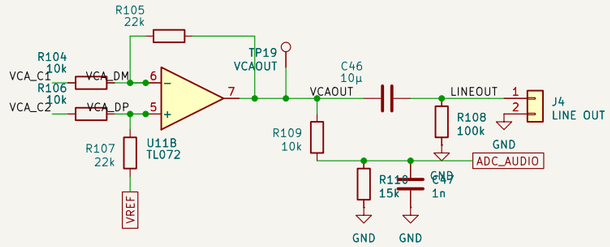
CV_VCA: PWM filter and V–to–I converter (470k pull–up guarantees zero current at CV = 0)





VCA: differential pair with offset trim, difference amplifier, line out, audio loopback





Generated by hw/gen_sch2.py (layouts.py) from hw/design.py

Sheet: /vca/
File: vca.kicad_sch

Title: TouchSynth — CV_VCA, VCA, line out and audio loopback

Size: A3	Date: 2026–09–27	**Rev: 0.1**
KiCad E.D.A. 10.0.6		Id: 8/8