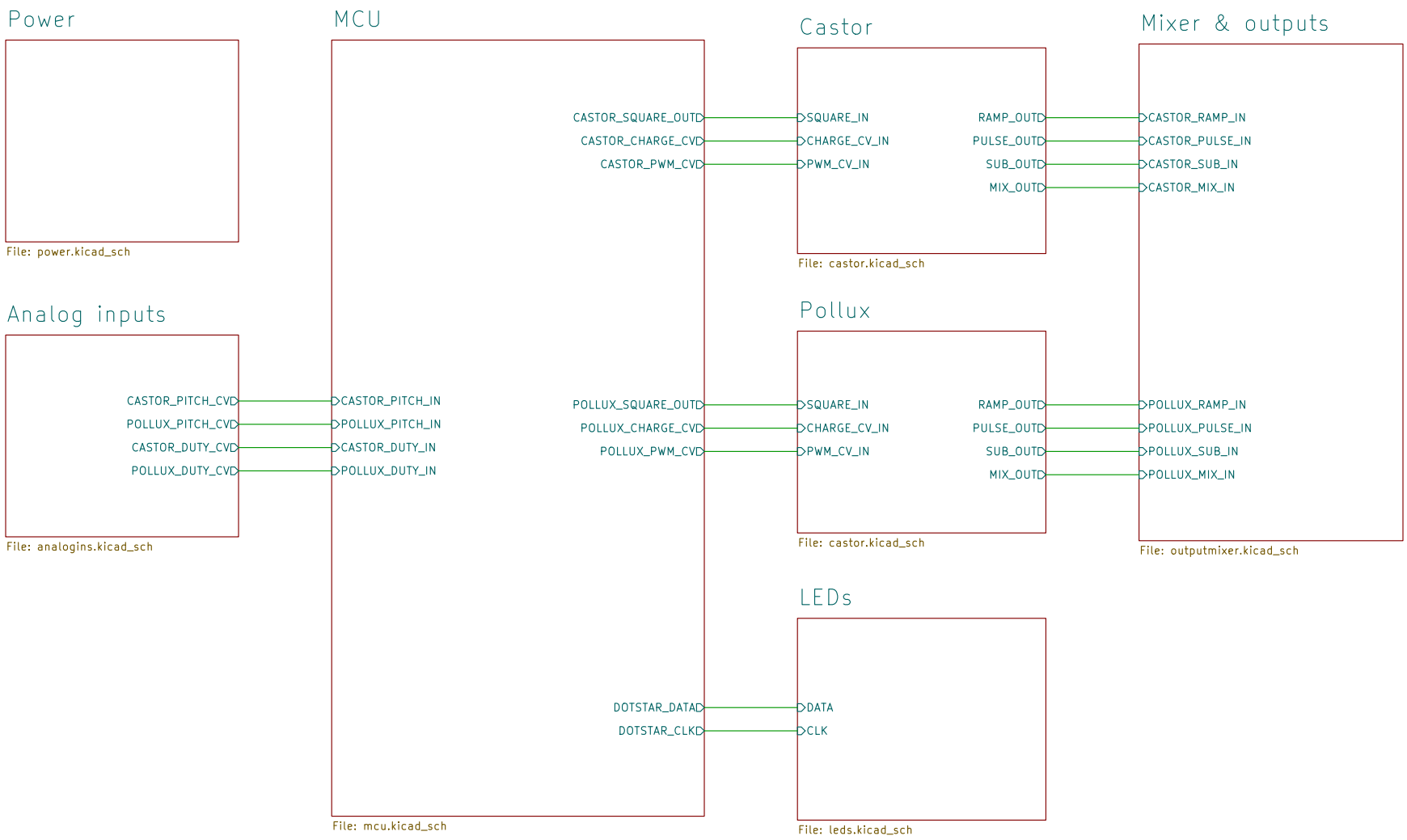


Castor & Pollux

open source hardware

Winterbloom

v5 2022-07-26 Alethea Flowers

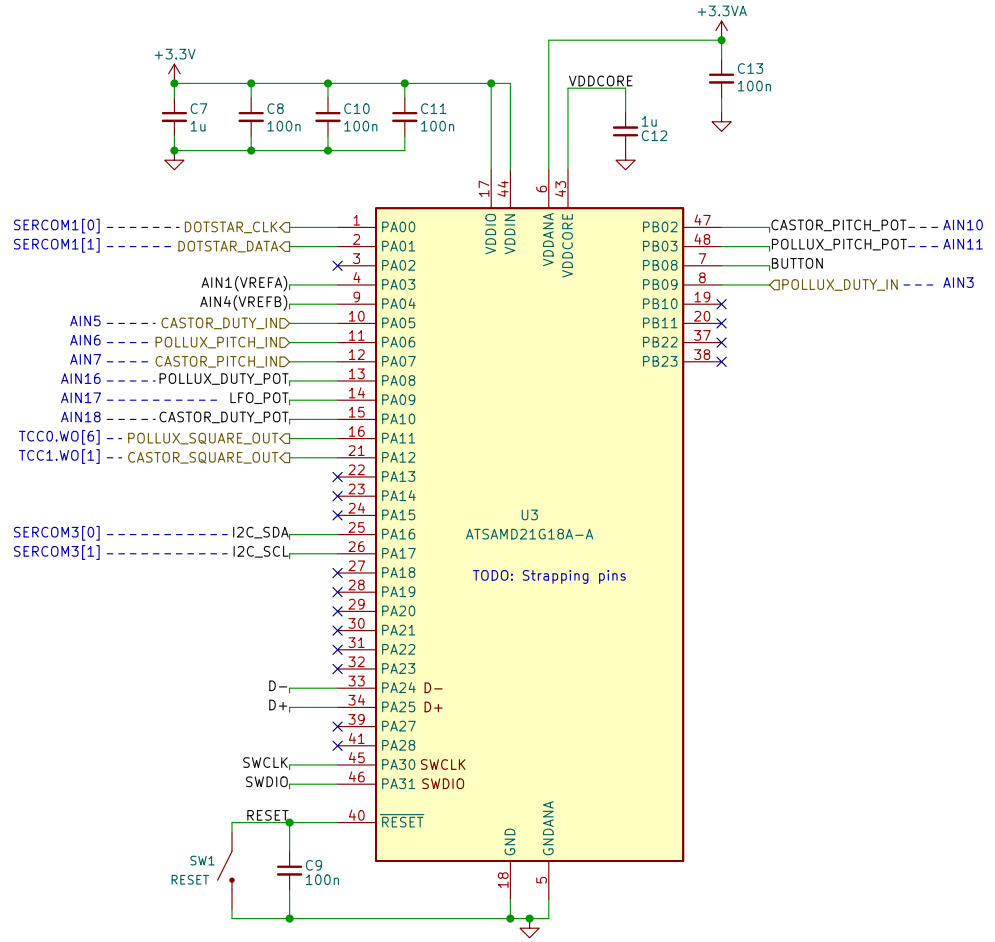
gemini.wntr.dev © Winterbloom, Licensed under CERN-OHL-P v2

/ support@winterbloom.com

KiCad E.D.A. kicad (6.0.5-0)

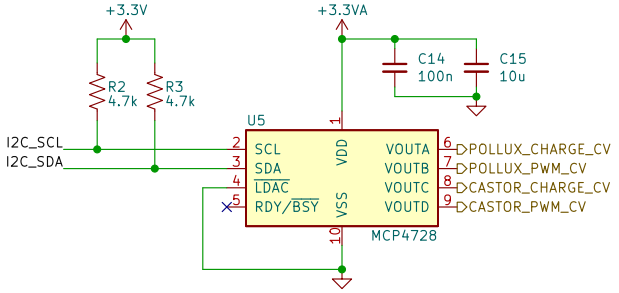
Microcontroller

Power consumption: 10 mA (estimated)
I2C on SERCOM3
Dotstar SPI on SERCOM1
Oscillator 1 output on TCC1.WO[1]
Oscillator 2 output on TCC0.WO[6]

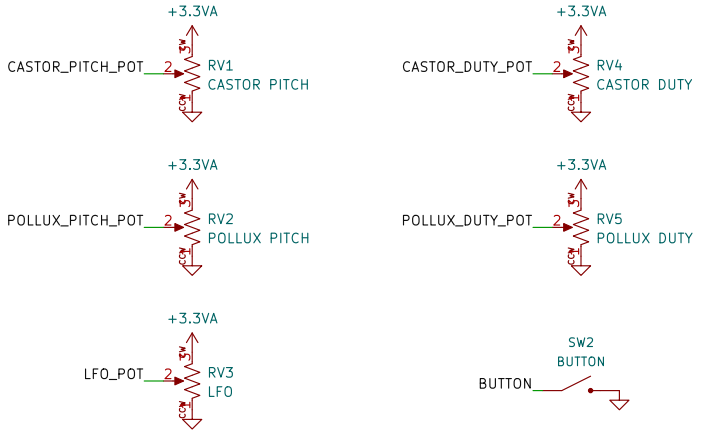


12-bit DAC

Power consumption: 1.5 mA (estimated)
I2C on SERCOM3
LDAC tied low to immediately update all voltage outputs
I2C pull-ups for fast mode



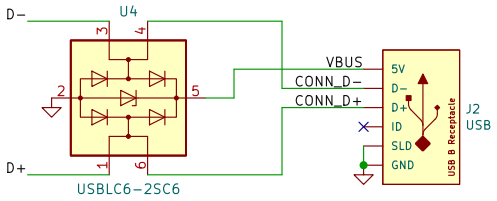
Potentiometers & button



Test points

SWDIO — TP4 SWDIO
SWCLK — TP5 SWCLK
RESET — TP6 RESET
CASTOR_SQUARE_OUT — TP7 SQ2
POLLUX_SQUARE_OUT — TP8 SQ1
CONN_D+ — D+ TP9
CONN_D- — D- TP10

USB



Castor & Pollux

v5 2022-07-26

Alethea Flowers

gemini.wntr.dev

© Winterbloom, Licensed under CERN-OHL-P v2

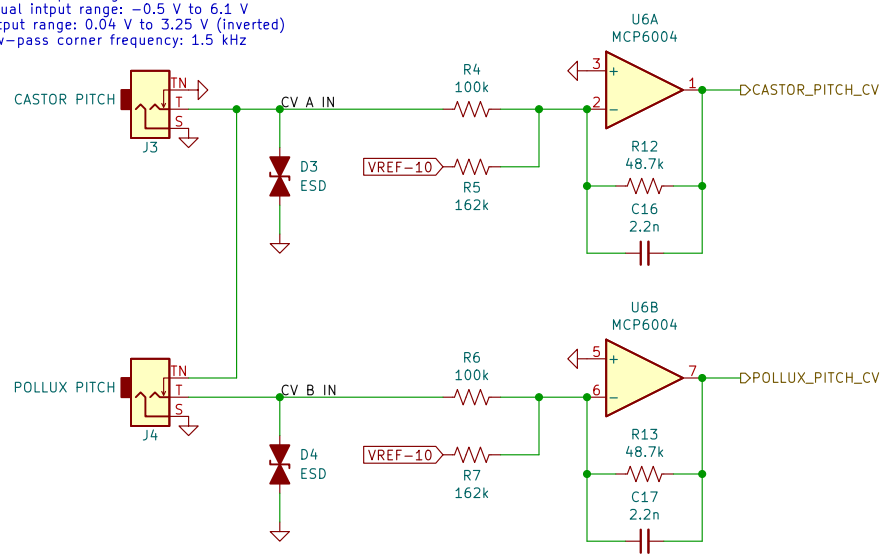
/MCU/

support@winterbloom.com

KiCad E.D.A. kicad (6.0.5-0)

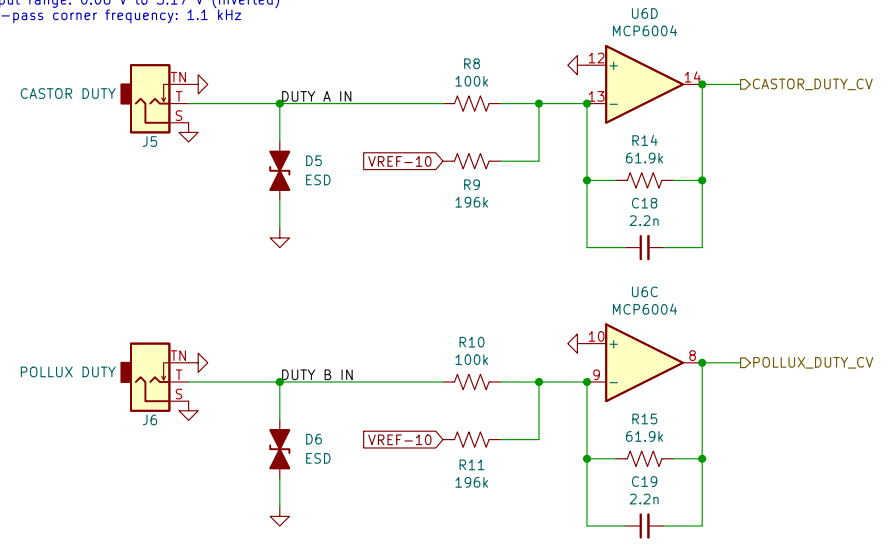
Pitch CV inputs

Nominal input range: 0 V to 6 V
Actual intput range: −0.5 V to 6.1 V
Output range: 0.04 V to 3.25 V (inverted)
Low−pass corner frequency: 1.5 kHz



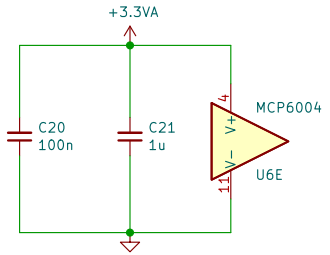
Pulse width CV inputs

Nominal input range: 0 V to 5 V
Actual input range: −0.01 V to 5.01 V
Output range: 0.06 V to 3.17 V (inverted)
Low−pass corner frequency: 1.1 kHz



Power & bypassing

Consumption: 4mA (max, est)



Castor & Pollux

open source hardware

Winterbloom

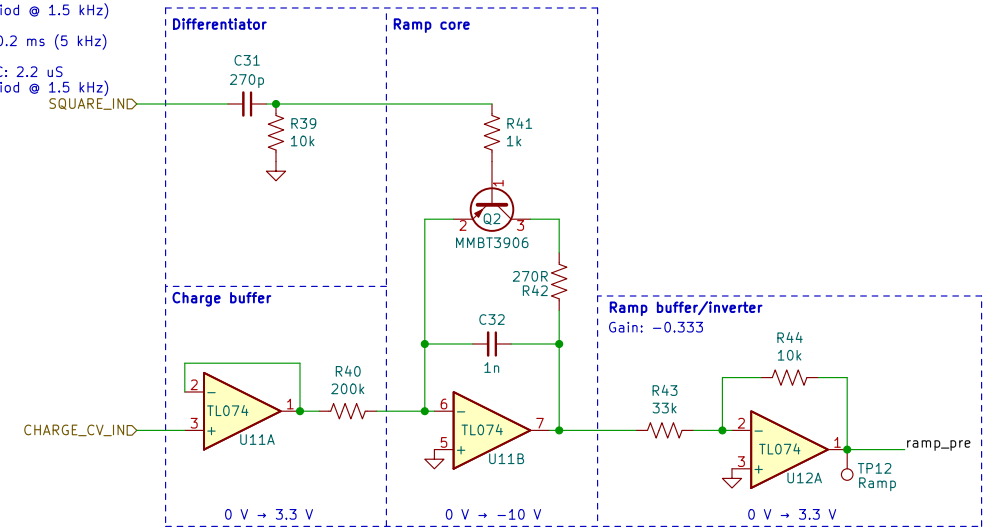
v5 2022−07−26	Alethea Flowers
gemini.wntr.dev	© Winterbloom, Licensed under CERN−OHL−P v2
/Analog inputs/	support@winterbloom.com
KiCad E.D.A. kicad (6.0.5−0)	Page 3/8

Sawtooth waveshaper

Differentiator RC: 2.7 us
(0.4% of period @ 1.5 kHz)

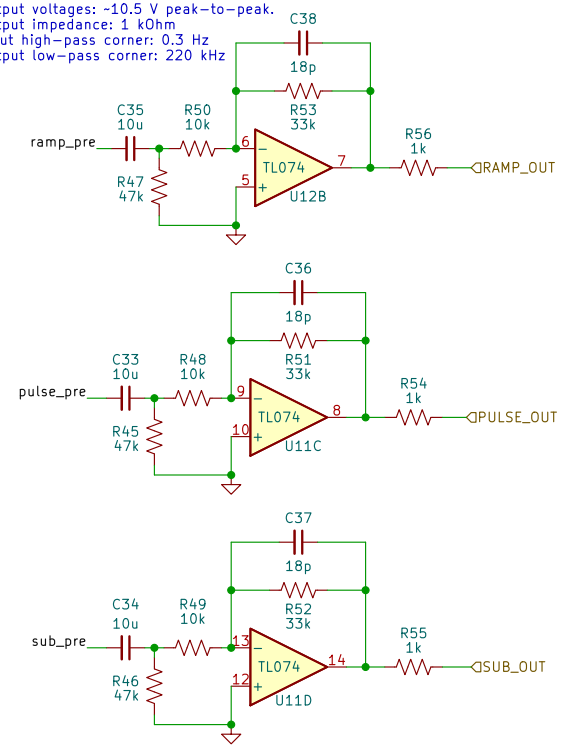
Charge RC: 0.2 ms (5 kHz)

Discharge RC: 2.2 uS
(0.3% of period @ 1.5 kHz)



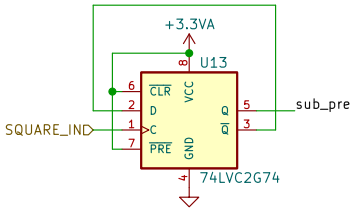
Output amplifiers

Input voltages: 0 V → 3.3 V (AC coupled)
Gain: −3.3
Output voltages: ~10.5 V peak-to-peak.
Output impedance: 1 kOhm
Input high-pass corner: 0.3 Hz
Output low-pass corner: 220 kHz



Suboctave clock divider

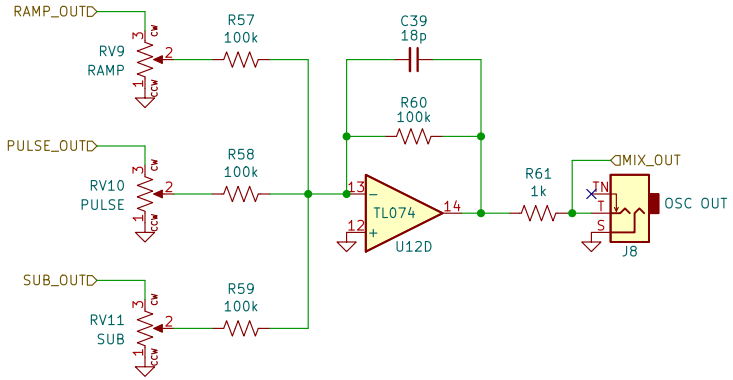
Power consumption: 1mA (estimated)



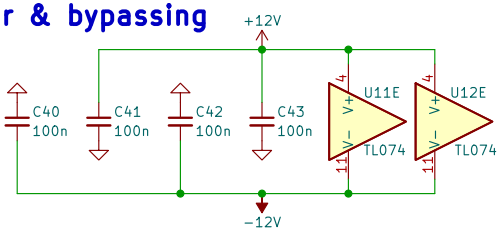
0 V → 3.3V

Waveform mixer

Gain: −1
Output low-pass corner: 88 kHz

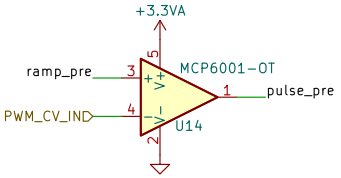


Power & bypassing



Pulse comparator

Power consumption: 1mA (estimated)



0 V → 3.3 V

Castor & Pollux

open source hardware

Winterbloom

v5 2022-07-26 — Alethea Flowers

gemini.wntr.dev — © Winterbloom, Licensed under CERN-OHL-P v2

/Pollux/ — support@winterbloom.com

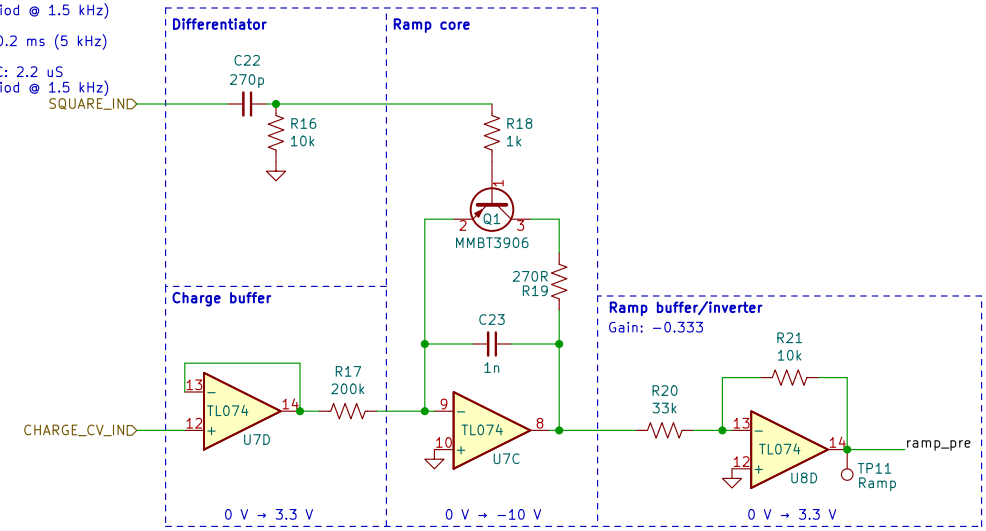
KiCad E.D.A. kicad (6.0.5-0) —

Sawtooth waveshaper

Differentiator RC: 2.7 us
(0.4% of period @ 1.5 kHz)

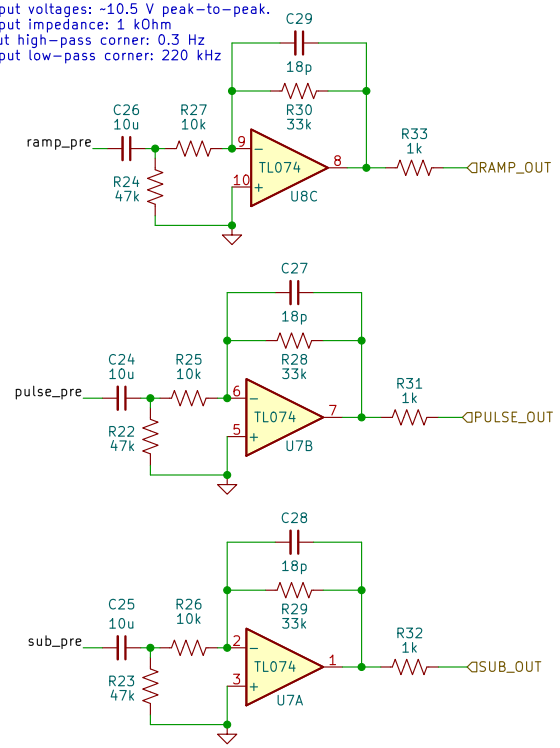
Charge RC: 0.2 ms (5 kHz)

Discharge RC: 2.2 uS
(0.3% of period @ 1.5 kHz)



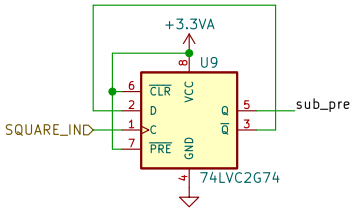
Output amplifiers

Input voltages: 0 V → 3.3 V (AC coupled)
Gain: −3.3
Output voltages: ~10.5 V peak-to-peak.
Output impedance: 1 kOhm
Input high-pass corner: 0.3 Hz
Output low-pass corner: 220 kHz



Suboctave clock divider

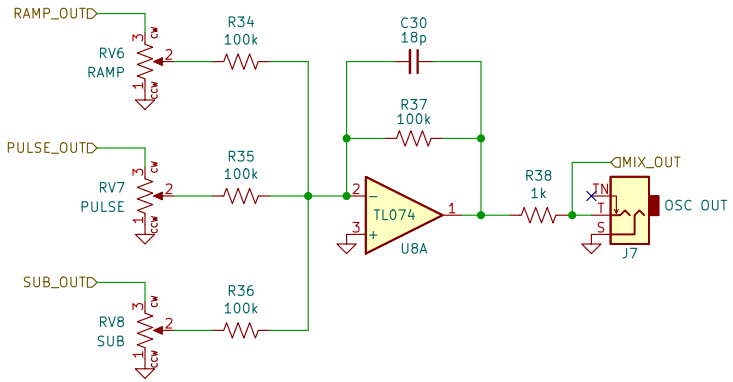
Power consumption: 1mA (estimated)



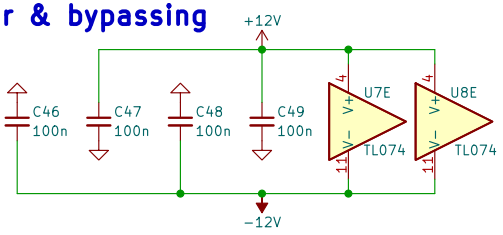
0 V → 3.3V

Waveform mixer

Gain: −1
Output low-pass corner: 88 kHz

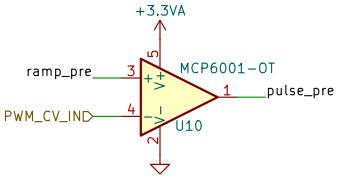


Power & bypassing



Pulse comparator

Power consumption: 1mA (estimated)



0 V → 3.3 V

Castor & Pollux

open source hardware

Winterbloom

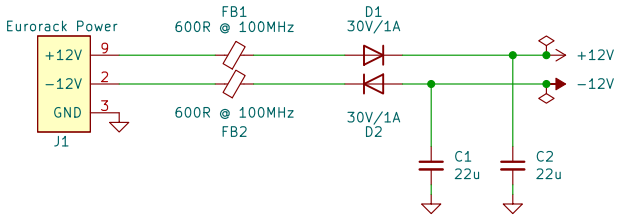
v5 2022-07-26 — Alethea Flowers

gemini.wntr.dev — © Winterbloom, Licensed under CERN-OHL-P v2

/Castor/ — support@winterbloom.com

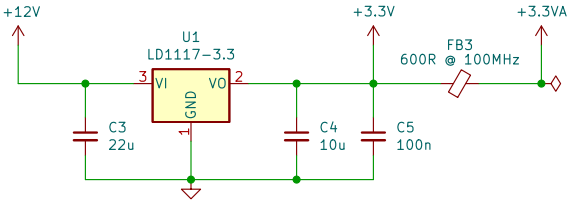
KiCad E.D.A. kicad (6.0.5-0) —

Power input



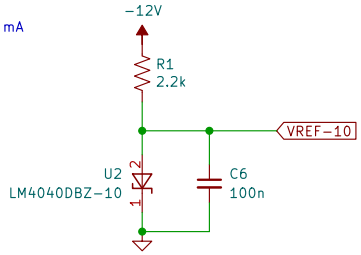
3.3V regulator

Power consumption: 65−100mA, 0.7−1.2W
Power dissipated: 0.8W
Heatsink area: TODO
Thermal resistance: TODO
Maximum thermal resistance: TODO

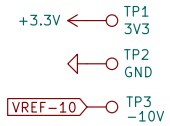


−10V reference

Cathode current:
Range: 75 uA to 15 mA
Simulated: 660 uA



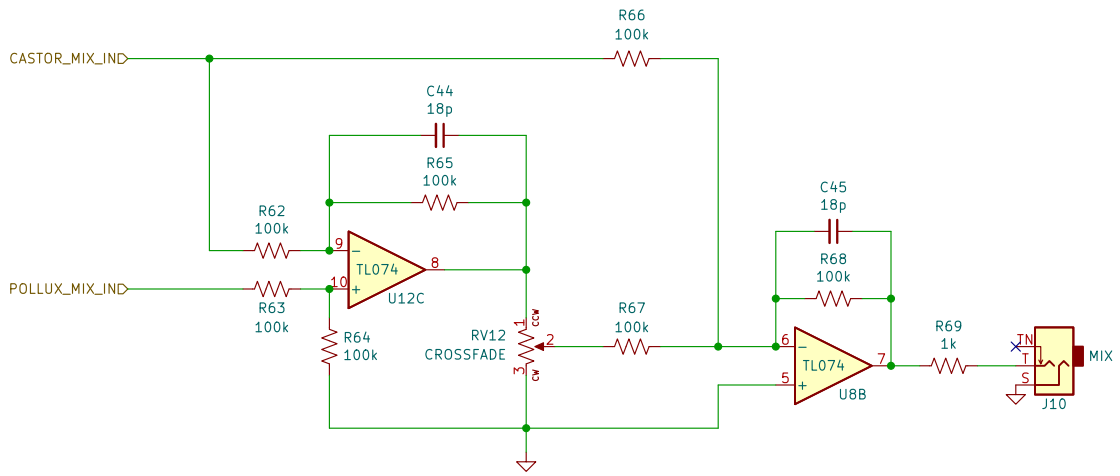
Test points



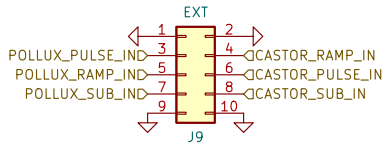
Castor & Pollux	open source hardware · Winterbloom
v5 2022−07−26	Alethea Flowers
gemini.wntr.dev	© Winterbloom, Licensed under CERN−OHL−P v2
/Power/	support@winterbloom.com
KiCad E.D.A. kicad (6.0.5−0)	Page 6/8

Crossfade mixer

Output low pass corner frequency: 88 kHz



Expansion header



Castor & Pollux

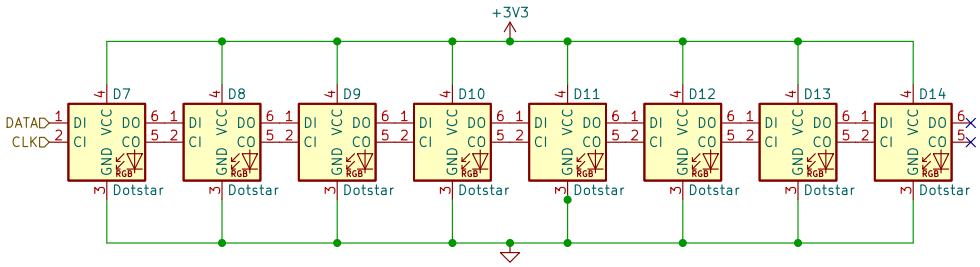
v5 2022-07-26 — Alethea Flowers

gemini.wntr.dev — © Winterbloom, Licensed under CERN-OHL-P v2

/Mixer & outputs/ — support@winterbloom.com

KiCad E.D.A. kicad (6.0.5-0) —

RGB LEDs



Castor & Pollux

open source hardware

Winterbloom

v5 2022-07-26 Alethea Flowers

gemini.wntr.dev © Winterbloom, Licensed under CERN-OHL-P v2

/LEDs/ support@winterbloom.com

KiCad E.D.A. kicad (6.0.5-0)