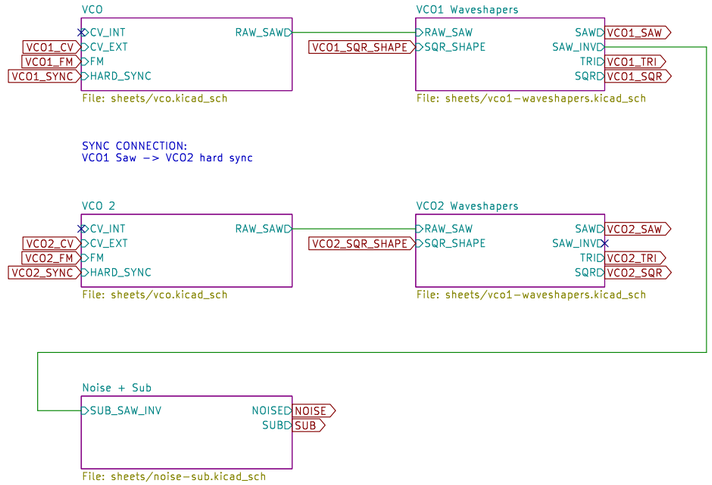
Power

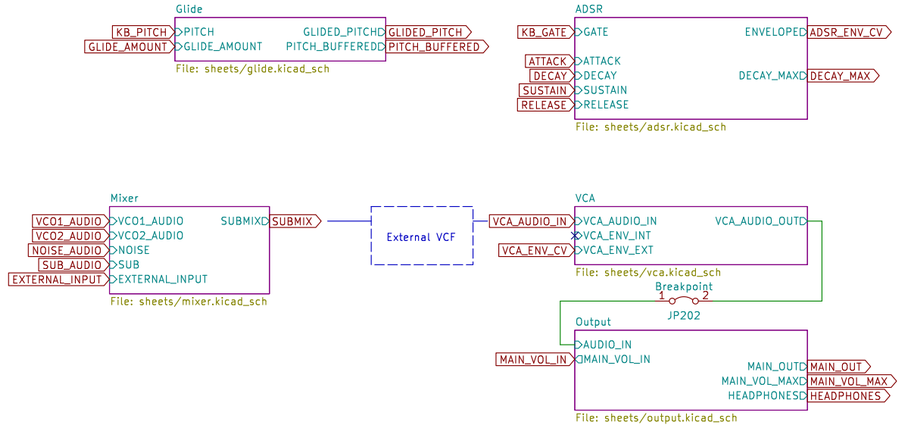
Power **Checked**

File: sheets/power.kicad_sch

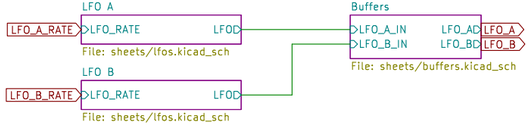
Sound sources



Control



Mod



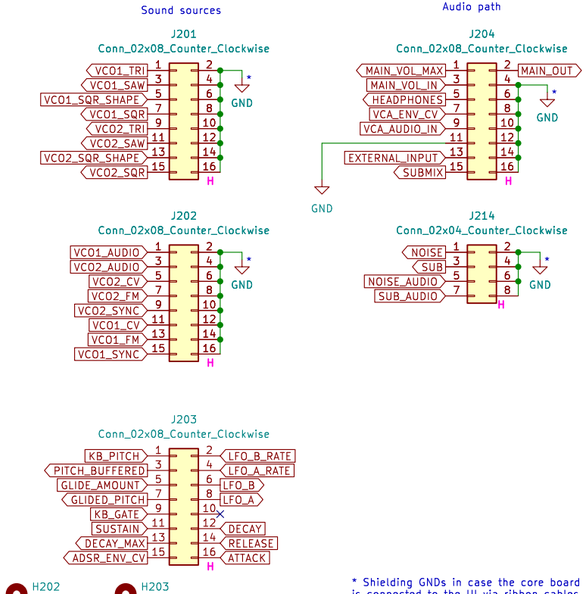
Playground

1. VCO1 Saw -> VCO2 Hard sync + on of the LFOs to pitch or FM in of VCO2. Makes hard sync even better.

2. VCO2 Audio -> VCO1 FM
3. VCO2 Audio -> Filter cutoff

All done by connections on the UI board.

Interface



* Shielding GNDs in case the core board is connected to the UI via ribbon cables. Should only be connected to ground here but not on the UI panel.

Inputs and outputs are from the perspective of this circuit.

H: hand soldered

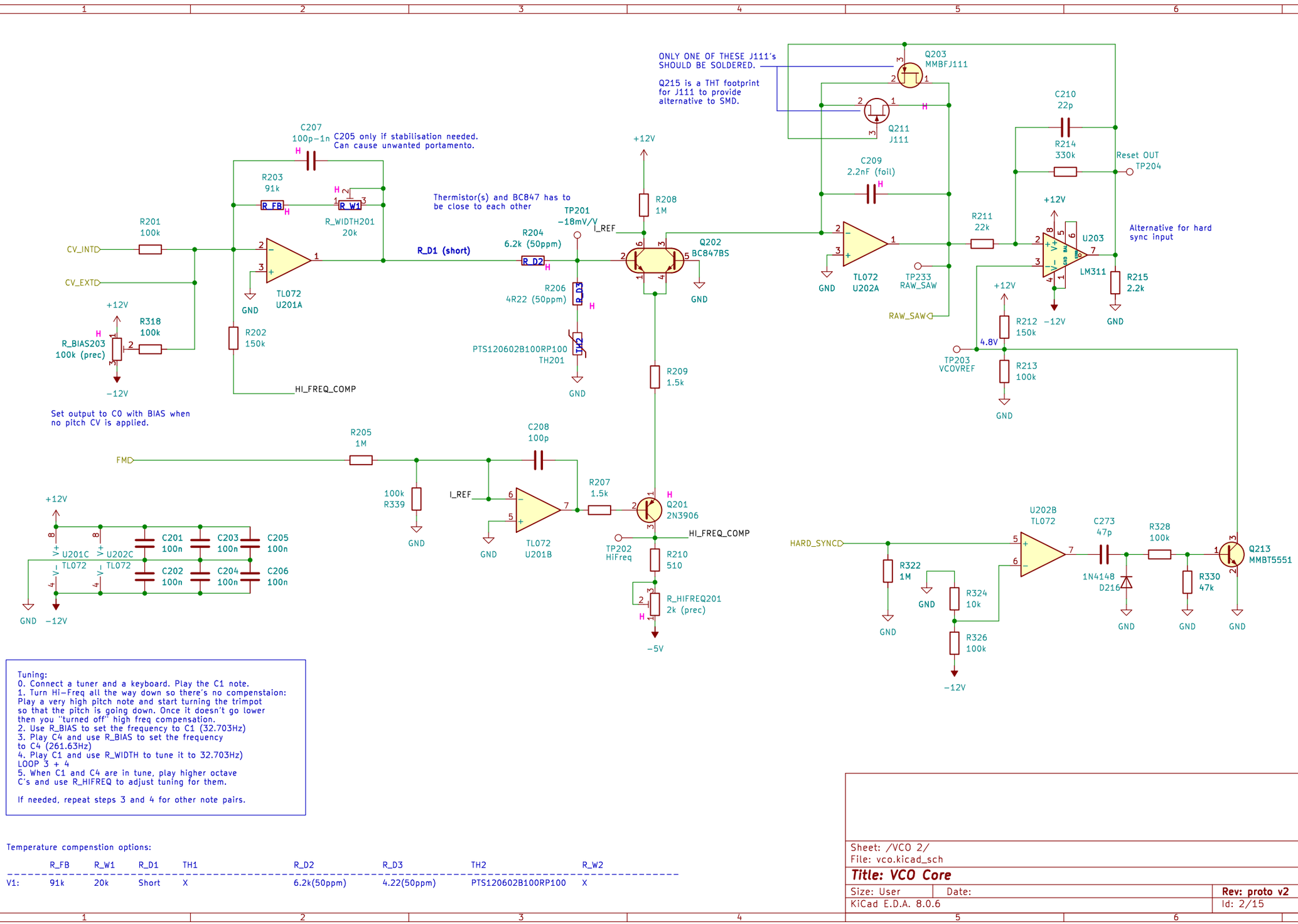
Shmøergh

Sheet: /

File: core.kicad_sch

Title: Hog Analog Synth — Core

Size: User	Date: 2023-10-28	**Rev: 1.0**
KiCad E.D.A. 8.0.6		Id: 1/15



Tuning:
0. Connect a tuner and a keyboard. Play the C1 note.
1. Turn Hi−Freq all the way down so there's no compenstaion: Play a very high pitch note and start turning the trimpot so that the pitch is going down. Once it doesn't go lower then you "turned off" high freq compensation.
2. Use R_BIAS to set the frequency to C1 (32.703Hz)
3. Play C4 and use R_BIAS to set the frequency to C4 (261.63Hz)
4. Play C1 and use R_WIDTH to tune it to 32.703Hz)
LOOP 3 + 4
5. When C1 and C4 are in tune, play higher octave C's and use R_HIFREQ to adjust tuning for them.

If needed, repeat steps 3 and 4 for other note pairs.

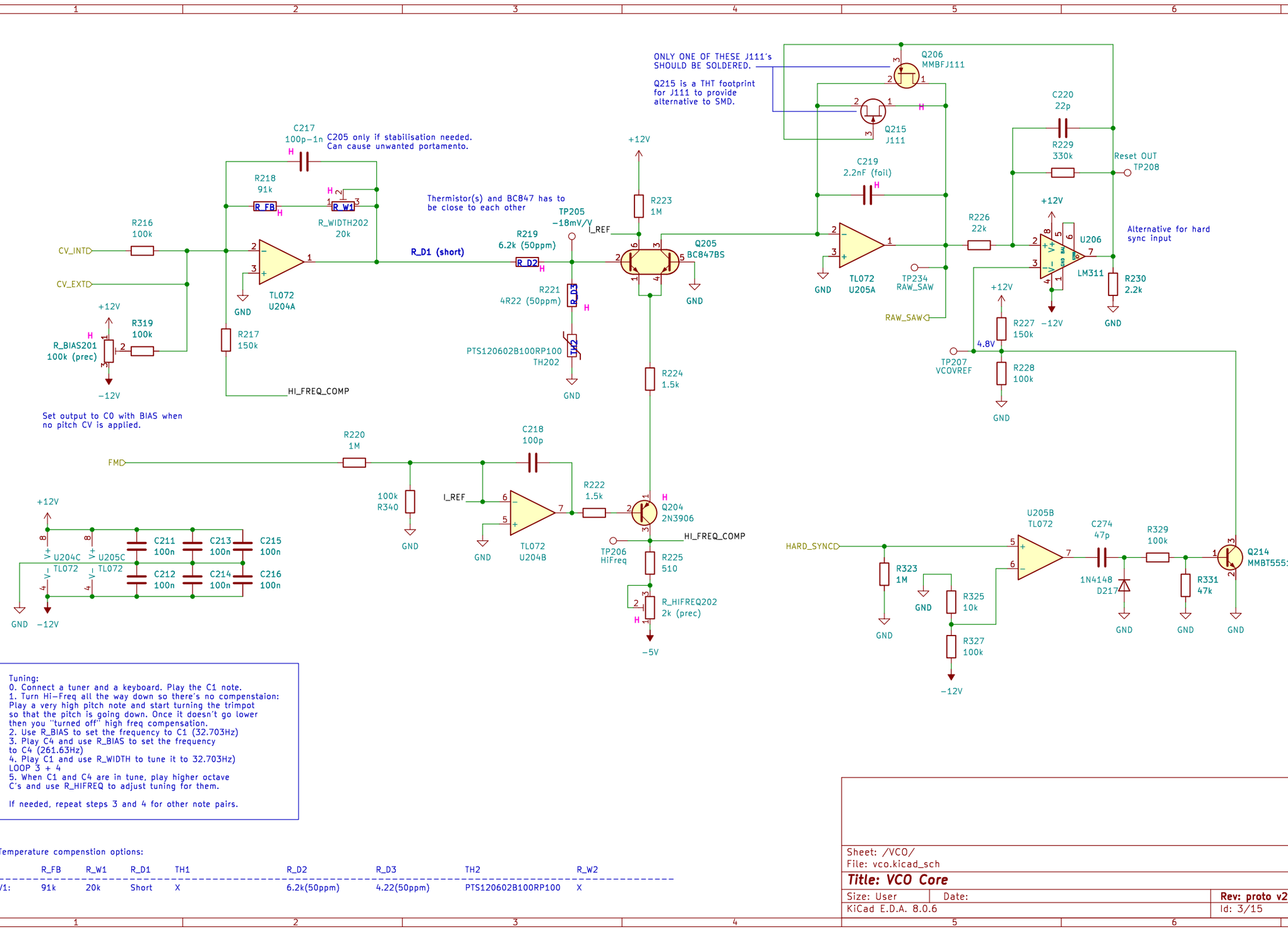
Temperature compenstion options:

	R_FB	R_W1	R_D1	TH1	R_D2	R_D3	TH2	R_W2
V1:	91k	20k	Short	X	6.2k(50ppm)	4.22(50ppm)	PTS120602B100RP100	X

Sheet: /VCO 2/
File: vco.kicad_sch

Title: VCO Core

Size: User	Date:	Rev: proto v2
KiCad E.D.A. 8.0.6		Id: 2/15



Tuning:
0. Connect a tuner and a keyboard. Play the C1 note.
1. Turn Hi-Freq all the way down so there's no compenstaion: Play a very high pitch note and start turning the trimpot so that the pitch is going down. Once it doesn't go lower then you "turned off" high freq compensation.
2. Use R_BIAS to set the frequency to C1 (32.703Hz)
3. Play C4 and use R_BIAS to set the frequency to C4 (261.63Hz)
4. Play C1 and use R_WIDTH to tune it to 32.703Hz)
LOOP 3 + 4
5. When C1 and C4 are in tune, play higher octave C's and use R_HIFREQ to adjust tuning for them.

If needed, repeat steps 3 and 4 for other note pairs.

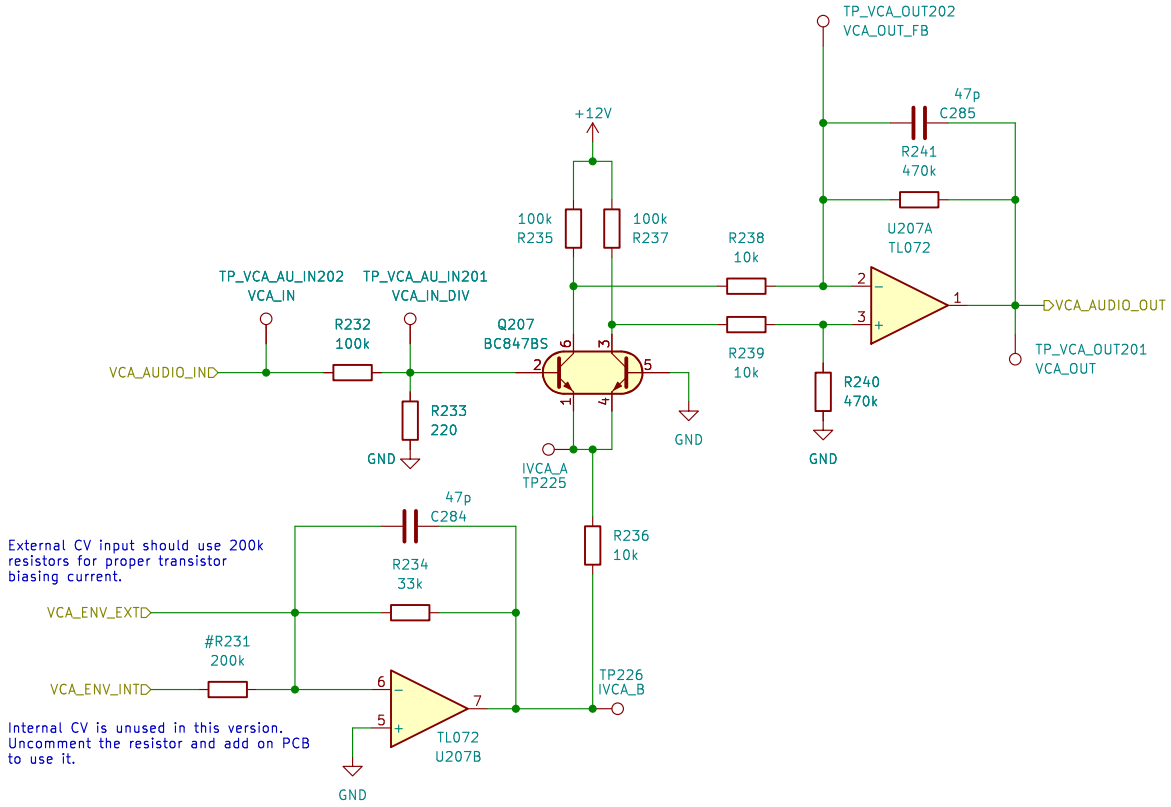
Temperature compenstion options:

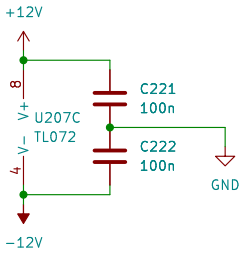
	R_FB	R_W1	R_D1	TH1	R_D2	R_D3	TH2	R_W2
V1:	91k	20k	Short	X	6.2k(50ppm)	4.22(50ppm)	PTS120602B100RP100	X

Sheet: /VCO/
File: vco.kicad_sch

Title: VCO Core

Size: User	Date:	Rev: proto v2
KiCad E.D.A. 8.0.6		Id: 3/15





Sheet: /VCA/		
File: vca.kicad_sch		
Title: VCA		
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.6		Id: 3/15

33k feedback resistor so if all input source
is on maximum value there's still no distortion.
This is a THT component so it can be customised.

The 47p feedback caps are here to avoid picking
up radio noise.

Breakout for using the synth with
external voices. If unused, ground
it through a 100k resistor to avoid
unnecessary noise.

EXTERNAL_INPUT

Trimmers here set the relative volume of
fixed volume sound sources (VCO 1, NOISE).

VCO1_AUDIO
100k Log
RV201
C225
22uF
R242
100k
GND

VCO2_AUDIO
100k Log
RV205
C226
22uF
R243
100k
GND

NOISE
100k Log
RV202
C227
22uF
R244
100k
GND

SUB
100k Log
RV204
C275
22uF
R338
100k
GND

C282
47p
R245
33k
U208A
TL072
GND

R246
100k

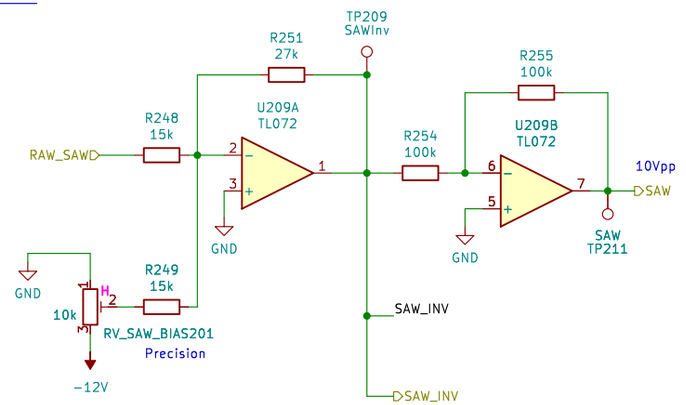
C283
47p
R247
100k
U208B
TL072
GND

SUBMIX
Submix
TP224

+12V
TL072
U208C
C223
100n
C224
100n
GND
-12V

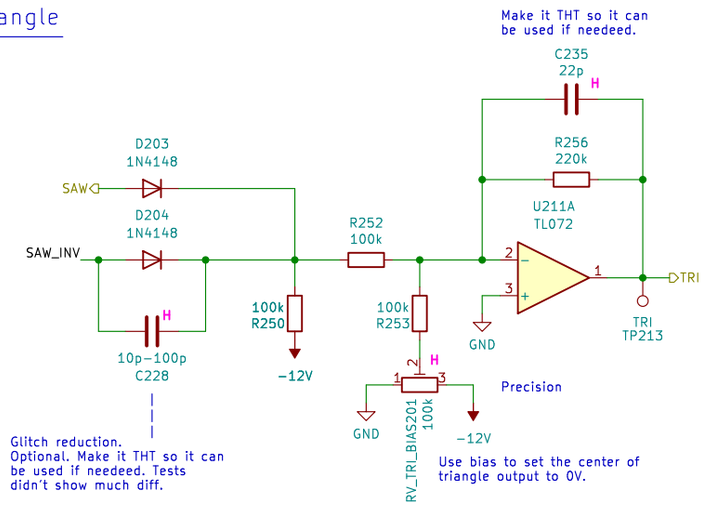
Sheet: /Mixer/	
File: mixer.kicad_sch	
Title: Mixer	
Size: A4	Date:
KiCad E.D.A. 8.0.6	Rev: Id: 4/15

Sawtooth



Use BIAS to set the sawtooth output exactly to oscillate around 0V. This is critical for a nice triangle wave.

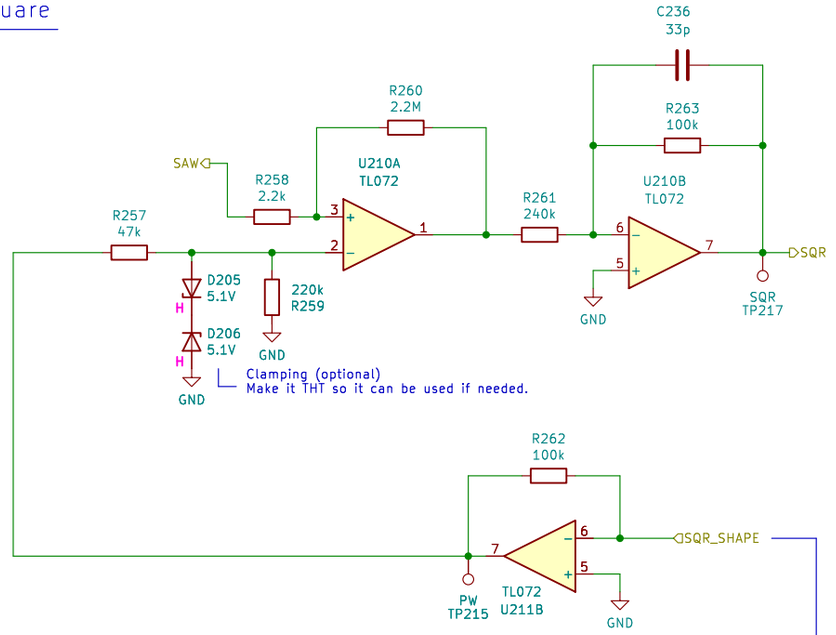
Triangle



Glitch reduction. Optional. Make it THT so it can be used if neeeded. Tests didn't show much diff.

Use bias to set the center of triangle output to 0V.

Square



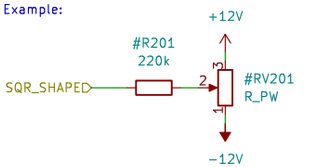
Square pulse width

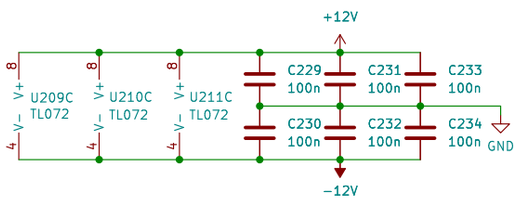
Connect any number of CV inputs through input resistors to set the pulse width with a CV on SQR_SHAPE. Use the following CV values:

0V/GND:	50%
−5.5V:	5%
+5.5V:	95%

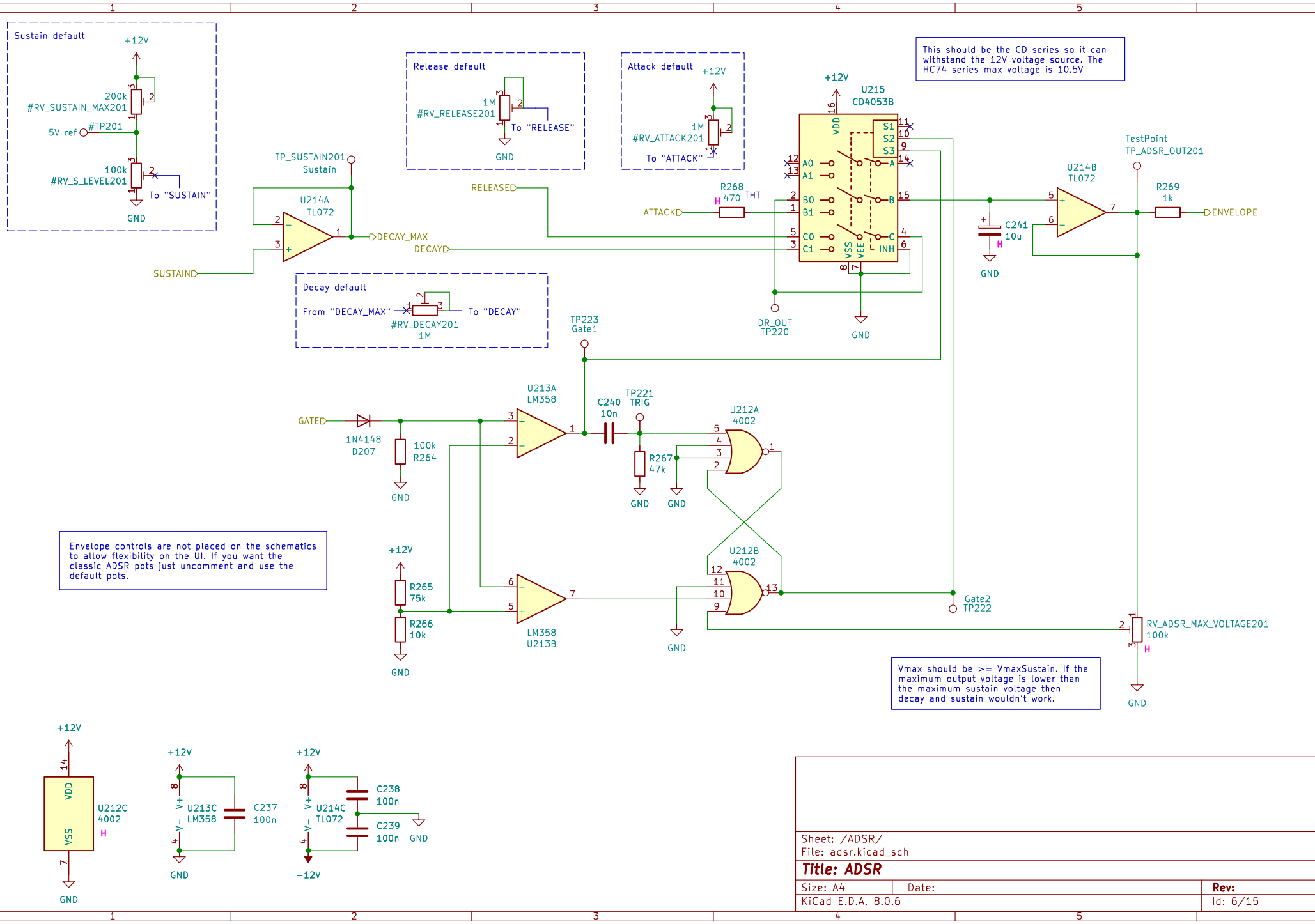
Set the input resistors so that the CV mixer's output value is between −/+5.5.

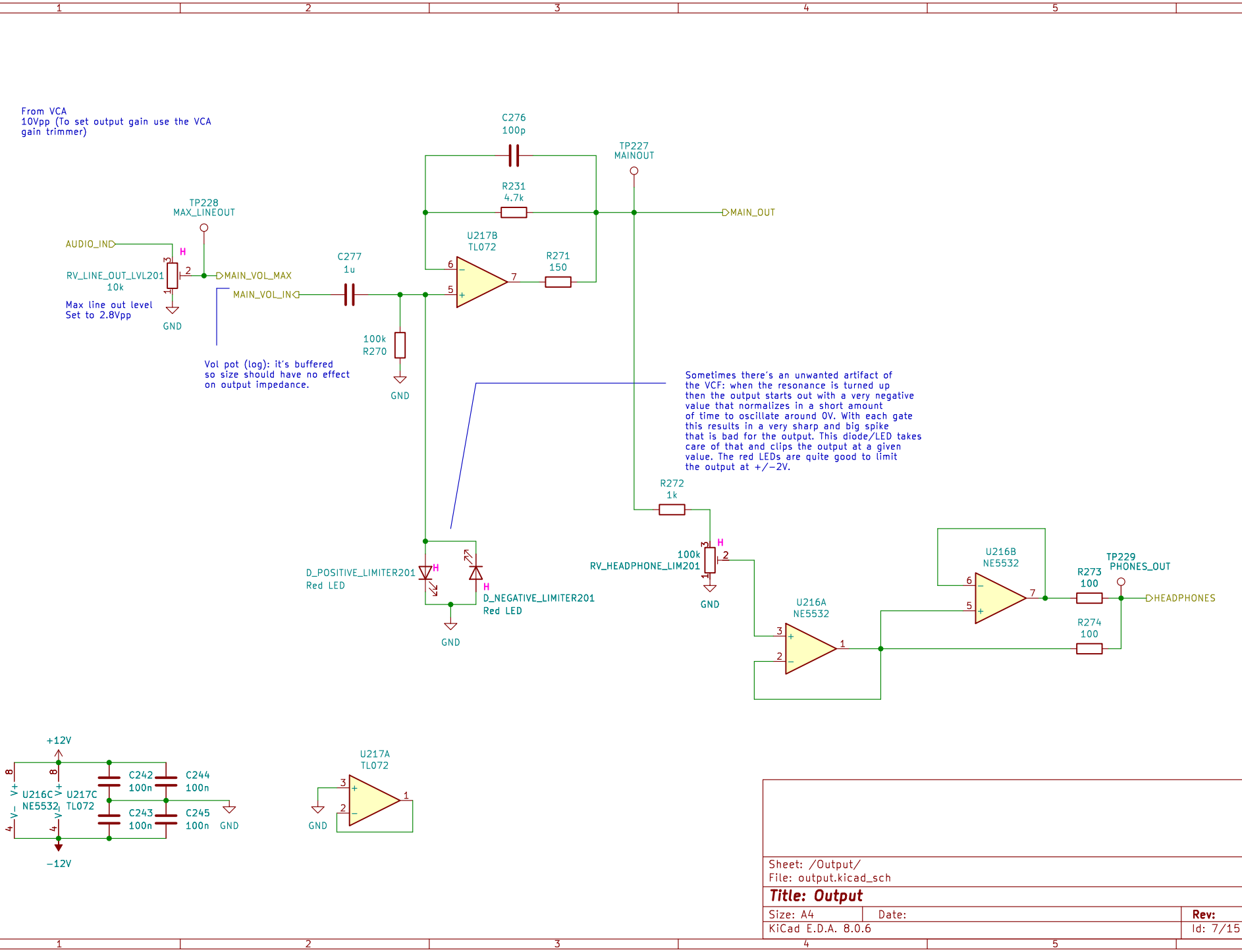
Example:

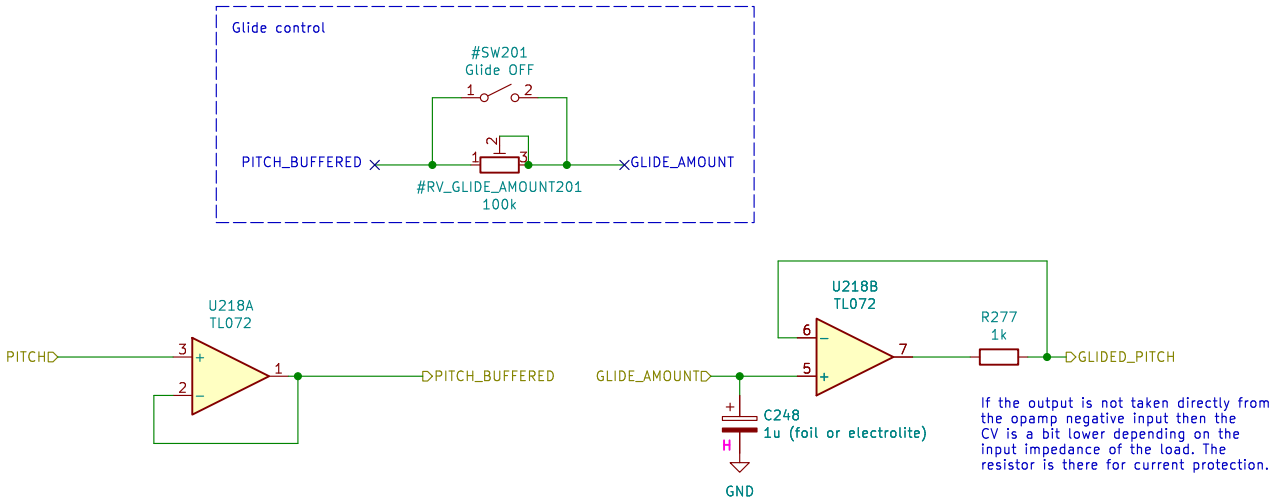


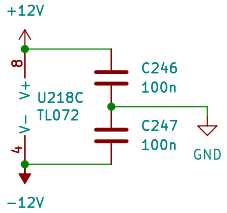


Sheet: /VCO2 Waveshapers/		
File: vco1−waveshapers.kicad_sch		
Title: Waveshapers		
Size: User	Date:	**Rev:**
KiCad E.D.A. 8.0.6		Id: 5/15

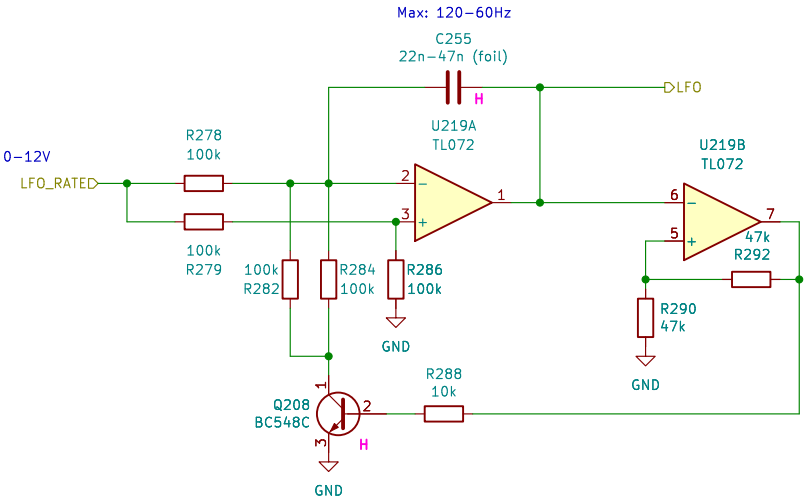

Sustain default
+12V
200k
#RV_SUSTAIN_MAX201
#TP201
5V ref
100k
#RV_S_LEVEL201
To "SUSTAIN"
GND
Release default
1M
#RV_RELEASE201
To "RELEASE"
GND
Attack default
+12V
1M
#RV_ATTACK201
To "ATTACK"
This should be the CD series so it can withstand the 12V voltage source. The HC74 series max voltage is 10.5V
U215
CD4053B
VDD
VSS
VEE
INH
A0
A1
B0
B1
C0
C1
S1
S2
S3
A
B
C
TP_SUSTAIN201
Sustain
U214A
TL072
DECAY_MAX
SUSTAIN
RELEASED
ATTACK
R268
470 THT
DECAY
Decay default
From "DECAY_MAX"
To "DECAY"
#RV_DECAY201
1M
DR_OUT
TP220
C241
10u
U214B
TL072
TestPoint
TP_ADSR_OUT201
R269
1k
ENVELOPE
TP223
Gate1
GATE
1N4148
D207
100k
R264
U213A
LM358
C240
10n
TP221
TRIG
R267
47k
U212A
4002
U212B
4002
R265
75k
R266
10k
LM358
U213B
Gate2
TP222
RV_ADSR_MAX_VOLTAGE201
100k
Envelope controls are not placed on the schematics to allow flexibility on the UI. If you want the classic ADSR pots just uncomment and use the default pots.
Vmax should be >= VmaxSustain. If the maximum output voltage is lower than the maximum sustain voltage then decay and sustain wouldn't work.
U212C
4002
U213C
LM358
C237
100n
U214C
TL072
C238
100n
C239
100n
-12V
Sheet: /ADSR/
File: adsr.kicad_sch
Title: ADSR
Size: A4
Date:
Rev:
KiCad E.D.A. 8.0.6
Id: 6/15

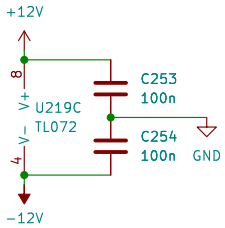

From VCA
10Vpp (To set output gain use the VCA
gain trimmer)
C276
100p
TP227
MAINOUT
R231
4.7k
MAIN_OUT
TP228
MAX_LINEOUT
AUDIO_IN
RV_LINE_OUT_LVL201
10k
Max line out level
Set to 2.8Vpp
GND
MAIN_VOL_MAX
MAIN_VOL_IN
C277
1u
U217B
TL072
R271
150
100k
R270
GND
Vol pot (log): it's buffered
so size should have no effect
on output impedance.
Sometimes there's an unwanted artifact of
the VCF: when the resonance is turned up
then the output starts out with a very negative
value that normalizes in a short amount
of time to oscillate around 0V. With each gate
this results in a very sharp and big spike
that is bad for the output. This diode/LED takes
care of that and clips the output at a given
value. The red LEDs are quite good to limit
the output at +/−2V.
R272
1k
D_POSITIVE_LIMITER201
Red LED
D_NEGATIVE_LIMITER201
Red LED
GND
100k
RV_HEADPHONE_LIM201
GND
U216A
NE5532
U216B
NE5532
R273
100
R274
100
TP229
PHONES_OUT
HEADPHONES
+12V
U216C
NE5532
U217C
TL072
C242
100n
C244
100n
C243
100n
C245
100n
GND
−12V
U217A
TL072
GND
Sheet: /Output/
File: output.kicad_sch
Title: Output
Size: A4
Date:
Rev:
KiCad E.D.A. 8.0.6
Id: 7/15



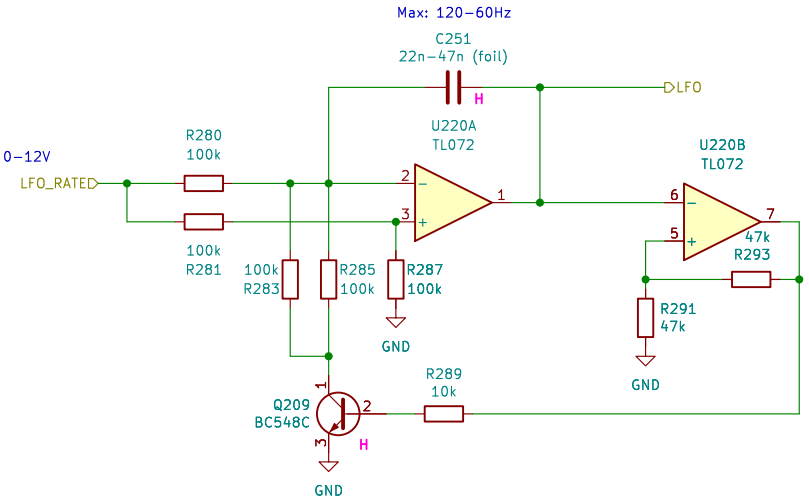


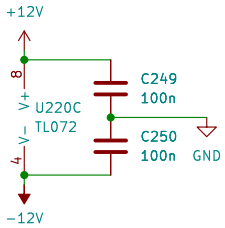
Sheet: /Glide/		
File: glide.kicad_sch		
Title: Glide		
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.6		Id: 8/15



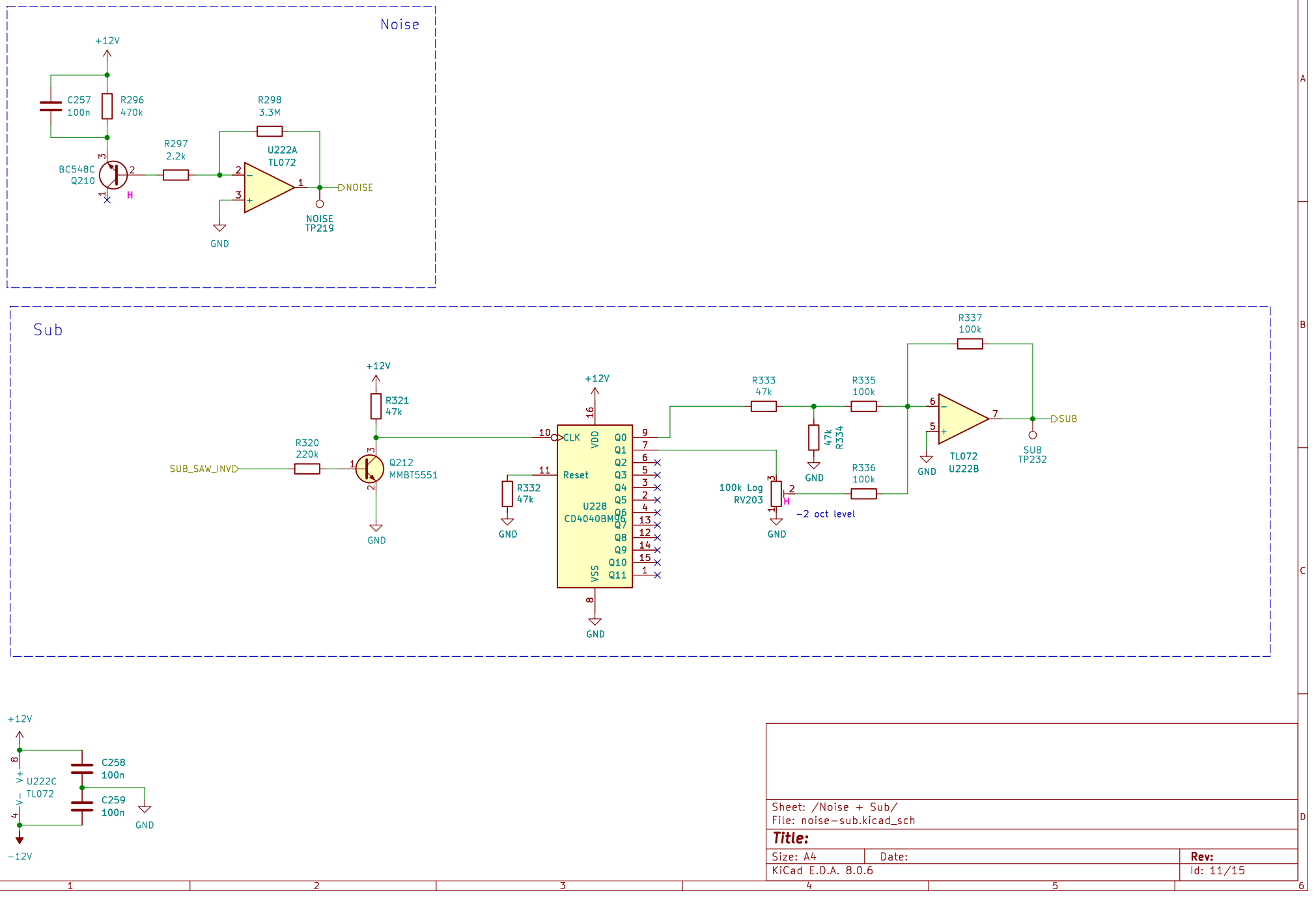


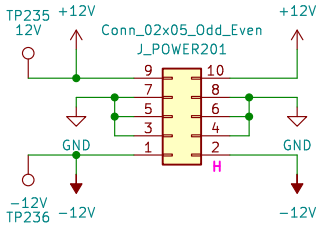
Sheet: /LFO A/		
File: lfos.kicad_sch		
Title: Dual LFO		
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.6		Id: 9/15

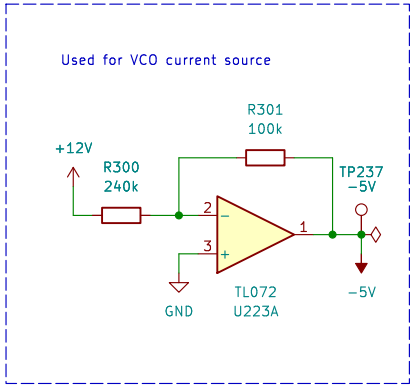


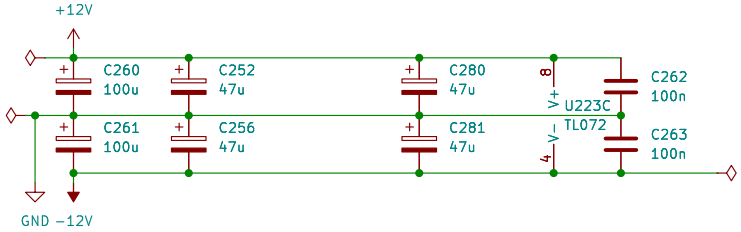


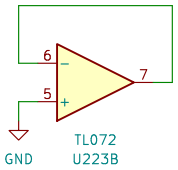
Sheet: /LFO B/		
File: lfos.kicad_sch		
Title: Dual LFO		
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.6		Id: 10/15


Noise
+12V
C257
100n
R296
470k
R298
3.3M
R297
2.2k
U222A
TL072
BC548C
Q210
H
NOISE
NOISE
TP219
GND
Sub
+12V
R321
47k
R320
220k
SUB_SAW_INVD
Q212
MMBT5551
GND
+12V
CLK
Reset
VDD
VSS
Q0
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
U228
CD4040BM96
R332
47k
GND
GND
R333
47k
R335
100k
R337
100k
47k
R334
GND
100k Log
RV203
H
−2 oct level
R336
100k
GND
TL072
U222B
SUB
SUB
TP232
+12V
C258
100n
U222C
TL072
C259
100n
GND
−12V
Sheet: /Noise + Sub/
File: noise−sub.kicad_sch
Title:
Size: A4
Date:
Rev:
KiCad E.D.A. 8.0.6
Id: 11/15



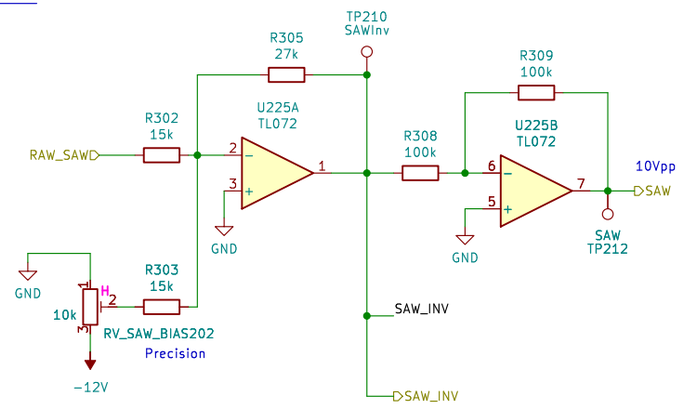






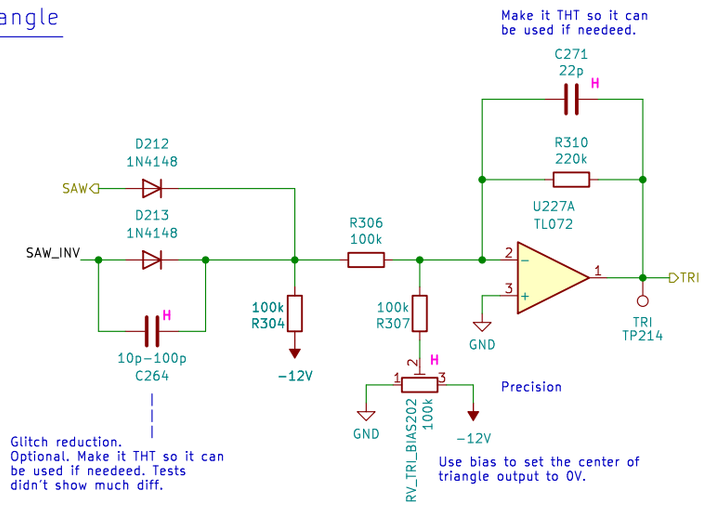
Sheet: /Power/		
File: power.kicad_sch		
Title: Power		
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.6		Id: 12/15

Sawtooth



Use BIAS to set the sawtooth output exactly to oscillate around 0V. This is critical for a nice triangle wave.

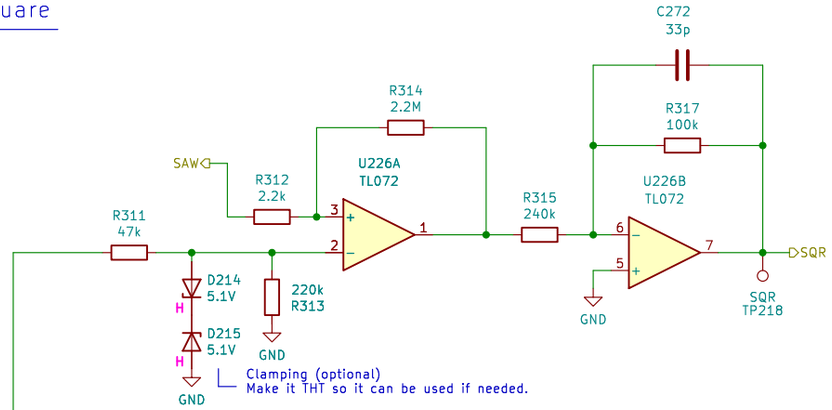
Triangle

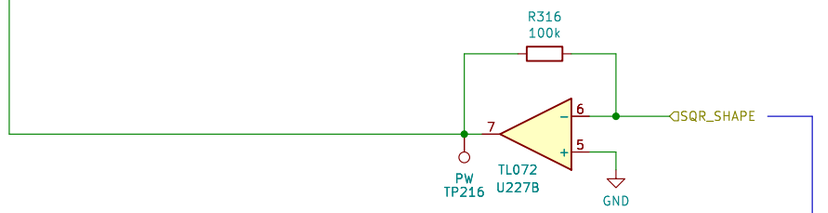


Glitch reduction. Optional. Make it THT so it can be used if neeeded. Tests didn't show much diff.

Use bias to set the center of triangle output to 0V.

Square





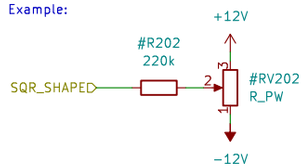
Square pulse width

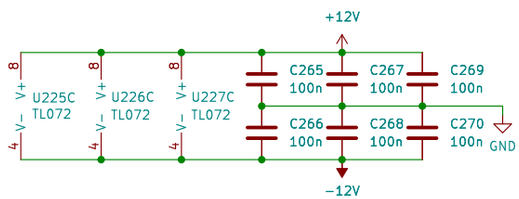
Connect any number of CV inputs through input resistors to set the pulse width with a CV on SQR_SHAPE. Use the following CV values:

0V/GND:	50%
−5.5V:	5%
+5.5V:	95%

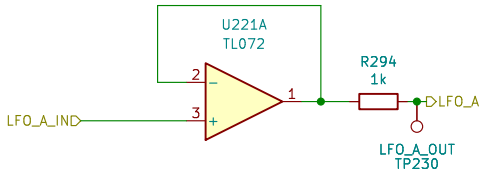
Set the input resistors so that the CV mixer's output value is between −/+5.5.

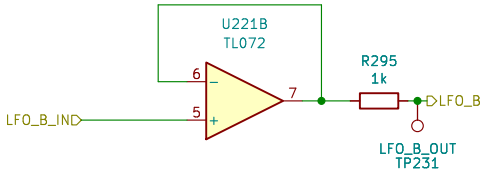
Example:

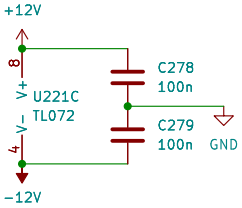




Sheet: /VCO1 Waveshapers/		
File: vco1−waveshapers.kicad_sch		
Title: Waveshapers		
Size: User	Date:	**Rev:**
KiCad E.D.A. 8.0.6		Id: 13/15







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KiCad E.D.A. 8.0.6 | Id: 14/15