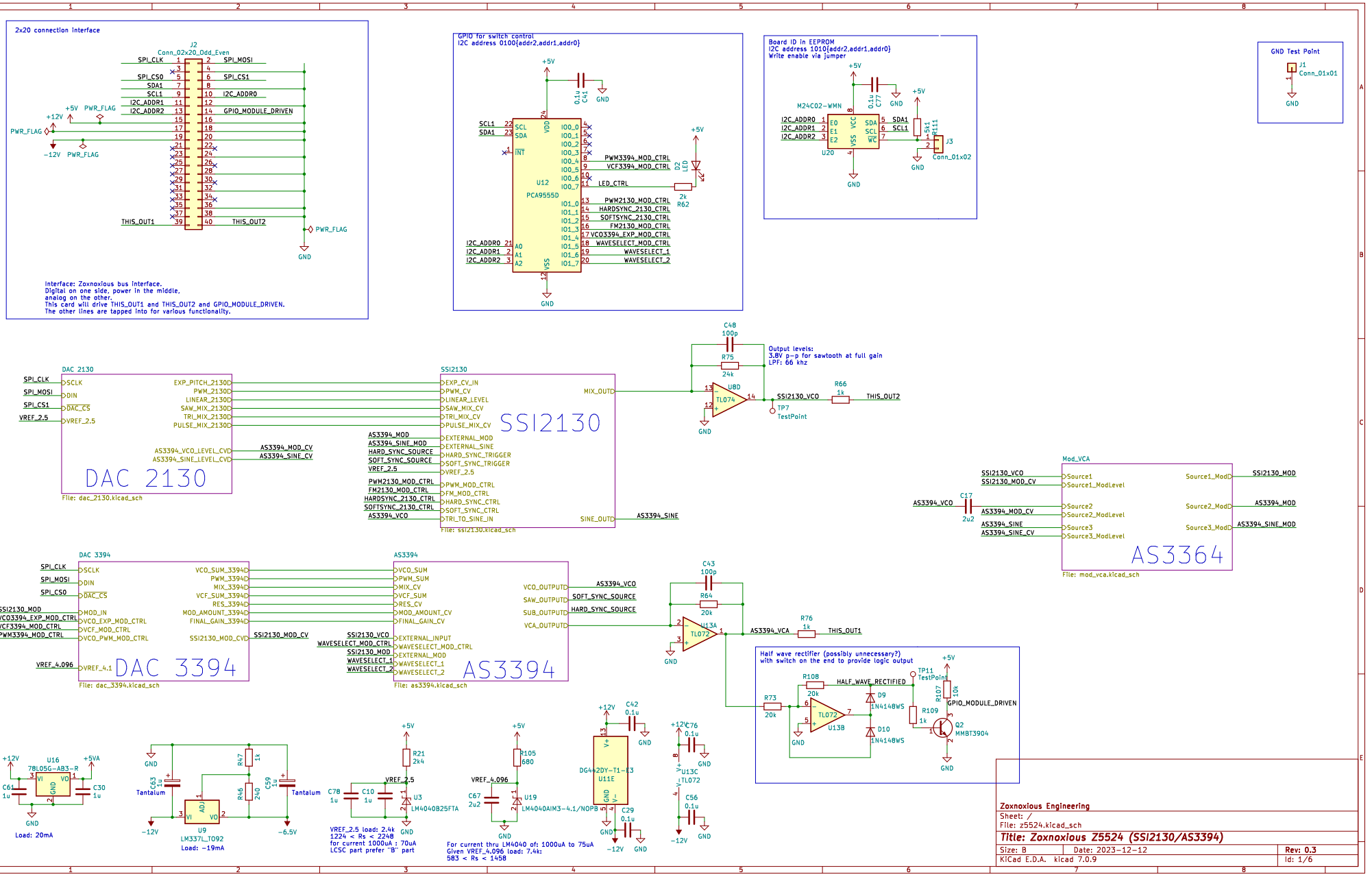
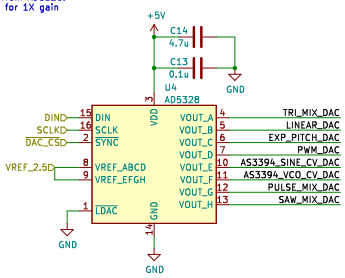
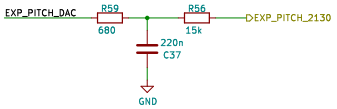

2x20 connection interface
J2
Conn_02x20_Odd_Even
SPI_CLK
SPI_MOSI
SPI_CS0
SPI_CS1
SDA1
I2C_ADDR0
SCL1
I2C_ADDR1
I2C_ADDR2
GPIO_MODULE_DRIVEN
THIS_OUT1
THIS_OUT2
+12V
-12V
+5V
PWR_FLAG
GND
Interface: Zoxnoxious bus interface.
Digital on one side, power in the middle,
analog on the other.
This card will drive THIS_OUT1 and THIS_OUT2 and GPIO_MODULE_DRIVEN.
The other lines are tapped into for various functionality.
GPIO for switch control
I2C address 0100{addr2,addr1,addr0}
U12
PCA9555D
SCL1
SDA1
INT
I2C_ADDR0
I2C_ADDR1
I2C_ADDR2
PWM3394_MOD_CTRL
VCF3394_MOD_CTRL
LED_CTRL
PWM2130_MOD_CTRL
HARDSYNC_2130_CTRL
SOFTSYNC_2130_CTRL
FM2130_MOD_CTRL
VCO3394_EXP_MOD_CTRL
WAVESELECT_MOD_CTRL
WAVESELECT_1
WAVESELECT_2
D2
LED
R62
2k
C41
0.1u
Board ID in EEPROM
I2C address 1010{addr2,addr1,addr0}
Write enable via jumper
M24C02-WMN
U20
C77
R111
J3
Conn_01x02
GND Test Point
J1
Conn_01x01
DAC 2130
SPI_CLK
SPI_MOSI
SPI_CS1
VREF_2.5
EXP_PITCH_2130
PWM_2130
LINEAR_2130
SAW_MIX_2130
TRI_MIX_2130
PULSE_MIX_2130
AS3394_VCO_LEVEL_CV
AS3394_SINE_LEVEL_CV
AS3394_MOD_CV
AS3394_SINE_CV
File: dac_2130.kicad_sch
SSI2130
AS3394_MOD
AS3394_SINE_MOD
HARD_SYNC_SOURCE
SOFT_SYNC_SOURCE
PWM2130_MOD_CTRL
FM2130_MOD_CTRL
HARDSYNC_2130_CTRL
SOFTSYNC_2130_CTRL
AS3394_VCO
EXP_CV_IN
PWM_CV
LINEAR_LEVEL
SAW_MIX_CV
TRI_MIX_CV
PULSE_MIX_CV
EXTERNAL_MOD
EXTERNAL_SINE
HARD_SYNC_TRIGGER
SOFT_SYNC_TRIGGER
PWM_MOD_CTRL
FM_MOD_CTRL
HARD_SYNC_CTRL
SOFT_SYNC_CTRL
TRI_TO_SINE_IN
MIX_OUT
SINE_OUT
AS3394_SINE
File: ssi2130.kicad_sch
C48
100p
R75
24k
U8D
TL074
R66
1k
SSI2130_VCO
THIS_OUT2
TP7
TestPoint
Output levels:
3.8V p-p for sawtooth at full gain
LPF: 66 khz
Mod_VCA
SSI2130_VCO
SSI2130_MOD_CV
AS3394_VCO
AS3394_MOD_CV
AS3394_SINE
AS3394_SINE_CV
C17
2u2
Source1
Source1_ModLevel
Source2
Source2_ModLevel
Source3
Source3_ModLevel
Source1_Mod
Source2_Mod
Source3_Mod
SSI2130_MOD
AS3394_MOD
AS3394_SINE_MOD
AS3364
File: mod_vca.kicad_sch
DAC 3394
SPI_CLK
SPI_MOSI
SPI_CS0
SSI2130_MOD
VCO3394_EXP_MOD_CTRL
VCF3394_MOD_CTRL
PWM3394_MOD_CTRL
VREF_4.096
VCO_SUM_3394
PWM_3394
MIX_3394
VCF_SUM_3394
RES_3394
MOD_AMOUNT_3394
FINAL_GAIN_3394
SSI2130_MOD_CV
File: dac_3394.kicad_sch
AS3394
SSI2130_VCO
WAVESELECT_MOD_CTRL
SSI2130_MOD
WAVESELECT_1
WAVESELECT_2
VCO_SUM
PWM_SUM
MIX_CV
VCF_SUM
RES_CV
MOD_AMOUNT_CV
FINAL_GAIN_CV
EXTERNAL_INPUT
WAVESELECT_MOD_CTRL
EXTERNAL_MOD
WAVESELECT_1
WAVESELECT_2
VCO_OUTPUT
SAW_OUTPUT
SUB_OUTPUT
VCA_OUTPUT
AS3394_VCO
SOFT_SYNC_SOURCE
HARD_SYNC_SOURCE
File: as3394.kicad_sch
C43
100p
R64
20k
U13A
TL072
R76
1k
AS3394_VCA
THIS_OUT1
Half wave rectifier (possibly unnecessary?)
with switch on the end to provide logic output
R108
20k
HALF_WAVE_RECTIFIED
D9
1N4148WS
D10
1N4148WS
R73
20k
U13B
TP11
TestPoint
R107
10k
R109
1k
Q2
MMBT3904
GPIO_MODULE_DRIVEN
U16
78L05G-AB3-R
C61
1u
C30
1u
Load: 20mA
C63
Tantalum
R47
1k
R46
240
C59
Tantalum
U9
LM337L_TO92
Load: ~19mA
C78
1u
C10
1u
R21
2k4
U3
LM4040B25FTA
VREF_2.5 load: 2.4k
122k < Rs < 224k
for current 1000uA : 70uA
LCSC part prefer "B" part
R105
680
C67
2u2
U19
LM4040AIM3-4.1/NOPB
For current thru LM4040 of: 1000uA to 75uA
Given VREF_4.096 load: 7.4k:
583 < Rs < 1458
DG442DY-T1-E3
U11E
C42
0.1u
C29
0.1u
C76
0.1u
U13C
TL072
C56
0.1u
-12V
GND
Zoxnoxious Engineering
Sheet: /
File: z5524.kicad_sch
Title: Zoxnoxious Z5524 (SSI2130/AS3394)
Size: B
Date: 2023-12-12
Rev: 0.3
KiCad E.D.A. kicad 7.0.9
Id: 1/6

DAC: 2.5V Reference Voltage
Outputs at 1X gain from AD5328.
Vref impedance 45k for 1X gain

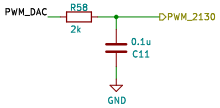


Sheet load:
Vref_2.5: 45k || 30k ==> 18k

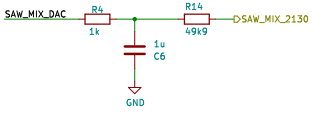
VCO Pitch:
From 2.5V source, a 20 uA/octave
source for 8 octaves gives 15625 for R.
Divide this to a low impedance LPF section
with a ~1063 Hz filter.
No R value needed on SSI2130 sheet.

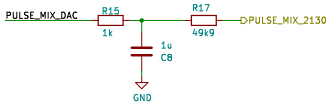


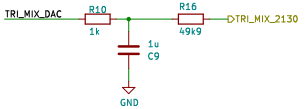
PWM: 795 Hz cutoff freq
note output impedance for next stage



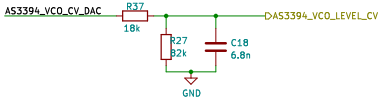
Mix DAC lines: ~159 Hz cutoff frequency.
Follow with current input control resistors

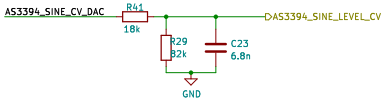


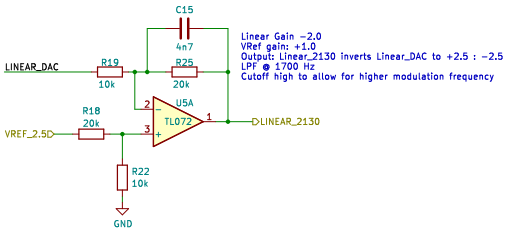


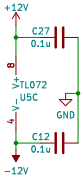


CV for AS3364 VCAs with max level 2.08V (or 1.93V typ)
Lowpass @ 1585 Hz



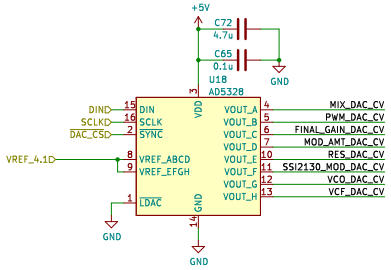




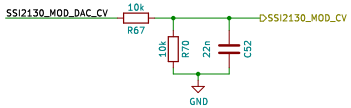


Zoxnoxious Engineering
Sheet: /DAC 2130/
File: dac_2130.kicad_sch
Title: Zoxnoxious Z5524 (SSI2130/AS3394)
Size: B | Date: 2023-12-12 | Rev: 0.3
KiCad E.D.A. kicad 7.0.9 | Id: 2/6

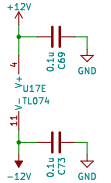
DAC: 4.096V Reference Voltage
B grade spec'd. C, D grades of LM4040 are good 'nuff
Programming: set to 1X gain, so DAC lines are 0 – 4.096V
VREF load: 45k



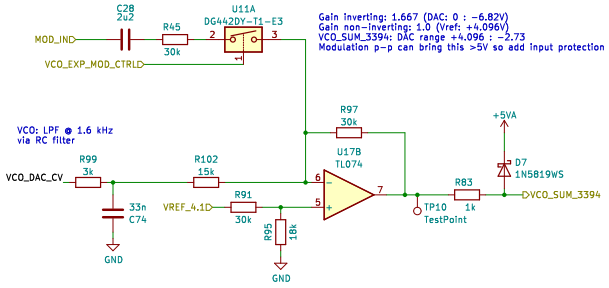
CV to AS3364 VCA:
Max gain at 2.08V (1.93 typ)
LPF @ 1400 Hz



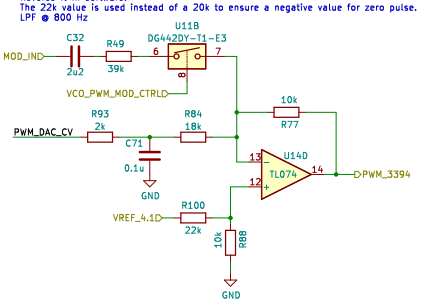
Decoupling caps close to pins



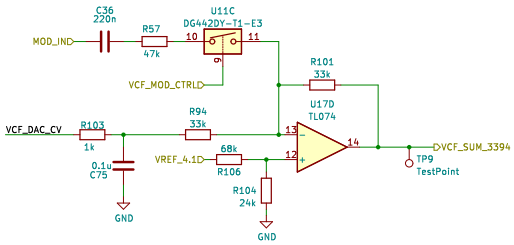
Gain Inverting: 1.667 (DAC: 0 : −6.82V)
Gain non-Inverting: 1.0 (Vref: +4.096V)
VCO_SUM_3394: DAC range +4.096 : −2.73
Modulation p-p can bring this >5V so add input protection



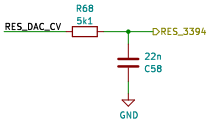
PWM Amount: datasheet is 0 : +2V for range
For DAC values this circuit gives 1.92V : −0.13 V
and yes, that's reverse where high DAC values give low width.
Reverse it in software.
The 22k value is used instead of a 20k to ensure a negative value for zero pulse.
LPF @ 800 Hz



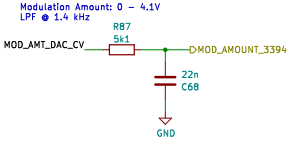
VCF: +2.1V : −1.9V
Gain Inverting: 0.97
Gain non-Inverting: 0.51
This should give ~10 octaves from +20kHz to 23Hz
LPF @ 1591 Hz.
Modulation resistor value: value should give a wide mod range.
The modulator is AC coupled, the R value gives a very wide mod range



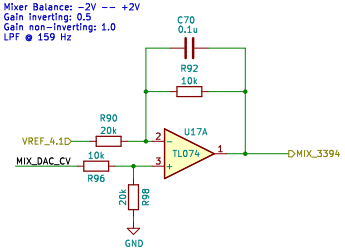
Resonance Amount: 0 -- 4.1V
LPF @ 1.4 kHz



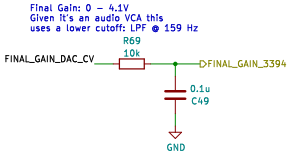
Modulation Amount: 0 – 4.1V
LPF @ 1.4 kHz



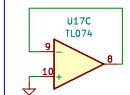
Mixer Balance: −2V -- +2V
Gain Inverting: 0.5
Gain non-Inverting: 1.0
LPF @ 159 Hz



Final Gain: 0 – 4.1V
Given it's an audio VCA this
uses a lower cutoff: LPF @ 159 Hz



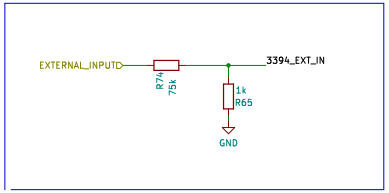
Unused

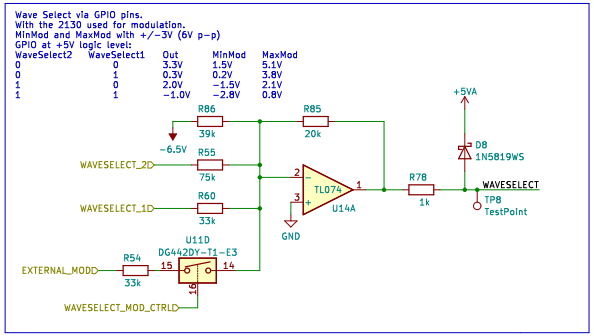


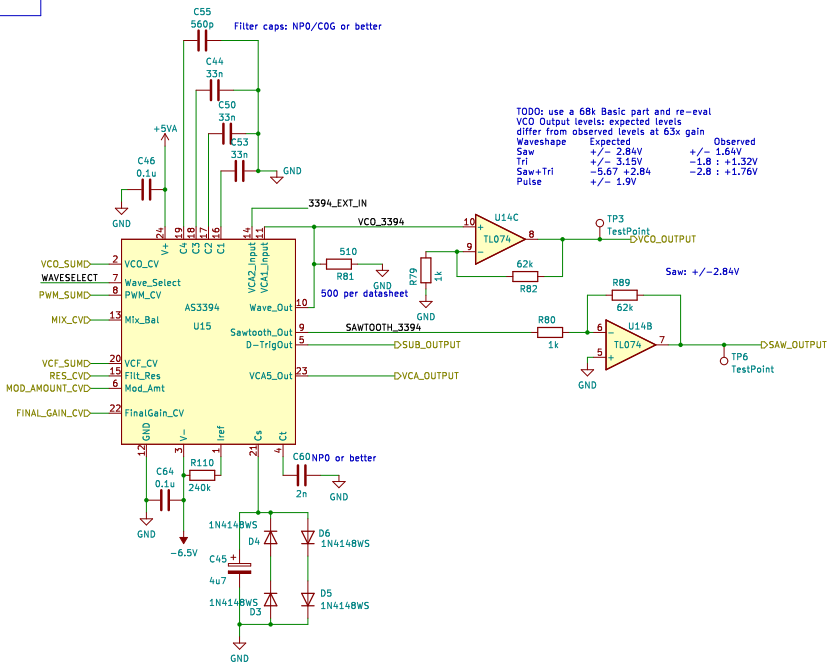
Sheet Load:
Vref 4.096: 45k || 20k || 92k || 48k || 32k ==> 7.4k

Filtering note:
AD5328 datasheet DC output impedance: 0.5 ohm
AS3394 input impedance: control inputs "high impedance", < 0.5 nA input current

Zoxnoxious Engineering		
Sheet: /DAC 3394/		
File: dac_3394.kicad_sch		
Title: Zoxnoxious Z5524 (SSI2130/AS3394)		
Size: B	Date: 2023-12-12	Rev: 0.3
KiCad E.D.A. kicad 7.0.9		Id: 3/6







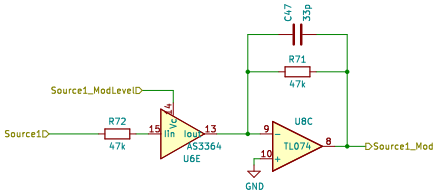
Zoxnoxious Engineering

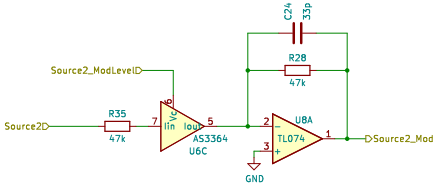
Sheet: /AS3394/

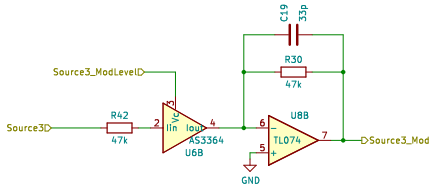
File: as3394.kicad_sch

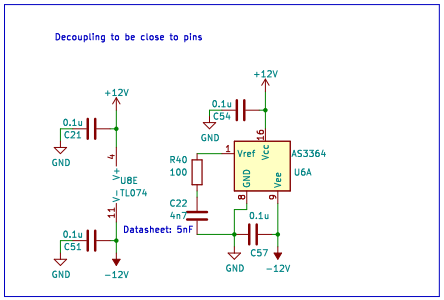
Title: Zoxnoxious Z5524 (SSI2130/AS3394)

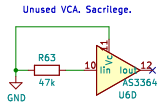
Size: B	Date: 2023-12-12	Rev: 0.3
KiCad E.D.A. kicad 7.0.9		Id: 4/6



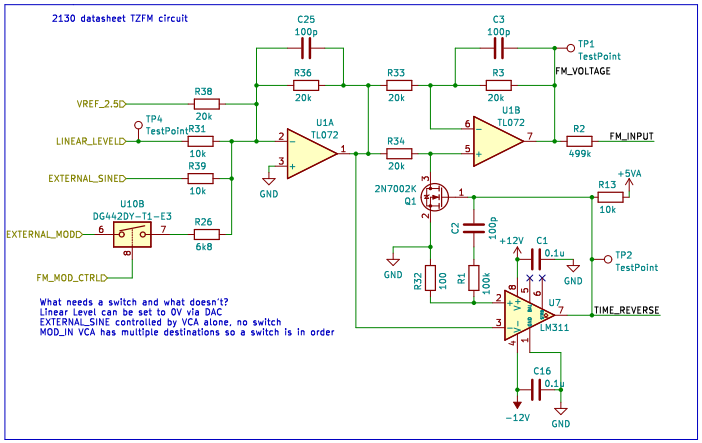


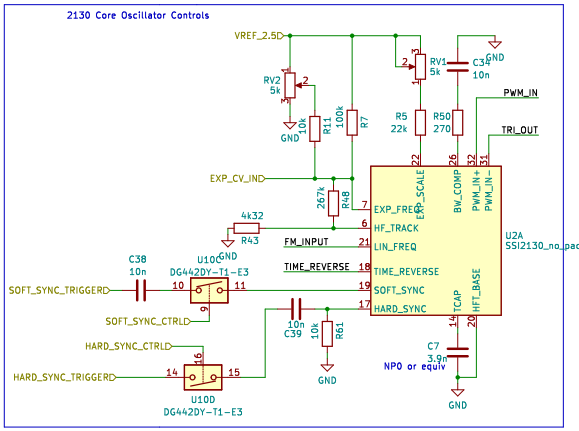


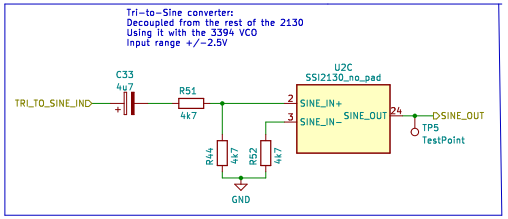


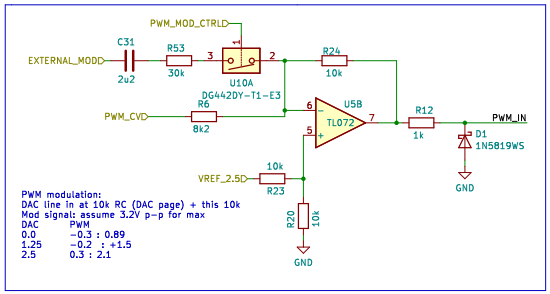


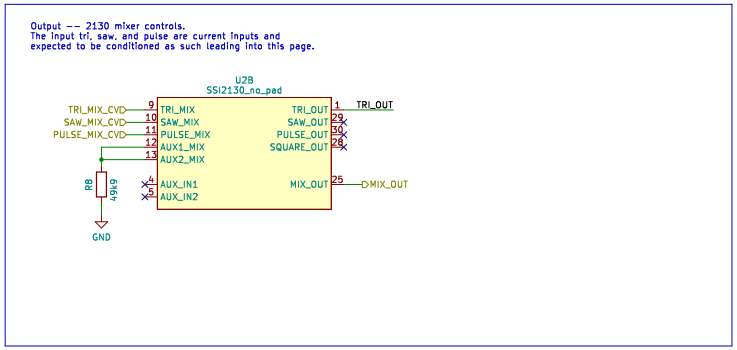
Zoxnoxious Engineering		
Sheet: /Mod_VCA/		
File: mod_vca.kicad_sch		
Title: Zoxnoxious Z5524 (SSI2130/AS3394)		
Size: B	Date: 2023-12-12	Rev: 0.3
KiCad E.D.A. kicad 7.0.9		Id: 5/6

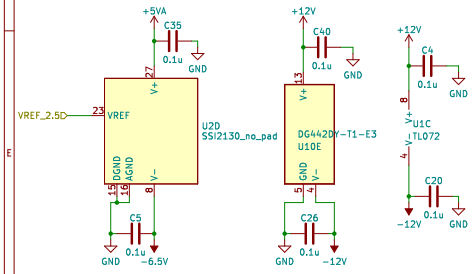












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LM337: -2.90mA

Zoxnoxious Engineering
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Size: B | Date: 2023-12-12 | Rev: 0.3
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