2x20 connection interface

J2
Conn_02x20_Odd_Even

SPI_CLK	1	2	SPI_MOSI
	3	4	
SPI_CS0	5	6	SPI_CS1
SDA1	7	8	
SCL1	9	10	I2C_ADDR0
I2C_ADDR1	11	12	
I2C_ADDR2	13	14	GPIO_MODULE_DRIVEN
	15	16	
	17	18	
	19	20	
	21	22	
	23	24	
	25	26	
	27	28	
	29	30	
	31	32	
	33	34	
	35	36	
	37	38	
THIS_OUT1	39	40	THIS_OUT2

+5V PWR_FLAG
+12V
PWR_FLAG
−12V PWR_FLAG
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}

+5V
0.1u C41
GND

U12
PCA9555D

SCL1	22	SCL	
SDA1	23	SDA	
	1	INT	
	24	VDD	
	4	IO0_0	
	5	IO0_1	
	6	IO0_2	
	7	IO0_3	
PWM3394_MOD_CTRL	8	IO0_4	
VCF3394_MOD_CTRL	9	IO0_5	
	10	IO0_6	
LED_CTRL	11	IO0_7	
PWM2130_MOD_CTRL	13	IO1_0	
HARDSYNC_2130_CTRL	14	IO1_1	
SOFTSYNC_2130_CTRL	15	IO1_2	
FM2130_MOD_CTRL	16	IO1_3	
VCO3394_EXP_MOD_CTRL	17	IO1_4	
WAVESELECT_MOD_CTRL	18	IO1_5	
WAVESELECT_1	19	IO1_6	
WAVESELECT_2	20	IO1_7	
I2C_ADDR0	21	A0	
I2C_ADDR1	2	A1	
I2C_ADDR2	3	A2	
	12	VSS	

+5V
D2 LED
4k7 R62
GND

Board ID in EEPROM
I2C address 1010{addr2,addr1,addr0}
Write enable via jumper

+5V
0.1u C77
GND
M24C02-WMN

I2C_ADDR0	1	E0	
I2C_ADDR1	2	E1	
I2C_ADDR2	3	E2	
	4	VSS	
	8	VCC	
SDA1	5	SDA	
SCL1	6	SCL	
	7	WC	

U20
5k1 R111
+5V
J3
Conn_01x02
GND

GND Test Point
J1
Conn_01x01
GND

DAC 2130

SPI_CLK	SCLK	EXP_PITCH_2130	EXP_CV_IN
SPI_MOSI	DIN	PWM_2130	PWM_CV
SPI_CS1	DAC_CS	LINEAR_2130	LINEAR_LEVEL
VREF_2.5	VREF_2.5	SAW_MIX_2130	SAW_MIX_CV
		TRI_MIX_2130	TRI_MIX_CV
		PULSE_MIX_2130	PULSE_MIX_CV
		AS3394_VCO_LEVEL_CV	AS3394_MOD_CV
		AS3394_SINE_LEVEL_CV	AS3394_SINE_CV

DAC 2130
File: dac_2130.kicad_sch

SSI2130

		MIX_OUT	
		AS3394_MOD	EXTERNAL_MOD
		AS3394_SINE_MOD	EXTERNAL_SINE
		HARD_SYNC_SOURCE	HARD_SYNC_TRIGGER
		SOFT_SYNC_SOURCE	SOFT_SYNC_TRIGGER
		VREF_2.5	VREF_2.5
		PWM2130_MOD_CTRL	PWM_MOD_CTRL
		FM2130_MOD_CTRL	FM_MOD_CTRL
		HARDSYNC_2130_CTRL	HARD_SYNC_CTRL
		SOFTSYNC_2130_CTRL	SOFT_SYNC_CTRL
		AS3394_VCO	TRI_TO_SINE_IN
		SINE_OUT	AS3394_SINE

SSI2130
File: ssi2130.kicad_sch

C48
100p
R75
24k
Output levels:
3.8V p-p for sawtooth at full gain
LPF: 66 khz
U8D
TL074
SSI2130_VCO
R66
51
THIS_OUT2
TP7
TestPoint
GND

Mod_VCA

SSI2130_VCO	Source1	Source1_Mod	SSI2130_MOD
SSI2130_MOD_CV	Source1_ModLevel		
	Source2	Source2_Mod	AS3394_MOD
AS3394_MOD_CV	Source2_ModLevel		
	Source3	Source3_Mod	AS3394_SINE_MOD
AS3394_SINE_CV	Source3_ModLevel		

AS3364
File: mod_vca.kicad_sch

AS3394_VCO
C17
2u2

DAC 3394

SPI_CLK	SCLK	VCO_SUM_3394	
SPI_MOSI	DIN	PWM_3394	
SPI_CS0	DAC_CS	MIX_3394	
		VCF_SUM_3394	
		RES_3394	
SSI2130_MOD	MOD_IN	MOD_AMOUNT_3394	
VCO3394_EXP_MOD_CTRL	VCO_EXP_MOD_CTRL	FINAL_GAIN_3394	
VCF3394_MOD_CTRL	VCF_MOD_CTRL		
PWM3394_MOD_CTRL	VCO_PWM_MOD_CTRL	SSI2130_MOD_CV	SSI2130_MOD_CV
VREF_4.096	VREF_4.1		

DAC 3394
File: dac_3394.kicad_sch

AS3394

		VCO_OUTPUT	AS3394_VCO
		SAW_OUTPUT	SOFT_SYNC_SOURCE
		SUB_OUTPUT	HARD_SYNC_SOURCE
		VCA_OUTPUT	
SSI2130_VCO	EXTERNAL_INPUT		
WAVESELECT_MOD_CTRL	WAVESELECT_MOD_CTRL		
SSI2130_MOD	EXTERNAL_MOD		
WAVESELECT_1	WAVESELECT_1		
WAVESELECT_2	WAVESELECT_2		

AS3394
File: as3394.kicad_sch

C43
100p
R64
20k
U13A
TL072
AS3394_VCA
R76
51
THIS_OUT1
GND

Half wave rectifier (possibly unnecessary?)
with switch on the end to provide logic output

R108
20k
HALF_WAVE_RECTIFIED
TP11
TestPoint
R73
20k
U13B
TL072
D9
1N4148WS
D10
1N4148WS
R109
1k
Q2
MMBT3904
+5V
R107
10k
GPIO_MODULE_DRIVEN
GND

+12V
U16
78L05G-AB3-R
+5VA
C61
1u
C30
1u
GND
Load: 20mA

GND
C63
1u
Tantalum
R47
1k
R46
240
C59
1u
Tantalum
AD1
U9
LM337L_TO92
−12V
−6.5V
Load: −19mA

+5V
R21
2k
VREF_2.5
C78
1u
C10
1u
U3
LM4040B25FTA
GND
VREF_2.5 load: 2k3 (13k || 2k8)
1250 < Rs < 2155
choose something close to 2k
for current 1000uA : 70uA
LCSC part prefer "B" part

+5V
R105
680
VREF_4.096
C67
2u2
U19
LM4040AIM3-4.1/NOPB
GND
For current thru LM4040 of: 1000uA to 75uA
Given VREF_4.096 load: 7.4k:
583 < Rs < 1458

+12V
C42
0.1u
GND
DG442DY-T1-E3
U11E
C29
0.1u
GND
−12V

+12V
C76
0.1u
GND
U13C
TL072
C56
0.1u
GND
−12V

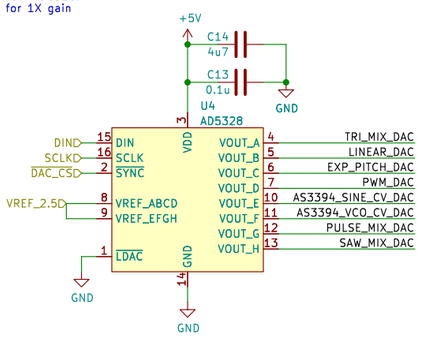
Zoxnoxious Engineering

Sheet: /
File: z5524.kicad_sch

Title: Zoxnoxious Z5524 (SSI2130/AS3394)

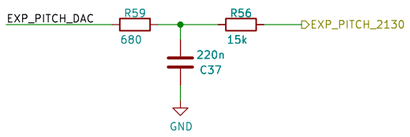
Size: B	Date: 2024-10-04	**Rev: 0.4**
KiCad E.D.A. kicad 7.0.11		Id: 1/6

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

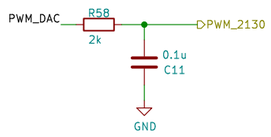


Sheet load:
Vref_2.5: 45k || 45k || 30k ==> 13k

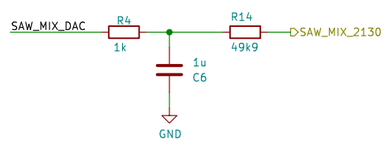
VCO Pitch:
From 2.5V source, a 20 uA/octave
source for 8 octaves gives 15625 for R.
Divide this to a low impedance LPF section
with a ~1063 Hz filter.
No R value needed on SSI2130 sheet.

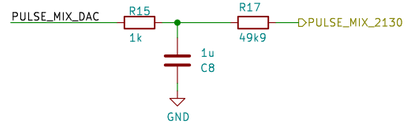


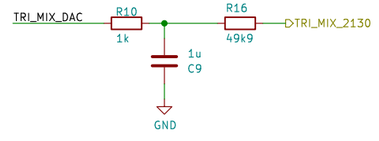
PWM: 795 Hz cutoff freq
note output impedance for next stage



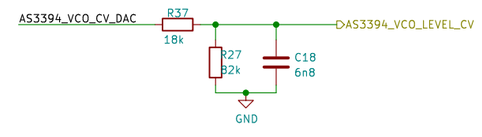
Mix DAC lines: ~159 Hz cutoff frequency.
Follow with current input control resistors

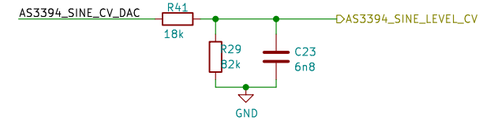


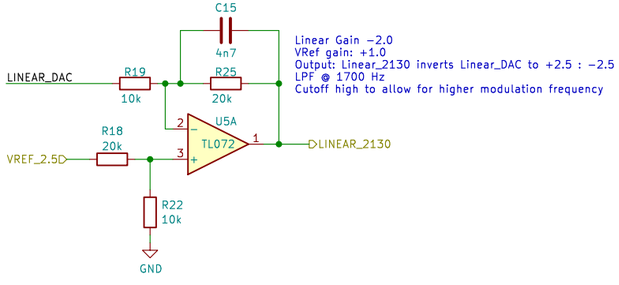


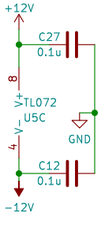


CV for AS3364 VCAs with max level 2.08V (or 1.93V typ)
Lowpass @ 1585 Hz



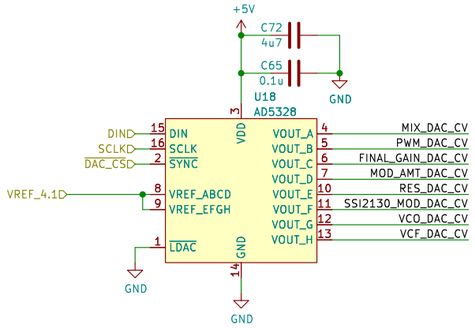






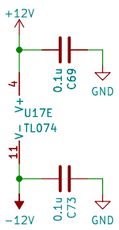
Zoxnoxious Engineering
Sheet: /DAC 2130/
File: dac_2130.kicad_sch
Title: Zoxnoxious Z5524 (SSI2130/AS3394)
Size: B | Date: 2024−10−04 | **Rev: 0.4**
KiCad E.D.A. kicad 7.0.11 | Id: 2/6

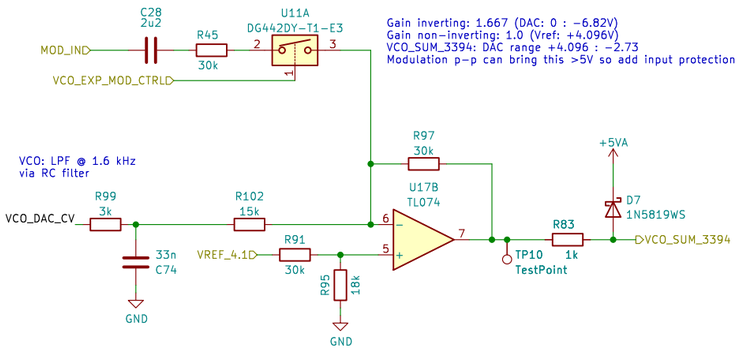
DAC: 4.096V Reference Voltage
B grade spec'd, C, D grades of LM4040 are good 'nuff
Programming: set to 1X gain, so DAC lines are 0 – 4.096V
VREF load: 45k

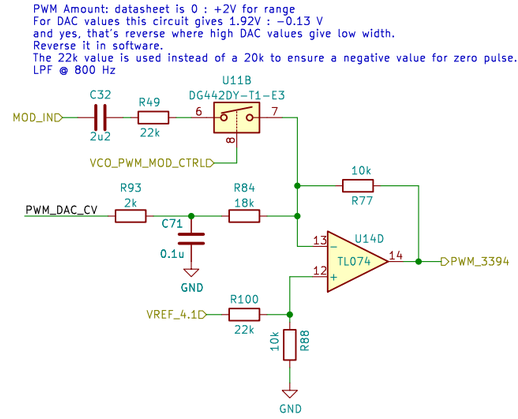


CV to AS3364 VCA:
Max gain at 2.08V (1.93 typ)
LPF @ 1400 Hz

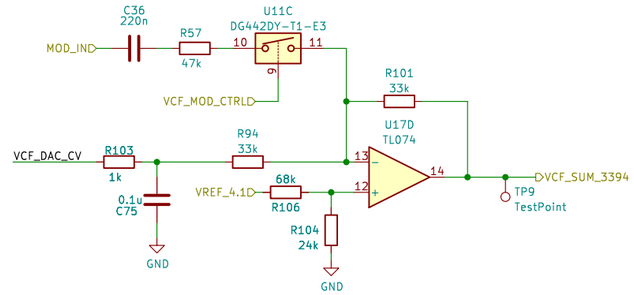
Decoupling caps close to pins

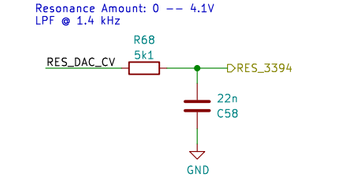


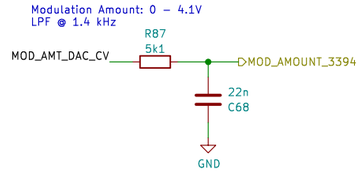




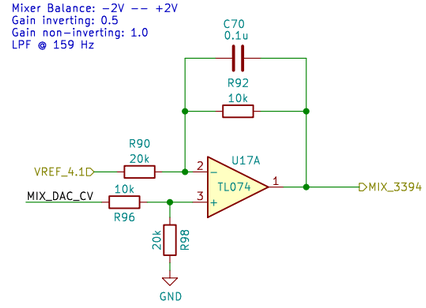
VCF: +2.1V : −1.9V
Gain inverting: 0.97
Gain non-inverting: 0.51
This should give ~10 octaves from +20kHz to 23Hz
LPF @ 1591 Hz.
Modulation resistor value: value shoudl give a wide mod range.
The modulator is AC coupled, the R value gives a very wide mod range

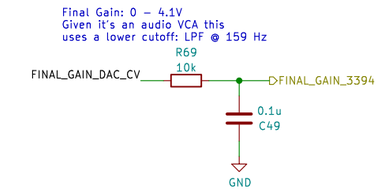


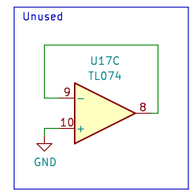




Mixer Balance: −2V –– +2V
Gain inverting: 0.5
Gain non-inverting: 1.0
LPF @ 159 Hz







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

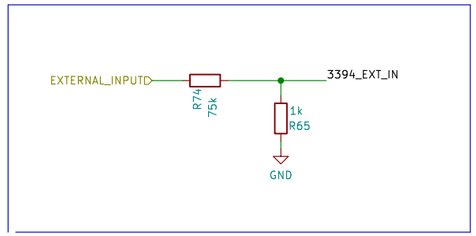
Filtering note:
AD5328 datasheet DC output impedance: 0.5 ohm
AS3394 input impedance: control inputs "high impedance", < 0.5 nA input current

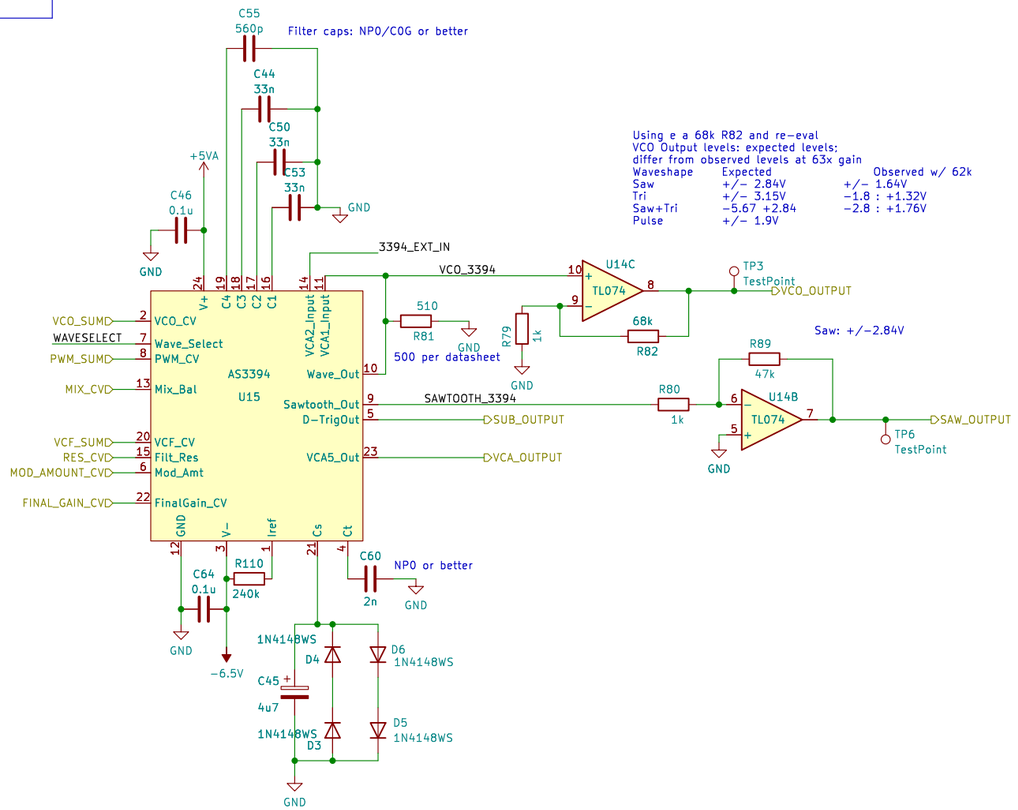
Zoxnoxious Engineering

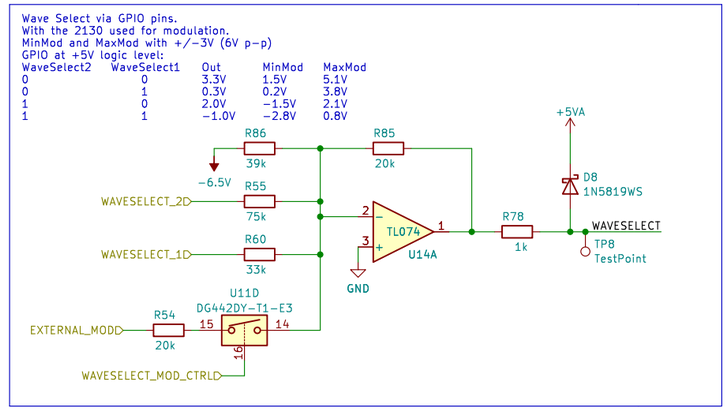
Sheet: /DAC 3394/
File: dac_3394.kicad_sch

Title: Zoxnoxious Z5524 (SSI2130/AS3394)

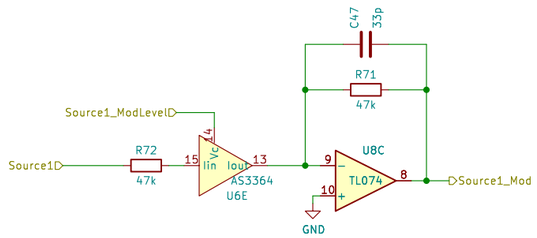
Size: B	Date: 2024-10-04	**Rev: 0.4**
KiCad E.D.A. kicad 7.0.11		Id: 3/6

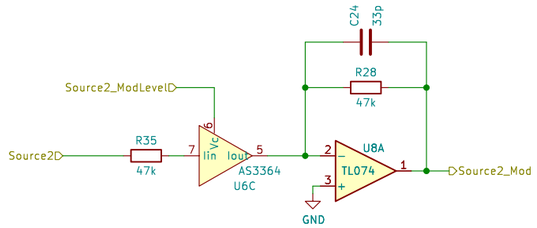


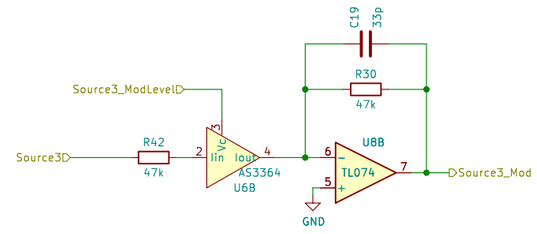


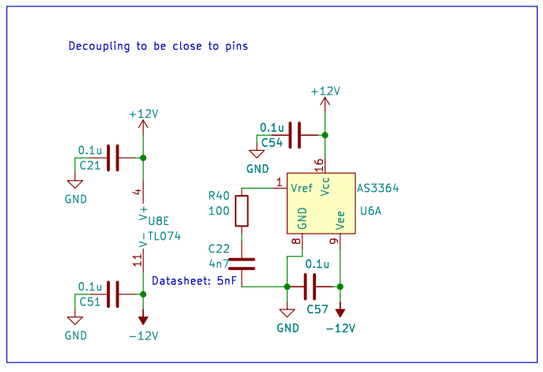


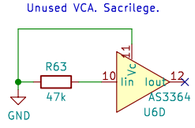
Zoxnoxious Engineering		
Sheet: /AS3394/		
File: as3394.kicad_sch		
Title: Zoxnoxious Z5524 (SSI2130/AS3394)		
Size: B	Date: 2024-10-04	**Rev: 0.4**
KiCad E.D.A. kicad 7.0.11		Id: 4/6









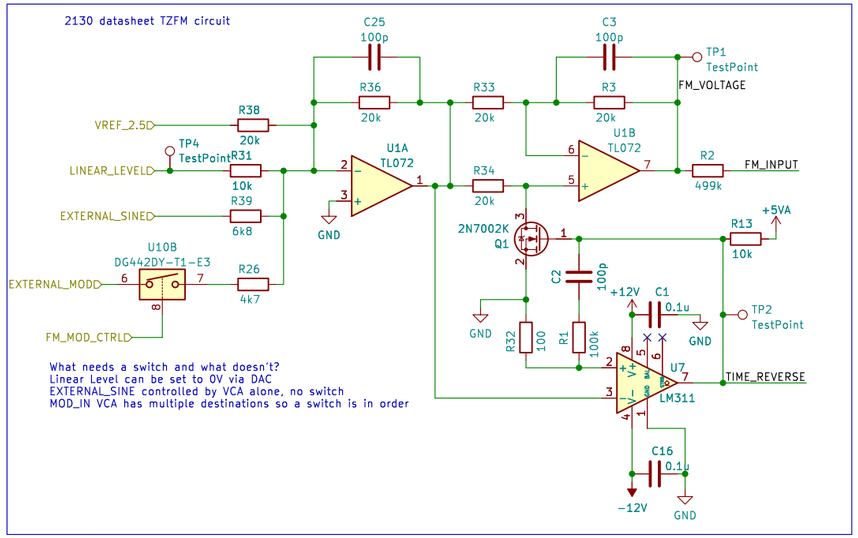


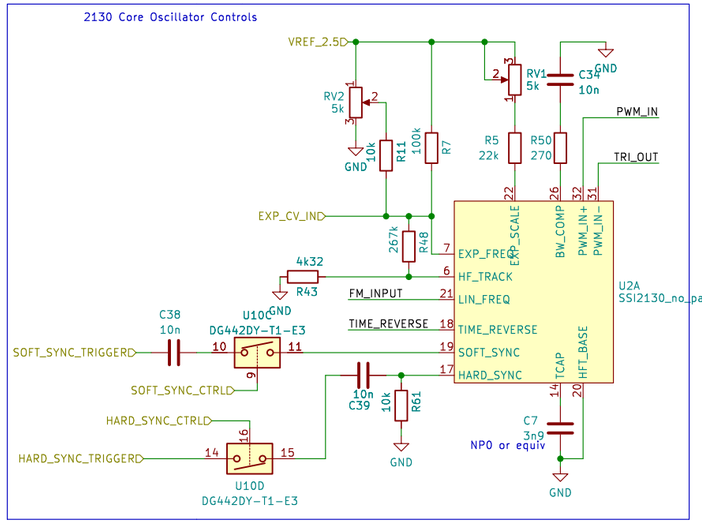
Zoxnoxious Engineering

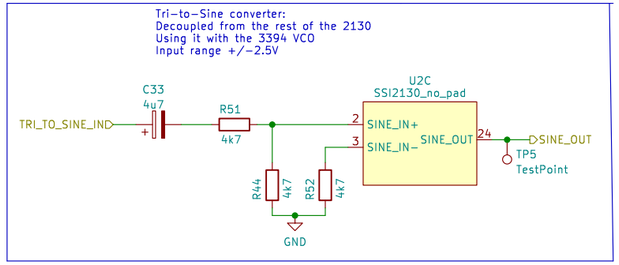
Sheet: /Mod_VCA/
File: mod_vca.kicad_sch

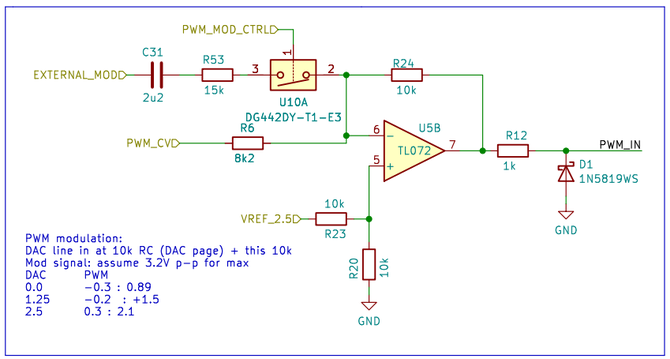
Title: Zoxnoxious Z5524 (SSI2130/AS3394)

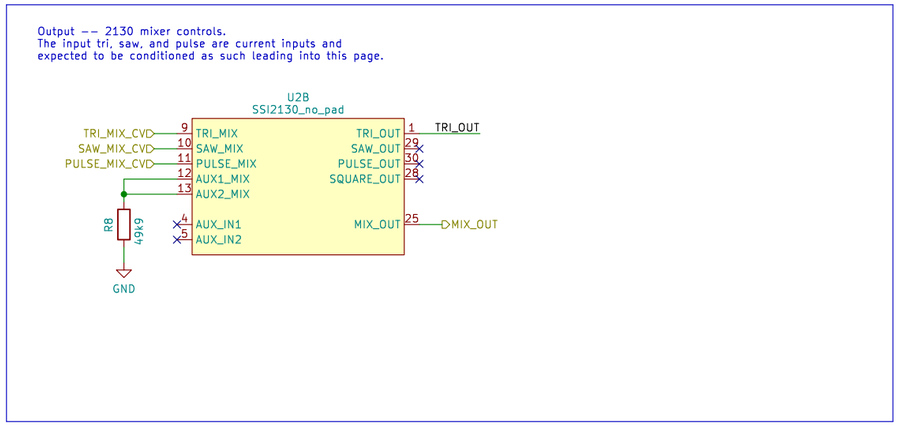
Size: B	Date: 2024-10-04	**Rev: 0.4**
KiCad E.D.A. kicad 7.0.11		Id: 5/6

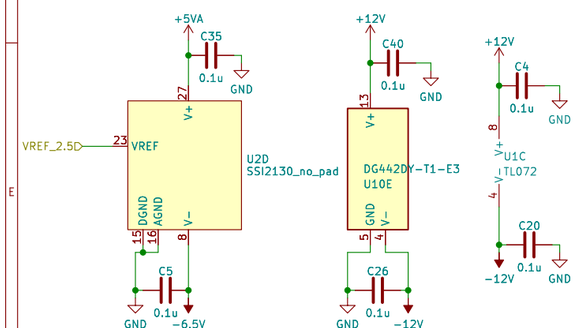












Sheet Load:
Vref 2.5: 25k (100uA per SSI2130 datasheet) || 20k || 20k || 5k || 100k ==> 2k8
LM7805: 3.75mA + 0.5mA
LM337: −2.90mA

Zoxnoxious Engineering		
Sheet: /SSI2130/		
File: ssi2130.kicad_sch		
Title: Zoxnoxious Z5524 (SSI2130/AS3394)		
Size: B	Date: 2024−10−04	**Rev: 0.4**
KiCad E.D.A. kicad 7.0.11		Id: 6/6