2x20 connection interface

J2
Conn_02x20_Odd_Even

SPI_CLK — 1 2 — SPI_MOSI
3 4
SPI_CS0 — 5 6
SDA1 — 7 8
SCL1 — 9 10 — I2C_ADDR0
I2C_ADDR1 — 11 12
I2C_ADDR2 — 13 14 — GPIO_MODULE_DRIVEN
15 16
+5V PWR_FLAG
17 18
+12V PWR_FLAG
19 20
PWR_FLAG
CARD1_OUT1 — 21 22 — CARD1_OUT2
CARD2_OUT1 — 23 24
-12V PWR_FLAG
CARD2_OUT2 — 25 26 — CARD3_OUT1
CARD3_OUT2 — 27 28
CARD4_OUT1 — 29 30 — CARD4_OUT2
CARD5_OUT1 — 31 32
CARD5_OUT2 — 33 34 — CARD6_OUT1
CARD6_OUT2 — 35 36
CARD7_OUT1 — 37 38
THIS_OUT1 — 39 40 — THIS_OUT2

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
C37
0.1u
GND

+5V
R55
4k7

U11
CAT9555YI-T2

SCL1 — 22 SCL VDD 24
SDA1 — 23 SDA
IO0_0 4 — LED_CTRL
IO0_1 5 — LED D2
IO0_2 6 — VCF_FM_CTRL
IO0_3 7 — RES_FM_CTRL
IO0_4 8 — VCA_FM_CTRL
IO0_5 9 — PAN_FM_CTRL
INT 1 IO0_6 10
IO0_7 11
IO1_0 13 — VCF_SIG1_EN
IO1_1 14 — VCF_SIG1_CTRL0
IO1_2 15 — VCF_SIG1_CTRL1
IO1_3 16 — VCF_SIG1_CTRL2
IO1_4 17 — VCF_SIG2_EN
IO1_5 18 — VCF_SIG2_CTRL0
I2C_ADDR0 21 A0 IO1_6 19 — VCF_SIG2_CTRL1
I2C_ADDR1 2 A1 IO1_7 20 — VCF_SIG2_CTRL2
I2C_ADDR2 3 A2 VSS
12

GND

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

+5V
0.1u C33
GND

U13
M24C02-WMN

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

+5V
R56 4k7

J3
1 2
Conn_01x02
GND

GND

Mounting Holes

H4 H3
MountingHole MountingHole
H2 H1
MountingHole MountingHole

GND Test Point

J1
Conn_01x01
1
GND

Signal select -- output selected signal in-phase

+12V
0.1u
C39
GND

U8A
TL072
2
3 1 — VCF_SIGNAL1

U7
MUX508

CARD7_OUT1 4 S1 VDD 13
CARD6_OUT2 5 S2 D 8
CARD5_OUT1 6 S3
CARD4_OUT2 7 S4
CARD3_OUT2 12 S5
CARD2_OUT2 11 S6
CARD1_OUT2 10 S7
CARD1_OUT1 9 S8
R46 100k
VCF_SIG1_EN 2 EN GND
A0 1 GND 14
A1 16 VSS 15
A2 15
0.1u
GND C31
-12V GND

DAC

SPI_CLK — SCLK
SPI_MOSI — DIN
SPI_CS0 — DAC_CS
VREF_2.5 — VREF_2.5

SIG1_VCA1_CVD — SIG1_VCA_CV
SIG2_VCA2_CVD — SIG2_VCA_CV
VCF_CVD — VCF_CV
RESONANCE_CVD — RES_CV
MOD_AMOUNT_CVD — MOD_LEVEL_CV
PAN_VCA_CVD — PAN_VCA_CV
NOISE_CONTROL_CVD — NOISE_CV
FINAL_VCA4_CVD — VCA4_CV

DAC

File: dac.kicad_sch

filter_as3372

VCF_SIGNAL1 — VCF_SIG1
VCF_SIGNAL2 — VCF_SIG2

SIG1_VCA_CV
SIG2_VCA_CV
VCF_CV
RES_CV
MOD_LEVEL_CV
PAN_VCA_CV
NOISE_CV
VCA4_CV

VCF_LEFT_OUTD — VCF_LEFT — R18 51 — THIS_OUT1
VCF_RIGHT_OUTD — R48 51 — THIS_OUT2

Filter

VCF_FM_CTRL — VCF_FM_CTRL
VCA_FM_CTRL — VCA_FM_CTRL
RES_FM_CTRL — RES_FM_CTRL
PAN_FM_CTRL — PAN_FM_CTRL

File: filter_as3372.kicad_sch

+12V
0.1u
C36
GND

U8B
TL072
6
5 7 — VCF_SIGNAL2

U10
MUX508

CARD6_OUT1 4 S1 VDD 13
CARD5_OUT2 5 S2 D 8
CARD4_OUT1 6 S3
CARD3_OUT1 7 S4
CARD2_OUT2 12 S5
CARD2_OUT1 11 S6
CARD1_OUT2 10 S7
CARD1_OUT1 9 S8

+12V 0.1u
C29
8
V+ U8C
TL072
V-
4
-12V

R19 100k
VCF_SIG2_EN 2 EN GND
A0 1 GND 14
A1 16 VSS 15
A2 15
0.1u
GND C35
-12V GND

0.1u
C10
GND

Voltage Reference

+5V
R53 4k7
VREF_2.5
C45 1u
U14
LM4040AIM3-2.5
GND GND

LM4040 resistor calc:
Vref input impedance total: 7k1 ==> 352 uA
lm4040 min: 80uA; with margin shoot for 150uA
352 + 150 ==> 502 uA through R. R = 4980.
Use 4k7 which gives 532 uA.

GPIO Module Driven:
drive this via VCF Raw output to allow for tuning / calibration

+5V
R45 10k
GPIO_MODULE_DRIVEN
TestPoint
TP10
VCF_LEFT — R47 100k
Q3 MMBT3904
GND

AD5328: "B" version works fine. For use at 2X gain output.
DAC: 2.5V Reference Voltage
B, C, D grades of LM4040 are likely good 'nuff

+5V
C44 4u7
C40 0.1u
GND

DIN 15 DIN
SCLK 16 SCLK
DAC_CS 2 SYNC
VREF_2.5 8 VREF_ABCD
9 VREF_EFGH
1 LDAC
AD5328
U12
3 VDD
14 GND

VOUT_A 4 — NOISE_CONTROL_DAC
VOUT_B 5 — PAN_VCA_DAC
VOUT_C 6 — RESONANCE_DAC
VOUT_D 7 — VCA4_DAC
VOUT_E 10 — VCF_CV
VOUT_F 11 — SIG1_VCA_DAC
VOUT_G 12 — SIG2_VCA_DAC
VOUT_H 13 — MOD_AMOUNT_DAC

GND
GND

Control Voltage level outputs from sheet:
VCF CV: 0 : 5V
Pan VCA CV: 0 : 5V
Noise Control Level CV: 0 : 1.9V
Res CV: 0 : −3.5V (note negative)
Sig1 VCA CV: 0 : 5V
Sig2 VCA CV: 0 : 5V
VCA4: 0 : −5V (note negative)
VCA Mod Level CV: 0 : 1.9V
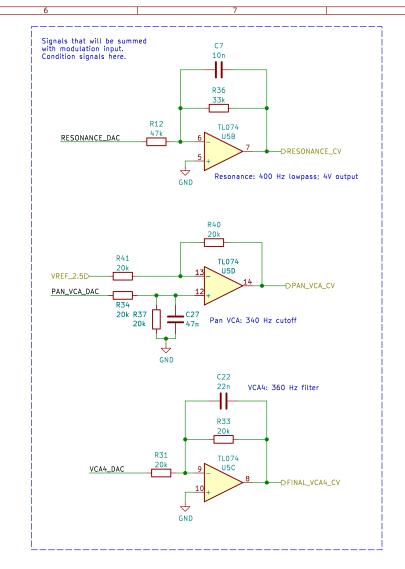
This sheet lowpass filters for nearly all signals.
VCF CF done outside of this sheet. sorry.

Sheet totals:
Vref impedance: 22k || 22k || 20k ==> 7k1

AS3372 input VCAs:
RC lowpass at ~1kHz

SIG1_VCA_DAC — R51 15k — SIG1_VCA1_CV
C41 10n
GND

SIG2_VCA_DAC — R54 15k — SIG2_VCA2_CV
C42 10n
GND

DAC lines for 3360 VCA:
Voltage divider to 1.9V for linear 3360 input.
Cap for lowpass filter of ~285 Hz

MOD_AMOUNT_DAC — R5 15k — MOD_AMOUNT_CV
R7 9k1
C4 0.1u
GND

NOISE_CONTROL_DAC — R29 15k — NOISE_CONTROL_CV
R13 9k1
C12 0.1u
GND

Signals that will be summed
with modulation input.
Condition signals here.

C7 10n
R36 33k
RESONANCE_DAC — R12 47k — 6 TL074 U5B 7 — RESONANCE_CV
5 +
GND
Resonance: 400 Hz lowpass; 4V output

R40 20k
R41 20k
VREF_2.5 — 13 TL074 U5D 14 — PAN_VCA_CV
PAN_VCA_DAC — 12 +
R34 20k R37 20k
C27 47n
GND
Pan VCA: 340 Hz cutoff

C22 22n   VCA4: 360 Hz filter
R33 20k
VCA4_DAC — R31 20k — 9 TL074 U5C 8 — FINAL_VCA4_CV
10 +
GND

Spares

2 TL074 U5A 1
3 +
GND

Power / Decoupling
+12V
C24 0.1u
GND
4 +
U5E
TL074
11 −
−12V
C28 0.1u
GND

Modulation Control
Note VCF_FM does not go through summer
and get inverted.
Resonance does get inverted, rez mod is
out of phase with the filter modulation.

Resonance modulation:
invert with gain of 1.0
Idea being that if one modulates filter cutoff _and_ resonance,
you want res high while cutoff is low and vice versa.

RES_FM_CTRLD
16
14   15   RES_FM
U4D
DG442xY

VCF_FM_CTRLD
3   1   2   VCF_FM
DG442xY
U4A

U4B
DG442xY
6   7   VCA4_FM
8

VCA_FM_CTRLD

PAN_FM_CTRLD
DG442xY
11   9   10   PAN_FM
U4C

U1B
AS3360-Audio
12 V_E Io 13
11 V_O
10 V_C
9   Signal

R26
47k

6
5 +   U2B   7
TL074   TP8
            TestPoint
GND

MOD_LEVEL_CVD

VCF_SIG1D

R16
20k

MOD_VCA_OUT

Pan CVA CV: Input range -2.5V : 2.5V.
Take 0V : 5V from DAC shift to -2.5V : 2.5V output.
33n cap to give a ~482 Hz low pass filter
Modulation: sum in at 1X gain

R21   R20
68k   1k

R22   R27
68k   1k
            GND

VCF_SIG2D

U3B
AS3372

VCA1_IN VCA_OUT1/2
7   8   5   WHITE_NOISE
VCA2_IN

6   VCA1_CV
9   VCA2_CV   VCF_Out 23
21 VCF_CV
16 Res_CV   Res_In 17

Ca Cb Cc Cd
4   3   2   1

C15 C17 C20 C21
33n 33n 33n 330p
C11, C12, C15, C17: NP0 or better
GND

C14, C16: Film cap or similar

C34
2u2

C38
2u2

R50
27k

R49
1k
GND

TP11
TestPoint

TP5
TestPoint

VCA4: Input range 0 : 5V.
33n cap to give a ~482 Hz low pass filter
Modulation: sum in at 1X gain

PAN_FM
R9   R11
30k   20k

PAN_VCA_CVD
R10
20k

13 -   U2D 14
12 +   PAN_CV
TL074
GND

VCA4_FM
R30
20k

VCA4_CVD
R35
20k   R32
           20k

9   -   U2C   8
10 +   TP9
TL074   TestPoint
GND

TP4
TestPoint

VCF Control:
VCF from DAC has 2k/0.1u RC
filter @ 800 Hz. External
mod has slightly less pull at
36k versus DAC at 20k effective.

VCF_FM
R38
36k

VCF_CVD
R52
2k

R39
20k

C25
0.1u
GND

R28
39k
-5V

R24
1k
GND

TP6
TestPoint

SIG1_VCA_CVD
SIG2_VCA_CVD

TP1
TestPoint

RES_FM
R8   R6
30k   20k

RES_CVD
R4
20k

2   -   U2A   1
3   +
TL074
GND

Resonance control:
CV from DAC lowpass set to 530 Hz.
External mod inverted.

R23
22k

U3C
AS3372
9   VCA4_CV
18 VCA4_IN   VCA4_OUT 20

TP7
TestPoint
R25
1k
GND

15 VCA5_IN   VCA5_OUT 10
14 VCA6_IN   VCA6_OUT 13
VCA5/6_CV 11
AS3372   U3D

VCA5_OUT
C9
33p
R15
33k
2   -   NE5532 1 VCF_LEFT_OUT
3   +
U6A
GND

VCA6_OUT
C30
33p
R44
33k
6   -   NE5532 7 VCF_RIGHT_OUT
5   +
U6B
GND

WHITE NOISE
+12V
R1
330k
R2
330k
R17
4k7
C11
4u7
Q1
MMBT3904
Q2
MMBT3904
C2
0.1u
GND
C13
22u
R14
1k
GND

NOISE_CVD
U1A
AS3360-Audio
3 V_E Io
4 V_O
5 V_C
6 Signal   WHITE_NOISE

R3
36k
TP2
TestPoint

VCA input resistor:
Assume noise is ~2V p-p.
Input to 3372 should be no more
than 60 uA. The 3360 has a max
gain of 1, so limit input to ~60 uA.
So 2V p-p / 47k => 43uA

Decoupling Caps
+12V
0.1u
C16
U3A
AS3372
24 V+
12 GND
22 V-
GND   -5V
C10
0.1u

+12V
0.1u
C3
U2E
TL074
4 V+
11 V-
C8
0.1u
GND
-12V

+12V
0.1u
C32
U6C
NE5532
8 V+
4 V-
C14
0.1u
GND
-12V

+12V
0.1u
C23
U4E
DG442xY
13 V+
5 V-
GND
C26
0.1u
-12V

Linear regulator -5V from -12V
GND
C43
1u
U9
L79L05_TO92
2 VI VO 3
1 GND
-12V
C18
1u
-5V

U1C
AS3360-Audio
14 Vcc
8 GND
1 Vref
7 Vee
C5
0.1u
+12V
GND
C6
4n7
C1
0.1u
GND
-12V

Sheet Totals:
Vref_2.5 load: 20k

Zoxnoxious Engineering
Sheet: /filter_as3372/
File: filter_as3372.kicad_sch
Title: Z3372 Signal Processor
Size: B   Date: 2025-02-02   Rev: 0.5
KiCad E.D.A. kicad 7.0.11   Id: 3/3