Misc — Archivo: misc.kicad_sch

- PXCK6M
- H2SYNC
- HX
- H
- H2
- H4
- WDRES
- MCK6M
- SCK6M
- H2B
- H4B

CPU — Archivo: cpu.kicad_sch

- WDRES
- MCK6M
- SCK6M
- H2B
- H4B
- YMIRQ
- VBLK
- PALEN
- VRAMWR
- BGTRNSP
- OBJRAMCS
- OBJORVRAMEN
- MRD
- MWR
- MD[0..7]
- MA[0..12]
- SA[0..2]
- SD[0..7]
- RDINPUTS
- SET_LOCK1
- SET_LOCK2
- CNT_UP1
- CNT_UP2
- SRD
- SWR
- SRST
- YM2203CS

Graphics — Archivo: graphics.kicad_sch

- PXCK6M
- H2SYNC
- WDRES
- H4B
- PALEN
- VRAMWR
- BGTRNSP
- OBJRAMCS
- OBJORVRAMEN
- MRD
- MWR
- MD[7..0]
- MA[0..11]
- MA12
- HX
- H
- H2
- H4
- SYNC
- RED
- GREEN
- BLUE
- VBLK

IO — Archivo: io.kicad_sch

- SPEAKER+
- SPEAKER−
- SYNC
- RED
- GREEN
- BLUE
- SA[0..2]
- SD[0..7]
- RDINPUTS
- SET_LOCK1
- SET_LOCK2
- CNT_UP1
- CNT_UP2

Sound — Archivo: sound.kicad_sch

- H2B
- SD[0..7]
- SA0
- SRD
- SWR
- SRST
- YM2203CS
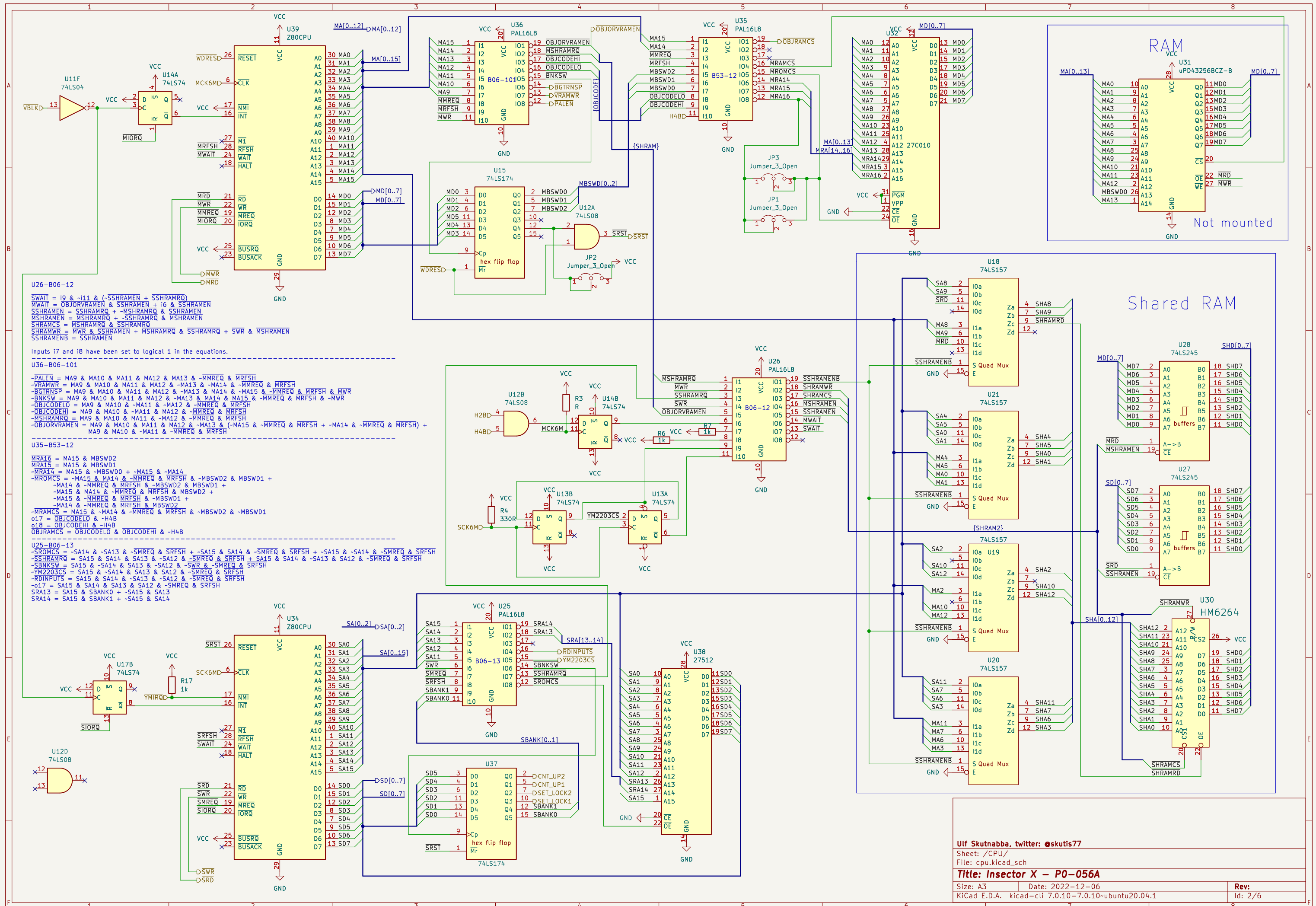- SPEAKER+
- SPEAKER−
- YMIRQ

SA0

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Sheet: /
File: insectx.kicad_sch

Title: Insector X – P0-056A

| Size: A3 | Date: 2022-12-06 | Rev: |
| KiCad E.D.A. kicad-cli 7.0.10-7.0.10-ubuntu20.04.1 | | Id: 1/6 |

RAM

U31
uPD43256BCZ-B

Not mounted

Shared RAM

U26-B06-12

$\overline{SWAIT}$ = i9 & -i11 & (-SSHRAMEN + $\overline{SSHRAMRQ}$)
MWAIT = OBJORVRAMEN & SSHRAMEN + i6 & SSHRAMEN
SSHRAMEN = $\overline{SSHRAMRQ}$ + -MSHRAMRQ & SSHRAMEN
MSHRAMEN = MSHRAMRQ + -MSHRAMRQ & MSHRAMEN
SHRAMCS = MSHRAMRQ & SSHRAMRQ
$\overline{SHRAMWR}$ = $\overline{MWR}$ & SSHRAMEN + MSHRAMRQ & SSHRAMRQ + $\overline{SWR}$ & MSHRAMEN
SSHRAMENB = M3

Inputs i7 and i8 have been set to logical 1 in the equations.

U36-B06-101

$\overline{PALEN}$ = MA9 & MA10 & MA11 & MA12 & MA13 & -MMREQ & MRFSH
-VRAMWR = MA9 & MA10 & MA11 & MA12 & -MA13 & -MA14 & -MMREQ & MRFSH
$\overline{BGTRNSP}$ = MA9 & MA10 & MA11 & MA12 & -MA13 & MA14 & MA15 & -MMREQ & MRFSH & MWR
$\overline{BNKSW}$ = MA9 & MA10 & MA11 & MA12 & -MA13 & MA14 & MA15 & -MMREQ & MRFSH & -MWR
-OBJCODELO = MA9 & MA10 & -MA11 & -MA12 & -MMREQ & MRFSH
-OBJCODEHI = MA9 & MA10 & MA11 & MA12 & -MMREQ & MRFSH
-MSHRAMRQ = MA9 & MA10 & MA11 & -MA12 & -MMREQ & MRFSH
-OBJORVRAMEN = MA9 & MA10 & MA11 & -MA12 & MA13 & (-MA15 & -MMREQ & MRFSH + -MA14 & -MMREQ & MRFSH) +
          MA9 & MA10 & -MA11 & -MMREQ & MRFSH

U35-B53-12

MRA16 = MA15 & MBSWD2
MRA15 = MA15 & MBSWD1
-MRA14 = MA15 & -MBSWD0 + -MA15 & -MA14
-MROMCS = -MA15 & MA14 & -MMREQ & MRFSH & -MBSWD2 & MBSWD1 +
          -MA14 & -MMREQ & MRFSH & -MBSWD2 & MBSWD1 +
          MA15 & MA14 & -MMREQ & MRFSH & MBSWD2 +
          -MA14 & -MMREQ & MRFSH & -MBSWD1 +
          -MA14 & -MMREQ & MRFSH & MBSWD2
-MRAMCS = -MA15 & -MA14 & -MMREQ & MRFSH & -MBSWD2 & -MBSWD1
o17 = OBJCODELO & -H4B
o18 = OBJCODEHI & -H4B
OBJRAMCS = OBJCODELO & OBJCODEHI & -H4B

U25-B06-13

-SROMCS = -SA14 & -SA13 & -SMREQ & SRFSH + -SA15 & SA14 & -SMREQ & SRFSH + -SA15 & -SA14 & -SMREQ & SRFSH
-SSHRAMRQ = SA15 & SA14 & SA13 & -SA12 & -SMREQ & SRFSH + SA15 & SA14 & -SA13 & SA12 & -SMREQ & SRFSH
-SBNKSW = SA15 & -SA14 & SA13 & -SA12 & -SWR & -SMREQ & SRFSH
-YM2203CS = SA15 & -SA14 & SA13 & SA12 & -SMREQ & SRFSH
-RDINPUTS = SA15 & -SA14 & -SA13 & -SA12 & -SMREQ & SRFSH
-o17 = SA15 & SA14 & SA13 & SA12 & -SMREQ & SRFSH
SRA13 = SA15 & SBANK0 + -SA15 & SA13
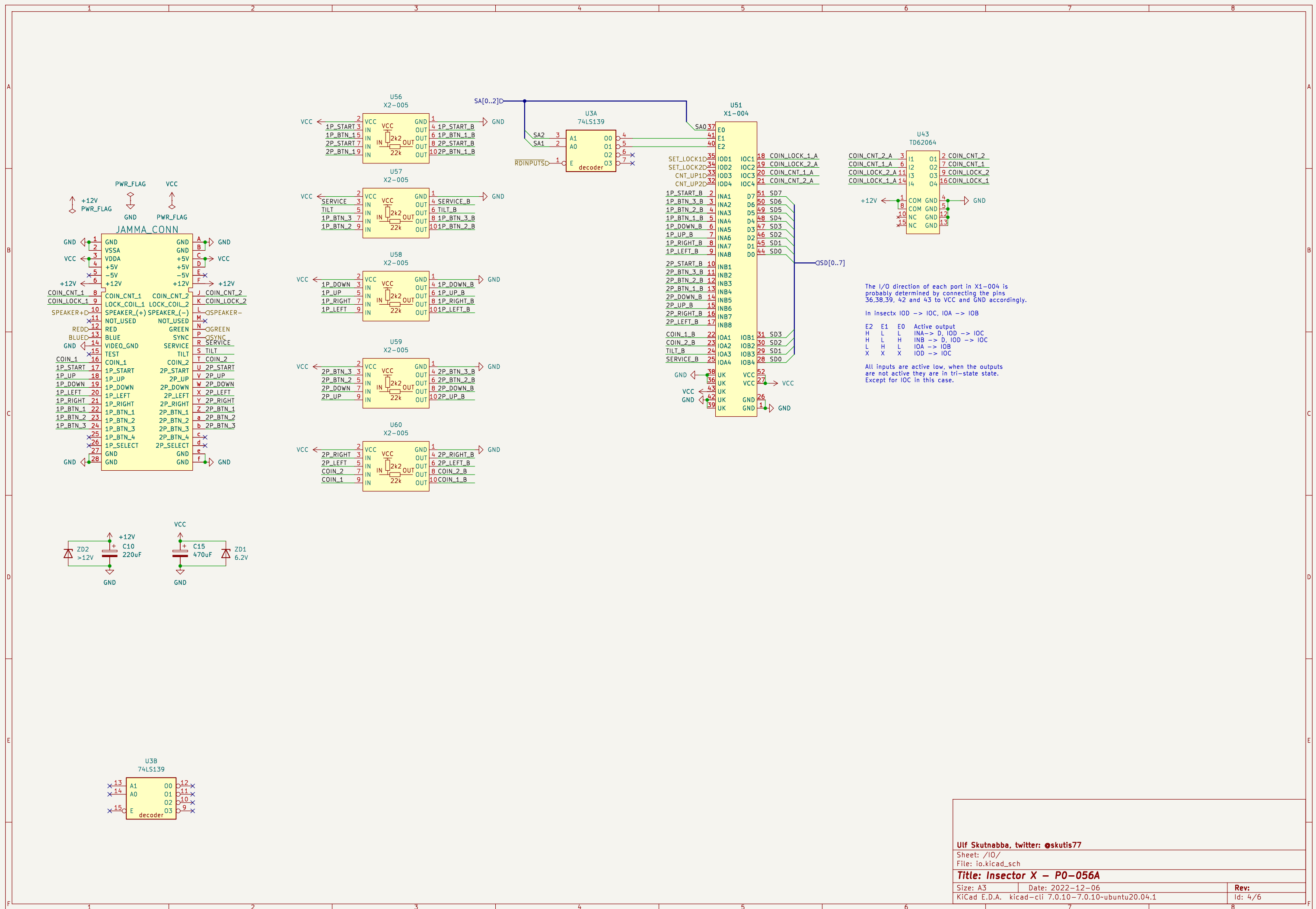SRA14 = SA15 & SBANK1 + -SA15 & SA14

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Sheet: /CPU/
File: cpu.kicad_sch

Title: Insector X – P0-056A

| Size: A3 | Date: 2022-12-06 | | Rev: |
| KiCad E.D.A. kicad-cli 7.0.10-7.0.10-ubuntu20.04.1 | | | Id: 2/6 |

Pixel clock PXCK6M: f = 6MHz

Horizontal sync and blanking signals have a
period of 64us and frequency 15.625kHz.
Pixels / horizontal line = 64us x 6MHz = 384 pixels.

Vertical sync and blanking signals have a
period of 16.896ms and a frequency of 59.1856Hz.
Vertical lines = 16.896ms x 15.625kHz = 264 lines.

The composite SYNC signal is a wired and of HSYNC and VSYNC

	HBLK	HBLK2	HSYNC
Active pixels	320	256	352
Blank pixels	64	128	32

	VBLK	VSYNC
Active lines	224	256
Blank lines	40	8

	HBLK2–HBLK	HBLK–HSYNC	VBLK–VSYNC
Front porch	32	4	16
Back porch	32	28	24

When VSYNC goes low there is a delay of 60 pixels (10us x 6MHz)
from HSYNC going high. It is the same delay when VSYNC goes high.

U23 and U33 use a modified version of LS245
in order to avoid errors during ERC. This happens
when GND is connected to a tri-state input.

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Sheet: /Graphics/
File: graphics.kicad_sch
Title: Insector X – P0-056A

Size: A3	Date: 2022-12-06		Rev:
KiCad E.D.A. kicad-cli 7.0.10-7.0.10-ubuntu20.04.1			Id: 3/6

SA[0..2]

U56
X2-005

VCC
2 VCC   VCC   GND 1
1P_START 3 IN   OUT 4 1P_START_B
1P_BTN_1 5 IN   2k2   OUT 6 1P_BTN_1_B
2P_START 7 IN   OUT 8 2P_START_B
2P_BTN_1 9 IN   22k   OUT 10 2P_BTN_1_B
GND

U57
X2-005

VCC
2 VCC   VCC   GND 1
SERVICE 3 IN   OUT 4 SERVICE_B
TILT 5 IN   2k2   OUT 6 TILT_B
1P_BTN_3 7 IN   OUT 8 1P_BTN_3_B
1P_BTN_2 9 IN   22k   OUT 10 1P_BTN_2_B
GND

U58
X2-005

VCC
2 VCC   VCC   GND 1
1P_DOWN 3 IN   OUT 4 1P_DOWN_B
1P_UP 5 IN   2k2   OUT 6 1P_UP_B
1P_RIGHT 7 IN   OUT 8 1P_RIGHT_B
1P_LEFT 9 IN   22k   OUT 10 1P_LEFT_B
GND

U59
X2-005

VCC
2 VCC   VCC   GND 1
2P_BTN_3 3 IN   OUT 4 2P_BTN_3_B
2P_BTN_2 5 IN   2k2   OUT 6 2P_BTN_2_B
2P_DOWN 7 IN   OUT 8 2P_DOWN_B
2P_UP 9 IN   22k   OUT 10 2P_UP_B
GND

U60
X2-005

VCC
2 VCC   VCC   GND 1
2P_RIGHT 3 IN   OUT 4 2P_RIGHT_B
2P_LEFT 5 IN   2k2 OUT 6 2P_LEFT_B
COIN_2 7 IN   OUT 8 COIN_2_B
COIN_1 9 IN   22k OUT 10 COIN_1_B
GND

U3A
74LS139

SA2   3 A1   O0 4 SA0
SA1   2 A0   O1 5
                 O2 6
RDINPUTS 1 E decoder O3 7

U3B
74LS139

13 A1   O0 12
14 A0   O1 11
            O2 10
15 E decoder O3 9

PWR_FLAG   VCC
+12V
PWR_FLAG
GND   PWR_FLAG

JAMMA_CONN

GND 1 GND   GND A GND
2 VSSA   GND B
VCC 3 VDDA   +5V C VCC
4 +5V   +5V D
-5V 5 -5V   -5V E
+12V 6 +12V   +12V F +12V
COIN_CNT_1 8 COIN_CNT_1 COIN_CNT_2 J COIN_CNT_2
COIN_LOCK_1 9 LOCK_COIL_1 LOCK_COIL_2 K COIN_LOCK_2
SPEAKER+ 10 SPEAKER_(+) SPEAKER_(-) L SPEAKER-
11 NOT_USED   NOT_USED M
RED 12 RED   GREEN N GREEN
BLUE 13 BLUE   SYNC P SYNC
GND 14 VIDEO_GND   SERVICE R SERVICE
15 TEST   TILT S TILT
COIN_1 16 COIN_1   COIN_2 T COIN_2
1P_START 17 1P_START 2P_START U 2P_START
1P_UP 18 1P_UP   2P_UP V 2P_UP
1P_DOWN 19 1P_DOWN 2P_DOWN W 2P_DOWN
1P_LEFT 20 1P_LEFT 2P_LEFT X 2P_LEFT
1P_RIGHT 21 1P_RIGHT 2P_RIGHT Y 2P_RIGHT
1P_BTN_1 22 1P_BTN_1 2P_BTN_1 Z 2P_BTN_1
1P_BTN_2 23 1P_BTN_2 2P_BTN_2 a 2P_BTN_2
1P_BTN_3 24 1P_BTN_3 2P_BTN_3 b 2P_BTN_3
25 1P_BTN_4   2P_BTN_4 c
26 1P_SELECT   2P_SELECT d
27 GND   GND e
GND 28 GND   GND f GND

U51
X1-004

SA0 37 E0
41 E1
40 E2
SET_LOCK1D 35 IOD1 IOC1 18 COIN_LOCK_1_A
SET_LOCK2D 34 IOD2 IOC2 19 COIN_LOCK_2_A
CNT_UP1D 33 IOD3 IOC3 20 COIN_CNT_1_A
CNT_UP2D 32 IOD4 IOC4 21 COIN_CNT_2_A
1P_START_B 2 INA1 D7 51 SD7
1P_BTN_3_B 3 INA2 D6 50 SD6
1P_BTN_2_B 4 INA3 D5 49 SD5
1P_BTN_1_B 5 INA4 D4 48 SD4
1P_DOWN_B 6 INA5 D3 47 SD3
1P_UP_B 7 INA6 D2 46 SD2
1P_RIGHT_B 8 INA7 D1 45 SD1
1P_LEFT_B 9 INA8 D0 44 SD0
2P_START_B 10 INB1
2P_BTN_3_B 11 INB2
2P_BTN_2_B 12 INB3
2P_BTN_1_B 13 INB4
2P_DOWN_B 14 INB5
2P_UP_B 15 INB6
2P_RIGHT_B 16 INB7
2P_LEFT_B 17 INB8
COIN_1_B 22 IOA1 IOB1 31 SD3
COIN_2_B 23 IOA2 IOB2 30 SD2
TILT_B 24 IOA3 IOB3 29 SD1
SERVICE_B 25 IOA4 IOB4 28 SD0
GND 38 UK VCC 52
36 UK VCC 27 VCC
VCC 43 UK
42 UK GND 26
39 UK GND 1 GND

SD[0..7]

U43
TD62064

COIN_CNT_2_A 3 I1 O1 2 COIN_CNT_2
COIN_CNT_1_A 6 I2 O2 7 COIN_CNT_1
COIN_LOCK_2_A 11 I3 O3 9 COIN_LOCK_2
COIN_LOCK_1_A 14 I4 O4 16 COIN_LOCK_1
+12V 1 COM GND 4 GND
8 COM GND 5
10 NC GND 12
15 NC GND 13

The I/O direction of each port in X1-004 is
probably determined by connecting the pins
36,38,39, 42 and 43 to VCC and GND accordingly.

In insectx IOD -> IOC, IOA -> IOB

E2 E1 E0   Active output
H   L   L   INA-> D, IOD -> IOC
H   L   H   INB -> D, IOD -> IOC
L   H   L   IOA -> IOB
X   X   X   IOD -> IOC

All inputs are active low, when the outputs
are not active they are in tri-state state.
Except for IOC in this case.

+12V C10 220uF ZD2 >12V
ZD1 6.2V C15 470uF VCC
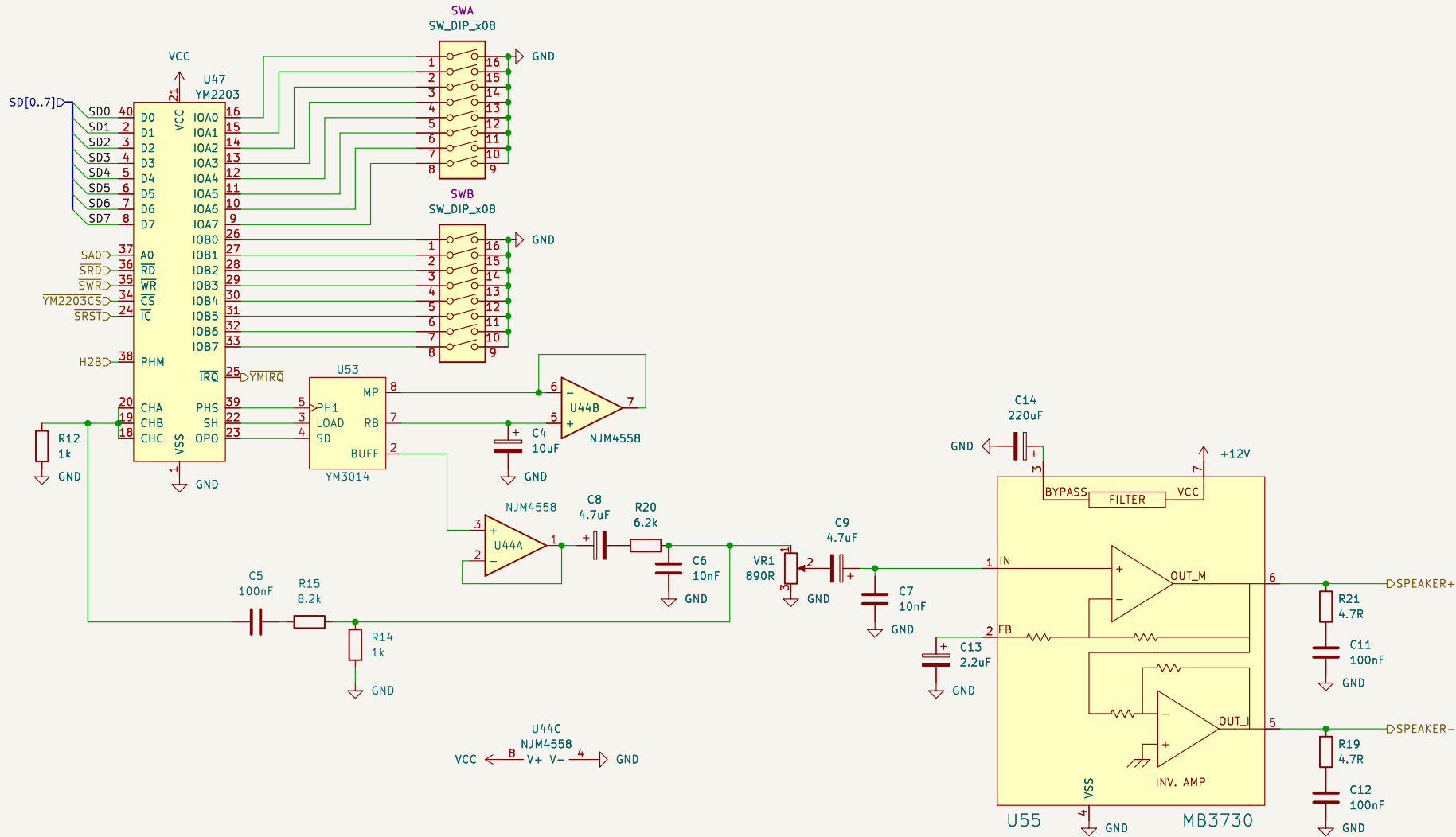GND

Ulf Skutnabba, twitter: @skutis77

Sheet: /IO/
File: io.kicad_sch
Title: Insector X — P0-056A
Size: A3   Date: 2022-12-06   Rev:
KiCad E.D.A. kicad-cli 7.0.10-7.0.10-ubuntu20.04.1   Id: 4/6

SWA
SW_DIP_x08

SWB
SW_DIP_x08

U47
YM2203

D0	40 SD0
D1	2 SD1
D2	3 SD2
D3	4 SD3
D4	5 SD4
D5	6 SD5
D6	7 SD6
D7	8 SD7

VCC 21

IOA0 16
IOA1 15
IOA2 14
IOA3 13
IOA4 12
IOA5 11
IOA6 10
IOA7 9

IOB0 26
IOB1 27
IOB2 28
IOB3 29
IOB4 30
IOB5 31
IOB6 32
IOB7 33

A0 37 SA0
RD 36 SRD
WR 35 SWR
CS 34 YM2203CS
IC 24 SRST

PHM 38 H2B

IRQ 25 YMIRQ

CHA 20
CHB 19
CHC 18

PHS 39
SH 22
OPO 23

VSS 1 GND

U53

PH1 5
LOAD 3
SD 4

MP 8
RB 7
BUFF 2

YM3014

R12
1k
GND

U44B
NJM4558
5 6 7

U44A
NJM4558
3 1 2

C4
10uF
GND

C5
100nF

R15
8.2k

R14
1k
GND

C8
4.7uF

R20
6.2k

C6
10nF
GND

VR1
890R

C9
4.7uF

C7
10nF
GND

U44C
NJM4558
V+ 8   V− 4
VCC   GND

C14
220uF
GND

+12V

BYPASS   FILTER   VCC

IN 1

OUT_M 6

FB 2

OUT_I 5

INV. AMP

VSS 4
GND

U55   MB3730

C13
2.2uF
GND

SPEAKER+
R21
4.7R
C11
100nF
GND

SPEAKER−
R19
4.7R
C12
100nF
GND

Clock

U22C 74LS244_Split
HD 6 14
U22B 74LS244_Split 4 16
R5 150
U22H 74LS244_Split 17 3
C1 200pF
GND
U22G 74LS244_Split 15 5 SCK6M
MCK6M

U22A 74LS244_Split
H2D 2 18
VCC
U17A 74LS74
2 D 5 Q
3
1
6 Q
4 74LS74
VCC
GND
H2B
U29C 74LS32 10 9 8 H2SYNC

U22D 74LS244_Split
H4D 8 12 H4B

U11C 74LS04 5 6
JP7 Jumper_8_Bridged1
8 1
7 2
6 3
5 4
R18 24
PXCK6M

U22F 74LS244_Split
HXD 13 7
U11B 74LS04 3 4
JP8 Jumper_8_Bridged1
8 1
7 2
6 3
5 4
JP9 Jumper_8_Bridged1
8 1
7 2
6 3
5 4

U22E 74LS244_Split
11 9
GND

Watchdog

VCC
R13 1k
U49 74LS161
GND 3 D0 Q0 14
GND 4 D1 Q1 13
GND 5 D2 Q2 12
GND 6 D3 Q3 11
JP10 not soldered on Insector X
U48E 74LS14
GND
9 PE
7 CEP VCC
10 CET VCC
2 CP
2.07Hz
1 MR counter
TC 15

R10 2M2
U48D 74LS14 11 10 8
C3 220n
GND

BNKSW
U12C 74LS08 10 9 8

GND
TR1 MPSA45
VCC 2 3 1

SW_DIP_x02
GND 1 4
2 3
SW
R9 250k
C2 220n
VCC
GND

U48F 74LS14 13 12
U29A 74LS32 1 2 3
U48B 74LS14 3 4
U48A 74LS14 1 2 WDRES

CLK (12M)
HX
H, SCK6M, PXCK6M
MCK6M
H2(B)
H4(B)
H8, H8R

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Sheet: /Misc/
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KiCad E.D.A. kicad-cli 7.0.10-7.0.10-ubuntu20.04.1   Id: 6/6