Expansion bus connector

File: expansion_bus.kicad_sch

Buffers and transceivers

File: buffers_transceivers.kicad_sch

Address decoding

Sheetfile: addr_decode.kicad_sch

GAL

File: gal.kicad_sch

Interrupt logic

File: interrupt.kicad_sch

Registers

File: registers.kicad_sch

Printer port

File: printer_port.kicad_sch

Sheet: /
File: Printer_Interface.kicad_sch
Title: PARALLEL PRINTER INTERFACE

| Size: A4 | Date: 2024-03-05 | Rev: 1 |
|---|---|---|
| KiCad E.D.A. 8.0.0 | | Id: 1/8 |

J1A
DIN41612_03x32_ABC_COMETbus

| Pin | Signal | | Pin | Signal |
|---|---|---|---|---|
| D0 | a1 | SD0 | | |
| D1 | a2 | SD1 | | |
| D2 | a3 | SD2 | | |
| D3 | a4 | SD3 | | |
| D4 | a5 | SD4 | | |
| D5 | a6 | SD5 | | |
| D6 | a7 | SD6 | | |
| D7 | a8 | SD7 | | |
| GND | a9 | | | |
| SYSCLK | a10 | | SYSCLK` | |
| GND | a11 | | | |
| UDS | a12 | | UDS | |
| LDS | a13 | | LDS | |
| WRITE | a14 | | WR` | |
| GND | a15 | | | |
| DTACK | a16 | | DTACK | |
| GND | a17 | | | |
| AS | a18 | | AS` | |
| GND | a19 | | | |
| AUTOVEC | a20 | | | |
| IACKIN | a21 | | IACKIN | |
| IACKOUT | a22 | | IACKOUT | |
| | a23 | | | |
| A7 | a24 | | | |
| A6 | a25 | | | |
| A5 | a26 | | | |
| A4 | a27 | | | |
| A3 | a28 | SA3 | | |
| A2 | a29 | SA2 | | |
| A1 | a30 | SA1 | | |
| −12V | a31 | | | |
| +5V | a32 | | | |

J1B
DIN41612_03x32_ABC_COMETbus

| Pin | Signal | | Out |
|---|---|---|---|
| | b1 | | |
| | b2 | | |
| ACFAIL | b3 | | |
| BG0IN | b4 | | |
| BG0OUT | b5 | | |
| BG1IN | b6 | | |
| BG1OUT | b7 | | |
| | b8 | | |
| BRIDGE | b9 | | |
| | b10 | | |
| BRIDGE | b11 | | |
| BR0 | b12 | | |
| BR1 | b13 | | |
| | b14 | | |
| | b15 | | |
| FC0 | b16 | | FC0 |
| FC1 | b17 | | FC1 |
| FC2 | b18 | | FC2 |
| | b19 | | |
| GND | b20 | | |
| | b21 | | |
| | b22 | | |
| GND | b23 | | |
| IRQ7 | b24 | | |
| IRQ6 | b25 | | |
| IRQ5 | b26 | | |
| IRQ4 | b27 | | IRQ4 |
| IRQ3 | b28 | | IRQ3 |
| IRQ2 | b29 | | IRQ2 |
| IRQ1 | b30 | | IRQ1 |
| +5STDBY | b31 | | |
| +5V | b32 | | |

J1C
DIN41612_03x32_ABC_COMETbus

| Pin | Signal | | Out |
|---|---|---|---|
| D8 | c1 | SD8 | |
| D9 | c2 | SD9 | |
| D10 | c3 | SD10 | |
| D11 | c4 | SD11 | |
| D12 | c5 | SD12 | |
| D13 | c6 | SD13 | |
| D14 | c7 | SD14 | |
| D15 | c8 | SD15 | |
| GND | c9 | | |
| | c10 | | |
| BERR | c11 | | |
| SYSRESET | c12 | | SYSRESET |
| | c13 | | |
| | c14 | | |
| A23 | c15 | SA23 | |
| A22 | c16 | SA22 | |
| A21 | c17 | SA21 | |
| A20 | c18 | SA20 | |
| A19 | c19 | SA19 | |
| A18 | c20 | SA18 | |
| A17 | c21 | SA17 | |
| A16 | c22 | SA16 | |
| A15 | c23 | SA15 | |
| A14 | c24 | SA14 | |
| A13 | c25 | SA13 | |
| A12 | c26 | SA12 | |
| A11 | c27 | | |
| A10 | c28 | | |
| A9 | c29 | | |
| A8 | c30 | | |
| +12V | c31 | | |
| +5V | c32 | | |

SD[15..0]
SA[23..1]

C1 22uF
C2 22uF
C3 22uF
GND   GND   GND

PWR_FLAG   +5V
PWR_FLAG   GND

FREE FOR NON-COMMERCIAL USE
(C) TOM STOREY
Sheet: /Expansion bus connector/
File: expansion_bus.kicad_sch
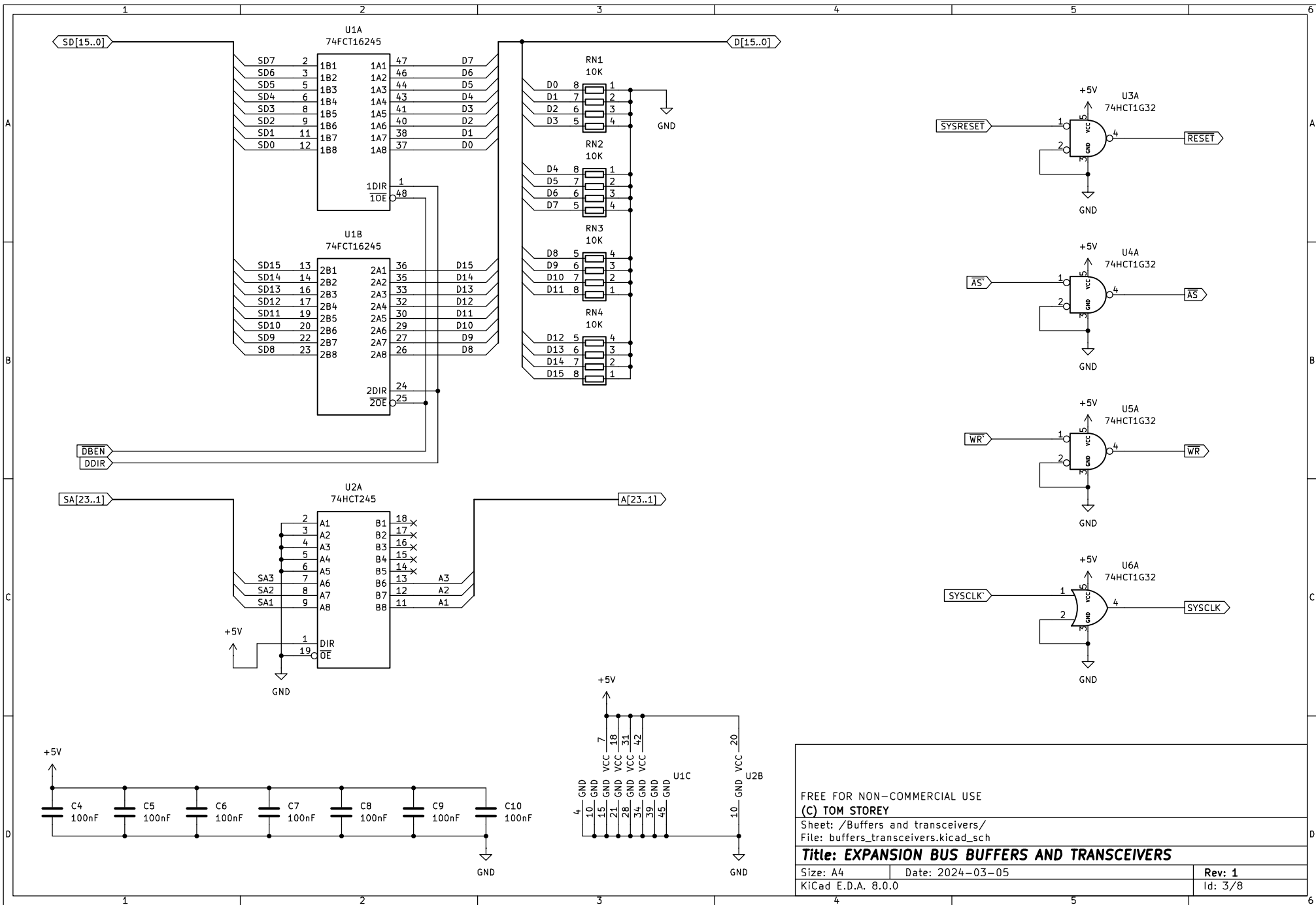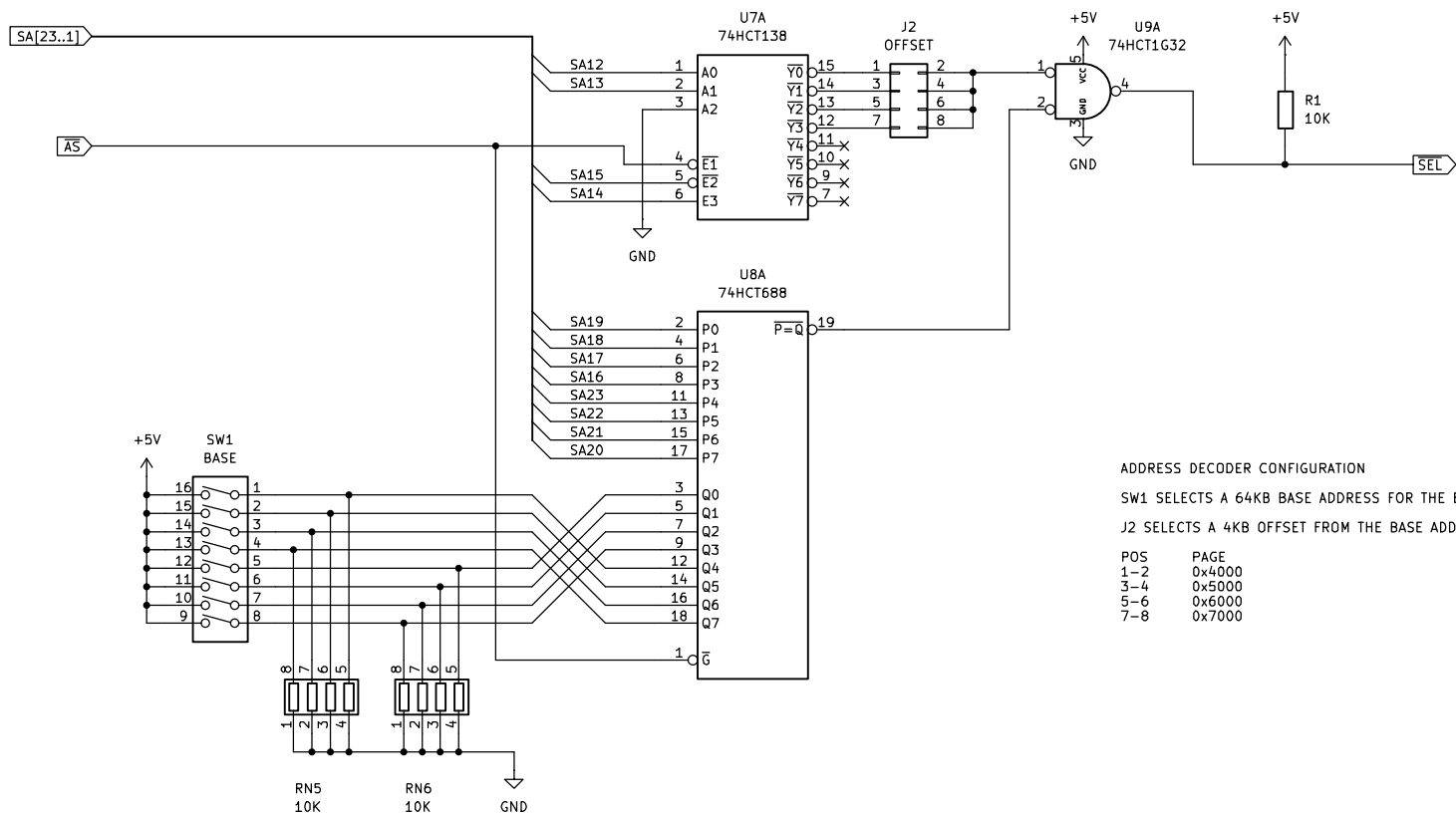Title: EXPANSION BUS CONNECTOR
Size: A4    Date: 2024-03-05    Rev: 1
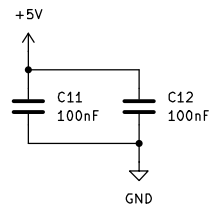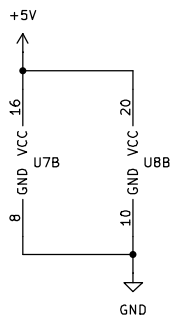KiCad E.D.A. 8.0.0    Id: 2/8

SD[15..0]
D[15..0]

U1A
74FCT16245

| SD7 | 2 | 1B1 | 1A1 | 47 | D7 |
| SD6 | 3 | 1B2 | 1A2 | 46 | D6 |
| SD5 | 5 | 1B3 | 1A3 | 44 | D5 |
| SD4 | 6 | 1B4 | 1A4 | 43 | D4 |
| SD3 | 8 | 1B5 | 1A5 | 41 | D3 |
| SD2 | 9 | 1B6 | 1A6 | 40 | D2 |
| SD1 | 11 | 1B7 | 1A7 | 38 | D1 |
| SD0 | 12 | 1B8 | 1A8 | 37 | D0 |

1DIR 1
1OE 48

U1B
74FCT16245

| SD15 | 13 | 2B1 | 2A1 | 36 | D15 |
| SD14 | 14 | 2B2 | 2A2 | 35 | D14 |
| SD13 | 16 | 2B3 | 2A3 | 33 | D13 |
| SD12 | 17 | 2B4 | 2A4 | 32 | D12 |
| SD11 | 19 | 2B5 | 2A5 | 30 | D11 |
| SD10 | 20 | 2B6 | 2A6 | 29 | D10 |
| SD9 | 22 | 2B7 | 2A7 | 27 | D9 |
| SD8 | 23 | 2B8 | 2A8 | 26 | D8 |

2DIR 24
2OE 25

DBEN
DDIR

RN1 10K
| D0 | 8 | | 1 |
| D1 | 7 | | 2 |
| D2 | 6 | | 3 |
| D3 | 5 | | 4 |
GND

RN2 10K
| D4 | 8 | | 1 |
| D5 | 7 | | 2 |
| D6 | 6 | | 3 |
| D7 | 5 | | 4 |

RN3 10K
| D8 | 5 | | 4 |
| D9 | 6 | | 3 |
| D10 | 7 | | 2 |
| D11 | 8 | | 1 |

RN4 10K
| D12 | 5 | | 4 |
| D13 | 6 | | 3 |
| D14 | 7 | | 2 |
| D15 | 8 | | 1 |

U2A
74HCT245

| | 2 | A1 | B1 | 18 | |
| | 3 | A2 | B2 | 17 | |
| | 4 | A3 | B3 | 16 | |
| | 5 | A4 | B4 | 15 | |
| | 6 | A5 | B5 | 14 | |
| SA3 | 7 | A6 | B6 | 13 | A3 |
| SA2 | 8 | A7 | B7 | 12 | A2 |
| SA1 | 9 | A8 | B8 | 11 | A1 |

SA[23..1]
A[23..1]

+5V
DIR 1
OE 19
GND

+5V
U3A
74HCT1G32
SYSRESET 1
2
5 VCC
3 GND
4 RESET
GND

+5V
U4A
74HCT1G32
AS` 1
2
5 VCC
3 GND
4 AS
GND

+5V
U5A
74HCT1G32
WR` 1
2
5 VCC
3 GND
4 WR
GND

+5V
U6A
74HCT1G32
SYSCLK` 1
2
5 VCC
3 GND
4 SYSCLK
GND

+5V
U1C
| 7 | VCC |
| 18 | VCC |
| 31 | VCC |
| 42 | VCC |
| 4 | GND |
| 10 | GND |
| 15 | GND |
| 21 | GND |
| 28 | GND |
| 34 | GND |
| 39 | GND |
| 45 | GND |
GND

U2B
| 20 | VCC |
| 10 | GND |
GND

+5V
| C4 100nF | C5 100nF | C6 100nF | C7 100nF | C8 100nF | C9 100nF | C10 100nF |
GND

FREE FOR NON−COMMERCIAL USE
(C) TOM STOREY
Sheet: /Buffers and transceivers/
File: buffers_transceivers.kicad_sch
Title: EXPANSION BUS BUFFERS AND TRANSCEIVERS
Size: A4    Date: 2024−03−05    Rev: 1
KiCad E.D.A. 8.0.0    Id: 3/8

SA[23..1]

AS

U7A
74HCT138

| SA12 | 1 | A0 | | Y0 | 15 |
| SA13 | 2 | A1 | | Y1 | 14 |
| | 3 | A2 | | Y2 | 13 |
| | | | | Y3 | 12 |
| | 4 | E1 | | Y4 | 11 | X |
| SA15 | 5 | E2 | | Y5 | 10 | X |
| SA14 | 6 | E3 | | Y6 | 9 | X |
| | | | | Y7 | 7 | X |

GND

J2
OFFSET

1 — 2
3 — 4
5 — 6
7 — 8

+5V
U9A
74HCT1G32

1
2
4

GND

+5V

R1
10K

SEL

U8A
74HCT688

| SA19 | 2 | P0 | | P=Q | 19 |
| SA18 | 4 | P1 | | | |
| SA17 | 6 | P2 | | | |
| SA16 | 8 | P3 | | | |
| SA23 | 11 | P4 | | | |
| SA22 | 13 | P5 | | | |
| SA21 | 15 | P6 | | | |
| SA20 | 17 | P7 | | | |

| 3 | Q0 |
| 5 | Q1 |
| 7 | Q2 |
| 9 | Q3 |
| 12 | Q4 |
| 14 | Q5 |
| 16 | Q6 |
| 18 | Q7 |
| 1 | G |

+5V

SW1
BASE

| 16 | | 1 |
| 15 | | 2 |
| 14 | | 3 |
| 13 | | 4 |
| 12 | | 5 |
| 11 | | 6 |
| 10 | | 7 |
| 9 | | 8 |

RN5
10K

RN6
10K

GND

ADDRESS DECODER CONFIGURATION

SW1 SELECTS A 64KB BASE ADDRESS FOR THE BOARD.

J2 SELECTS A 4KB OFFSET FROM THE BASE ADDRESS:

| POS | PAGE |
| 1-2 | 0x4000 |
| 3-4 | 0x5000 |
| 5-6 | 0x6000 |
| 7-8 | 0x7000 |

+5V

U7B
16 VCC
8 GND

U8B
20 VCC
10 GND

GND

+5V

C11
100nF

C12
100nF

GND

U10A
PRINTER_GAL

SYSCLK — 2 CLK
SEL — 3 SEL
LDS — 11 LDS
UDS — 12 UDS
— 10 WR
FC0 — 9 FC0
FC1 — 7 FC1
FC2 — 6 FC2
A1 — 4 A1
VECTOR — 5 VECTOR

CON 24
DAT 25
VEC 26
STAT 27
DDIR 19
DBEN 20
DTACK_DRV 21
TIMER 18
CPU_SPACE 17

U13A
74LVC1G19
1 A  Y0 6 — WRCON
3 E  Y1 4 — RDCON

U11A
74LVC1G19
1 A  Y0 6 — WRDAT
3 E  Y1 4 — RDDAT

U12A
74LVC1G19
1 A  Y0 6 — WRVEC
3 E  Y1 4 — RDVEC

U14A
74LVC1G19
1 A  Y0 6
3 E  Y1 4 — RDSTAT

WR —

R2
10K  +5V

RN7
10K  5 6 7 8 / 4 3 2 1  +5V  +5V

R3
10K

DDIR
DBEN

+5V
U15A
74LVC1G07
2  GND VCC 5  4 — DTACK
3
GND

+5V
U10B  GND* 8  GND *VCC 14  GND* VCC 15  GND* 22  1  28
U11B  GND VCC 5  2
U12B  GND VCC 5  2
U13B  GND VCC 5  2
U14B  GND VCC 5  2
GND

+5V
C13 100nF   C14 100nF   C15 100nF
GND
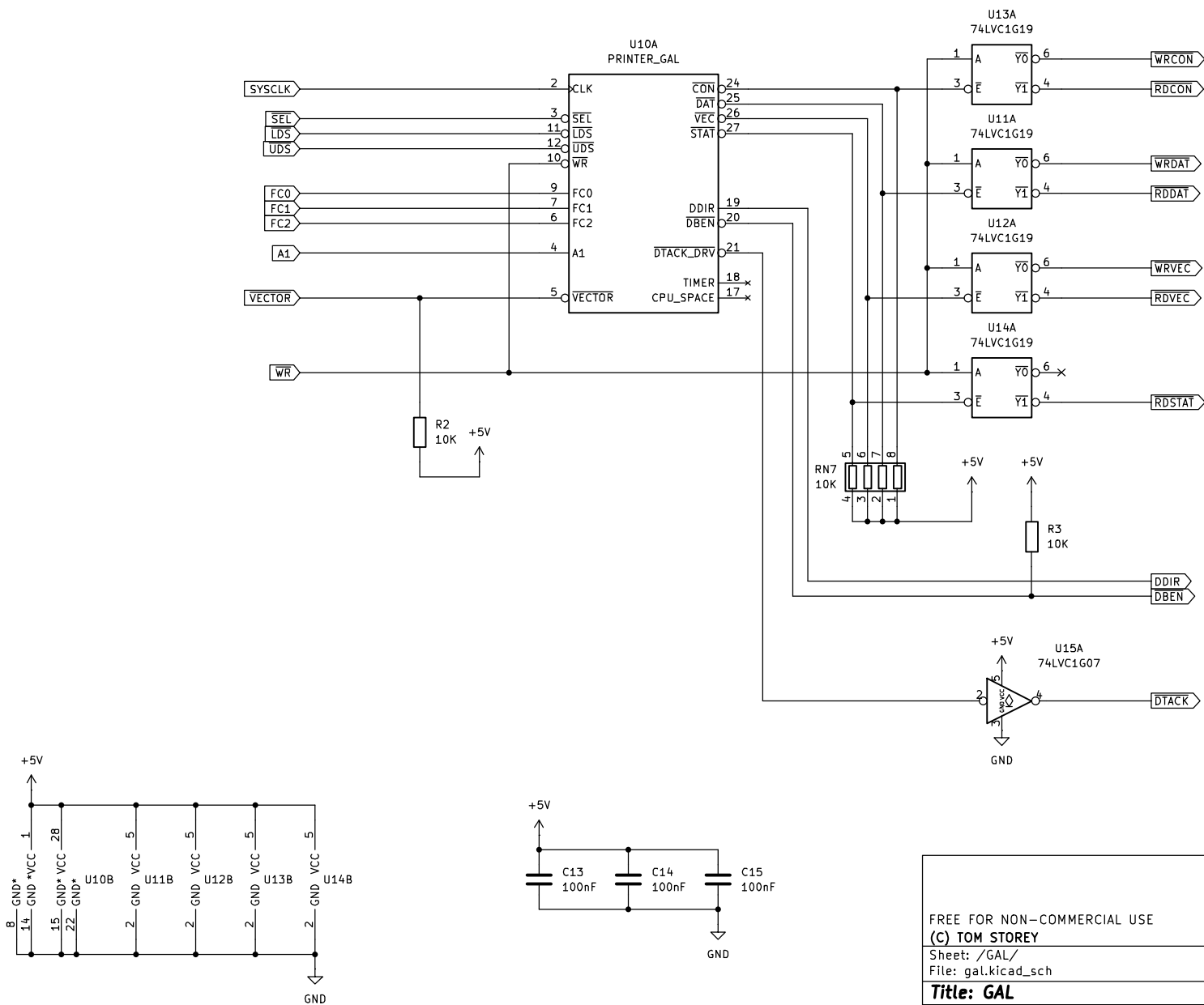
FREE FOR NON—COMMERCIAL USE
(C) TOM STOREY
Sheet: /GAL/
File: gal.kicad_sch
Title: GAL
Size: A4        Date: 2024-03-05        Rev: 1
KiCad E.D.A. 8.0.0                       Id: 5/8

A[23..1]

U16A
74HCT138
1 A0
2 A1
3 A2
4 E1
5 E2
6 E3
15 Y0
14 Y1
13 Y2
12 Y3
11 Y4
10 Y5
9 Y6
7 Y7

GND

J3
IACK
1 2
3 4
5 6
7 8

+5V
R4
10K

+5V

U17A
INTERRUPT_GAL
3 IACK
2 IACKIN
4 IRQ_EN
7 IRQ
8 IRQ
1 CLK
IACKOUT 19
IRQ_DRV 18
VECTOR 17
STATE 16

IACKOUT

+5V
U20A
74LVC1G07
2 4

GND

J4
IRQ
2 1 IRQ1
4 3 IRQ2
6 5 IRQ3
8 7 IRQ4

IACKIN

SYSCLK

JP1
Jumper_2_Open
1 2

VECTOR

+5V
U19A
74HCT74
4 PRE
2 D
3 CLK
1 CLR
Q 5
Q 6

+5V
U19B
74HCT74
10 PRE
12 D
11 CLK
13 CLR
Q 9
Q 8

GND

IRQ_PEND

PRN_ACK

U18A
74LVC1G08
1
2 4

IRQ_EN

RDSTAT

ALL COMPONENTS:
NOPOP IF INTERRUPTS NOT USED

BRIDGE JP1 IF INTERRUPTS NOT USED

+5V

16 VCC
GND 8
U16B

20 VCC
GND 10
U17B

5 VCC
GND 3
U18B

14 VCC
GND 7
U19C

GND

+5V
C16
100nF
C17
100nF
C18
100nF

GND
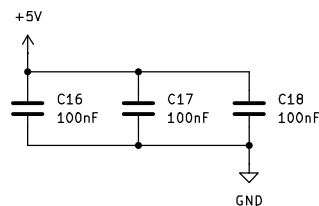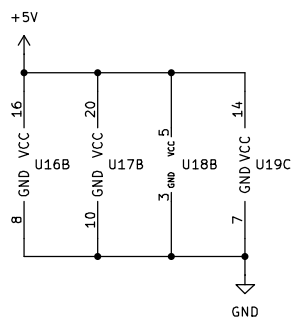
FREE FOR NON-COMMERCIAL USE
(C) TOM STOREY
Sheet: /Interrupt logic/
File: interrupt.kicad_sch
Title: INTERRUPT LOGIC
Size: A4    Date: 2024-03-05    Rev: 1
KiCad E.D.A. 8.0.0    Id: 6/8

# REGISTERS

**U22A**
74HCT244

| | | |
|---|---|---|
| 2 | 1A1 | 1Y1 18 D15 |
| 4 | 1A2 | 1Y2 16 D13 |
| 6 | 1A3 | 1Y3 14 D11 |
| 8 | 1A4 | 1Y4 12 D9 |
| 1 | 1OE | |
| 11 | 2A1 | 2Y1 9 D8 |
| 13 | 2A2 | 2Y2 7 D10 |
| 15 | 2A3 | 2Y3 5 D12 |
| 17 | 2A4 | 2Y4 3 D14 |
| 19 | 2OE | |

**U22B**
74HCT244

**U21A**
74HCT273

| | | |
|---|---|---|
| D15 3 | D0 | Q0 2 |
| D13 4 | D1 | Q1 5 |
| D11 7 | D2 | Q2 6 |
| D9 8 | D3 | Q3 9 |
| D8 13 | D4 | Q4 12 |
| D10 14 | D5 | Q5 15 |
| D12 17 | D6 | Q6 16 |
| D14 18 | D7 | Q7 19 |
| | 11 CP | |
| | 1 MR | |

SELIN_IN
AUTOFD_IN
STROBE_IN
PRN_INIT

SELIN_OUT
AUTOFD_OUT
STROBE_OUT
INIT_OUT
IRQ_EN

R5 1K   D1 IN_USE   GND

RDCON
WRCON
RESET

**U23A**
74HCT573

| | | |
|---|---|---|
| 2 | D0 | Q0 19 D7 |
| 3 | D1 | Q1 18 D6 |
| 4 | D2 | Q2 17 D5 |
| 5 | D3 | Q3 16 D4 |
| 6 | D4 | Q4 15 D3 |
| 7 | D5 | Q5 14 D2 |
| 8 | D6 | Q6 13 D1 |
| 9 | D7 | Q7 12 D0 |
| 11 | LE | |
| 1 | OE | |

GND

BUSY_IN
PRN_ACK
PRN_PE
PRN_SEL
PRN_FAULT
IRQ_PEND
RDSTAT

**U25A**
74HCT240

| | | |
|---|---|---|
| D3 2 | 1A1 | 1Y1 18 |
| D2 4 | 1A2 | 1Y2 16 |
| D1 6 | 1A3 | 1Y3 14 |
| D0 8 | 1A4 | 1Y4 12 |
| 1 | 1OE | |
| D4 11 | 2A1 | 2Y1 9 |
| D5 13 | 2A2 | 2Y2 7 |
| D6 15 | 2A3 | 2Y3 5 |
| D7 17 | 2A4 | 2Y4 3 |
| 19 | 2OE | |

GND

**U26B**
74HCT244

**U24A**
74HCT273

| | | |
|---|---|---|
| 3 | D0 | Q0 2 |
| 4 | D1 | Q1 5 |
| 7 | D2 | Q2 6 |
| 8 | D3 | Q3 9 |
| 13 | D4 | Q4 12 |
| 14 | D5 | Q5 15 |
| 17 | D6 | Q6 16 |
| 18 | D7 | Q7 19 |
| 11 | CP | |
| 1 | MR | |

**U25B**
74HCT240

| | | |
|---|---|---|
| 19 | 2OE | |
| 17 | 2A4 | 2Y4 3 D3 |
| 15 | 2A3 | 2Y3 5 D2 |
| 13 | 2A2 | 2Y2 7 D1 |
| 11 | 2A1 | 2Y1 9 D0 |
| 1 | 1OE | |
| 8 | 1A4 | 1Y4 12 D4 |
| 6 | 1A3 | 1Y3 14 D5 |
| 4 | 1A2 | 1Y2 16 D6 |
| 2 | 1A1 | 1Y1 18 D7 |

**U26A**
74HCT244

D[15..0]
WRVEC
RDVEC

U26, U27, U28, AND ASSOCIATED CAPS:
NOPOP IF INTERRUPTS NOT USED

+5V

| U21B | U22C | U23B | U24B | U25C | U26C |
|---|---|---|---|---|---|
| 20 VCC | 20 VCC | 20 VCC | 20 VCC | 20 VCC | 20 VCC |
| 10 GND | 10 GND | 10 GND | 10 GND | 10 GND | 10 GND |

GND

+5V

| C20 100nF | C21 100nF | C22 100nF | C23 100nF | C24 100nF | C25 100nF |
|---|---|---|---|---|---|

GND

FREE FOR NON-COMMERCIAL USE
(C) TOM STOREY
Sheet: /Registers/
File: registers.kicad_sch
**Title: REGISTERS**
Size: A4    Date: 2024-03-05    Rev: 1
KiCad E.D.A. 8.0.0    Id: 7/8

D[15..0]

U27A
74HCT574

| D15 | 2 | D0 | Q0 | 19 |
| D14 | 3 | D1 | Q1 | 18 |
| D13 | 4 | D2 | Q2 | 17 |
| D12 | 5 | D3 | Q3 | 16 |
| D11 | 6 | D4 | Q4 | 15 |
| D10 | 7 | D5 | Q5 | 14 |
| D9 | 8 | D6 | Q6 | 13 |
| D8 | 9 | D7 | Q7 | 12 |

11 CLK
1 OE
GND

WRDAT

RDDAT

R11
R12
R13   4x 33R
R14

PD7
PD6
PD5
PD4
PD3
PD2
PD1
PD0

R15
R16
R17   4x 33R
R18

C31 C33 C35 C37 C38 C39 C41 C42
8x 2.2nF
GND

U28A
74HCT573

| PD7 | 2 | D0 | Q0 | 19 | D15 |
| PD6 | 3 | D1 | Q1 | 18 | D14 |
| PD5 | 4 | D2 | Q2 | 17 | D13 |
| PD4 | 5 | D3 | Q3 | 16 | D12 |
| PD3 | 6 | D4 | Q4 | 15 | D11 |
| PD2 | 7 | D5 | Q5 | 14 | D10 |
| PD1 | 8 | D6 | Q6 | 13 | D9 |
| PD0 | 9 | D7 | Q7 | 12 | D8 |

11 LE
1 OE

PD[7..0]

| PD0 | 2 | D0 |
| PD1 | 3 | D1 |
| PD2 | 4 | D2 |
| PD3 | 5 | D3 |
| PD4 | 6 | D4 |
| PD5 | 7 | D5 |
| PD6 | 8 | D6 |
| PD7 | 9 | D7 |

J5
DB25_Printer

1 STROBE
14 AUTOFD
16 INIT
17 SELIN
10 ACK
13 SEL
15 FAULT
12 PE
11 BUSY

18 GND
19 GND
20 GND
21 GND
22 GND
23 GND
24 GND
25 GND
SHLD
GND

Jumper_2_Bridged
JP2
2   1
0

4x 2.2nF
C28 C30 C32 C34
GND

5x 1K5
R6 R7 R8 R9
+5V

R10
33R

STROBE_OUT
U29A
74LVC1G06
2      4

AUTOFD_OUT
U30A
74LVC1G06
2

INIT_OUT
U31A
74LVC1G07
2

SELIN_OUT
U32A
74LVC1G06
2

U33A
74LVC1G14
2      4

U34A
74LVC1G14
2

U35A
74LVC1G14
2      4

+5V
R19
R20
R21
5x 10K
R22
R23
GND

U36A
74LVC1G14
2      4

BUSY_IN
PRN_PE
PRN_FAULT
PRN_SEL
PRN_ACK
STROBE_IN
AUTOFD_IN
PRN_INIT
SELIN_IN

+5V

U27B   10 GND VCC 20
U28B   10 GND VCC 20
U29B 3 GND VCC 5
U33B 3 GND VCC 5
U30B 3 GND VCC 5
U34B 3 GND VCC 5
U31B 3 GND VCC 5
U32B 3 GND VCC 5
U35B 3 GND VCC 5
U36B 3 GND VCC 5
GND

C26 100nF
C27 100nF
C29 100nF
C36 100nF
C40 100nF

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(C) TOM STOREY
Sheet: /Printer port/
File: printer_port.kicad_sch
Title: PRINTER PORT
Size: A4     Date: 2024-03-05     Rev: 1
KiCad E.D.A. 8.0.0     Id: 8/8