Sheet: CPU

File: cpu.sch

Sheet: TED

File: ted.sch

Sheet: RAM

File: ram.sch

Sheet: ROMs

File: rom.sch

Sheet: Keyboard & Joystick

File: kbd+joy.sch

Sheet: Datassette & Serial Bus

File: datasette.sch

Sheet: Expansion Port

File: exp_port.sch

Sheet: Power & Misc

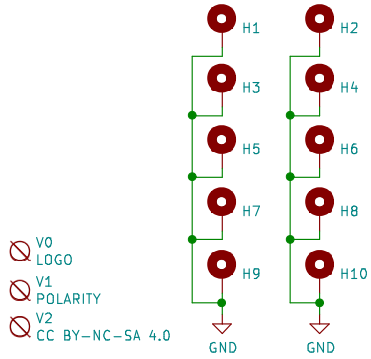
File: misc.sch

Sheet: PLA & Chip Selection

File: pla.sch

Sheet: Audio/Video Output

File: avout.sch



WARNING: These schematics might contain errors!

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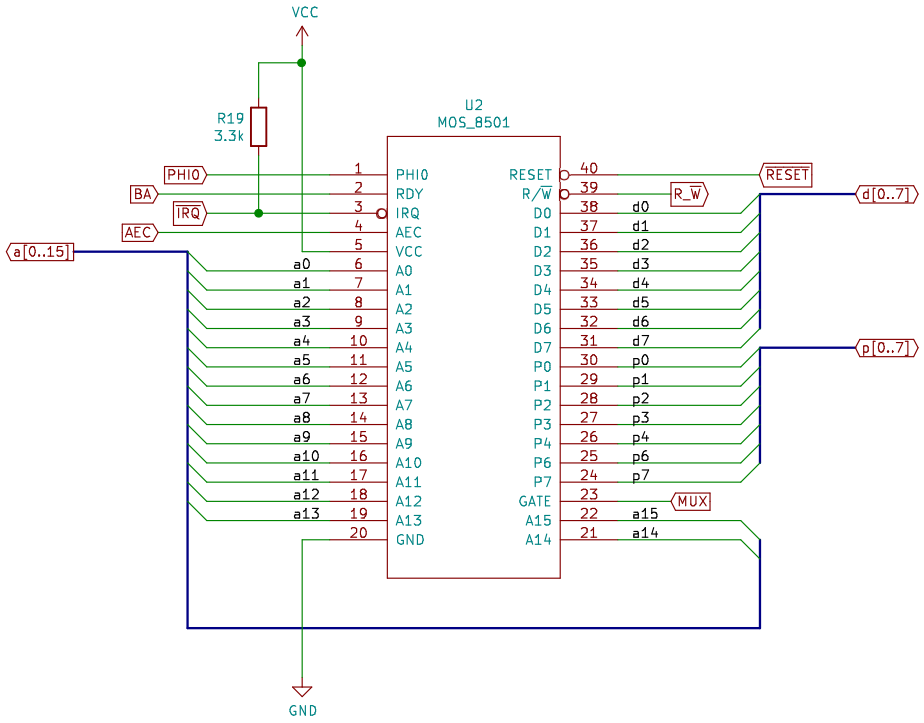
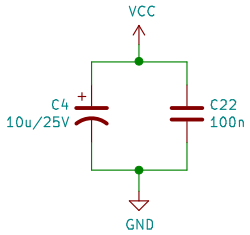
Sheet: /

File: LittleSixteen.sch

Title: LittleSixteen

Size: A4	Date: 2021-07-20	**Rev: 2git**
KiCad E.D.A. kicad 5.1.10		Id: 1/11





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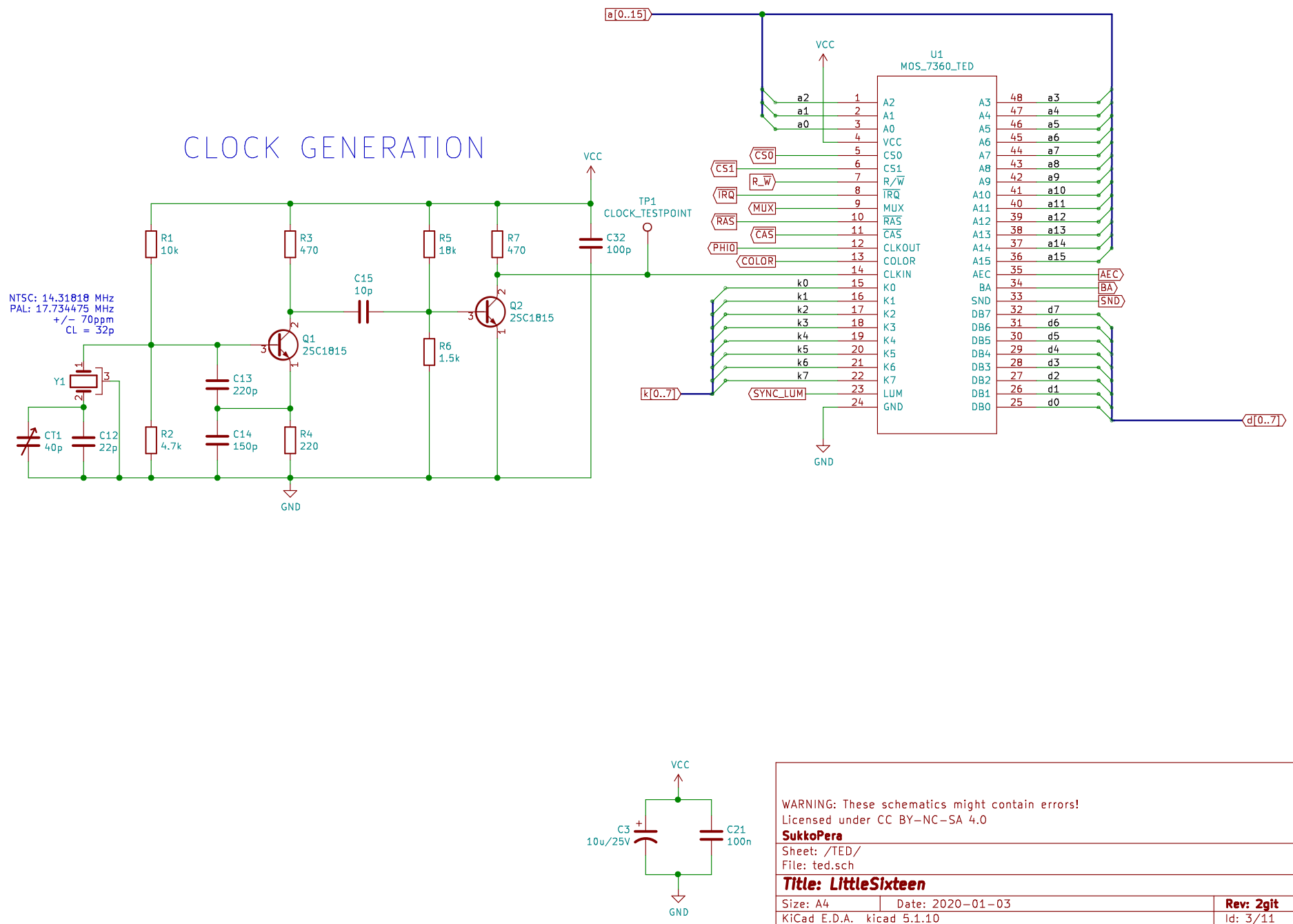
Sheet: /CPU/
File: cpu.sch

Title: LittleSixteen

Size: A4	Date: 2021-10-31	**Rev: 2git**
KiCad E.D.A. kicad 5.1.10		Id: 2/11


CLOCK GENERATION
NTSC: 14.31818 MHz
PAL: 17.734475 MHz
+/- 70ppm
CL = 32p
Y1
CT1
40p
C12
22p
R1
10k
R2
4.7k
R3
470
C13
220p
C14
150p
R4
220
C15
10p
R5
18k
R6
1.5k
R7
470
Q1
2SC1815
Q2
2SC1815
C32
100p
TP1
CLOCK_TESTPOINT
VCC
GND
a[0..15]
k[0..7]
d[0..7]
U1
MOS_7360_TED
CS0
CS1
R_W
IRQ
MUX
RAS
CAS
PHI0
COLOR
SYNC_LUM
AEC
BA
SND
C3
10u/25V
C21
100n
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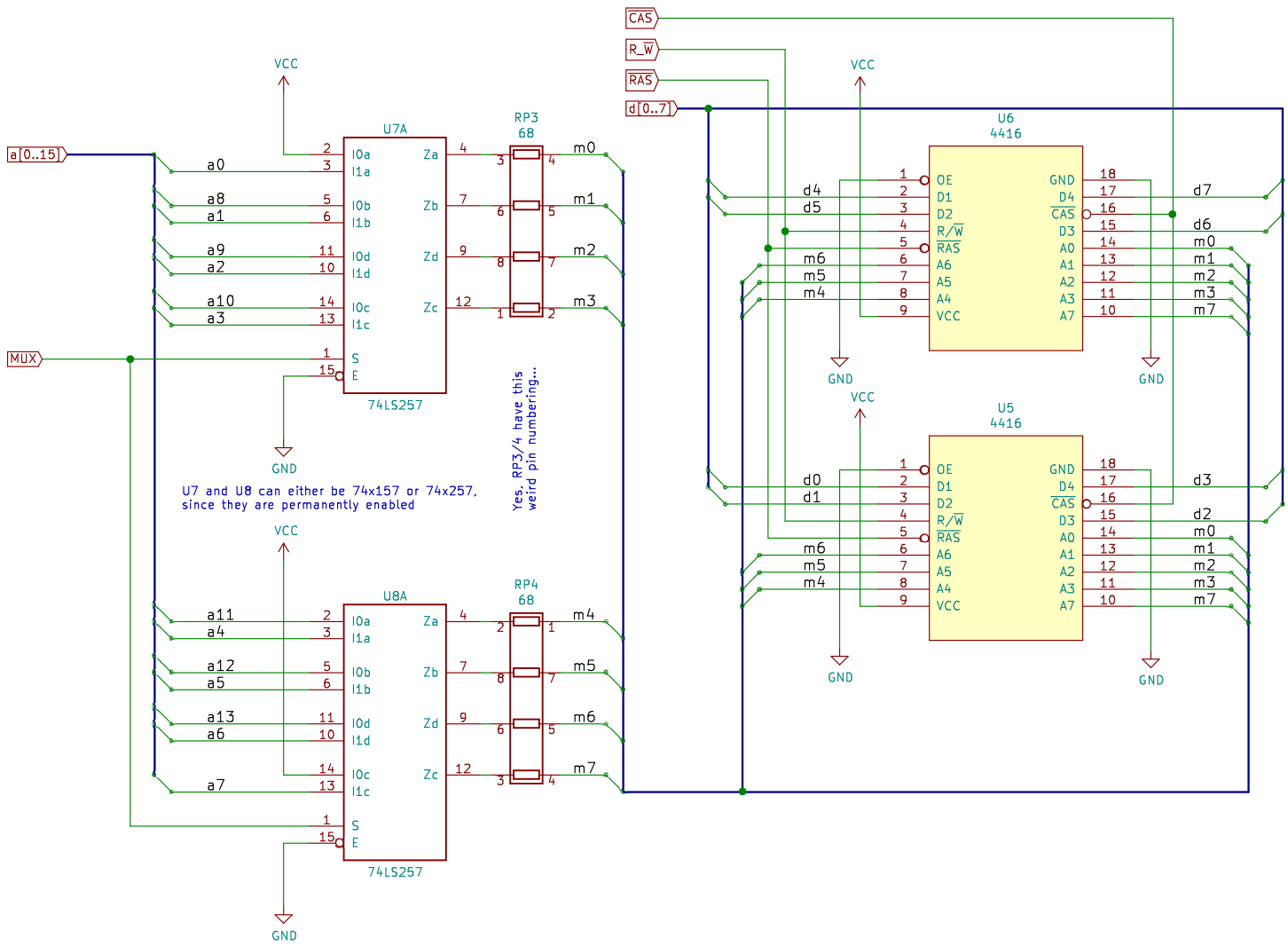
SukkoPera
Sheet: /TED/
File: ted.sch
Title: LittleSixteen
Size: A4
Date: 2020-01-03
Rev: 2git
KiCad E.D.A. kicad 5.1.10
Id: 3/11



WARNING: These schematics might contain errors!

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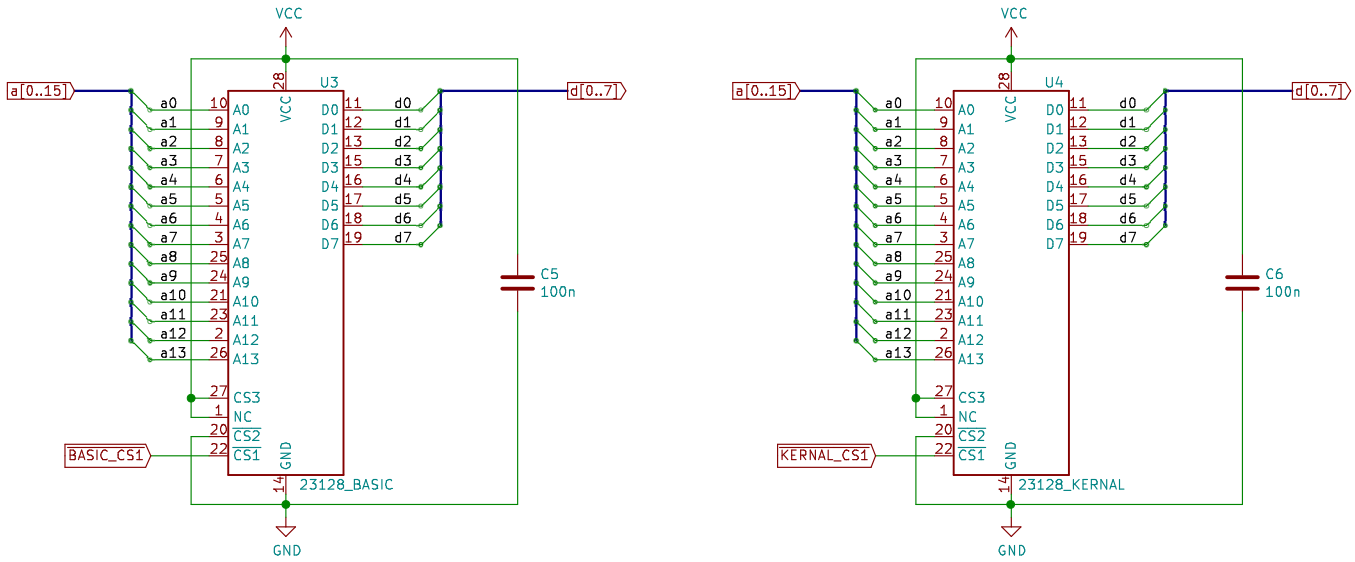
Sheet: /RAM/
File: ram.sch

Title: LittleSixteen

Size: A4	Date: 2021-07-20	**Rev: 2git**
KiCad E.D.A. kicad 5.1.10		Id: 4/11

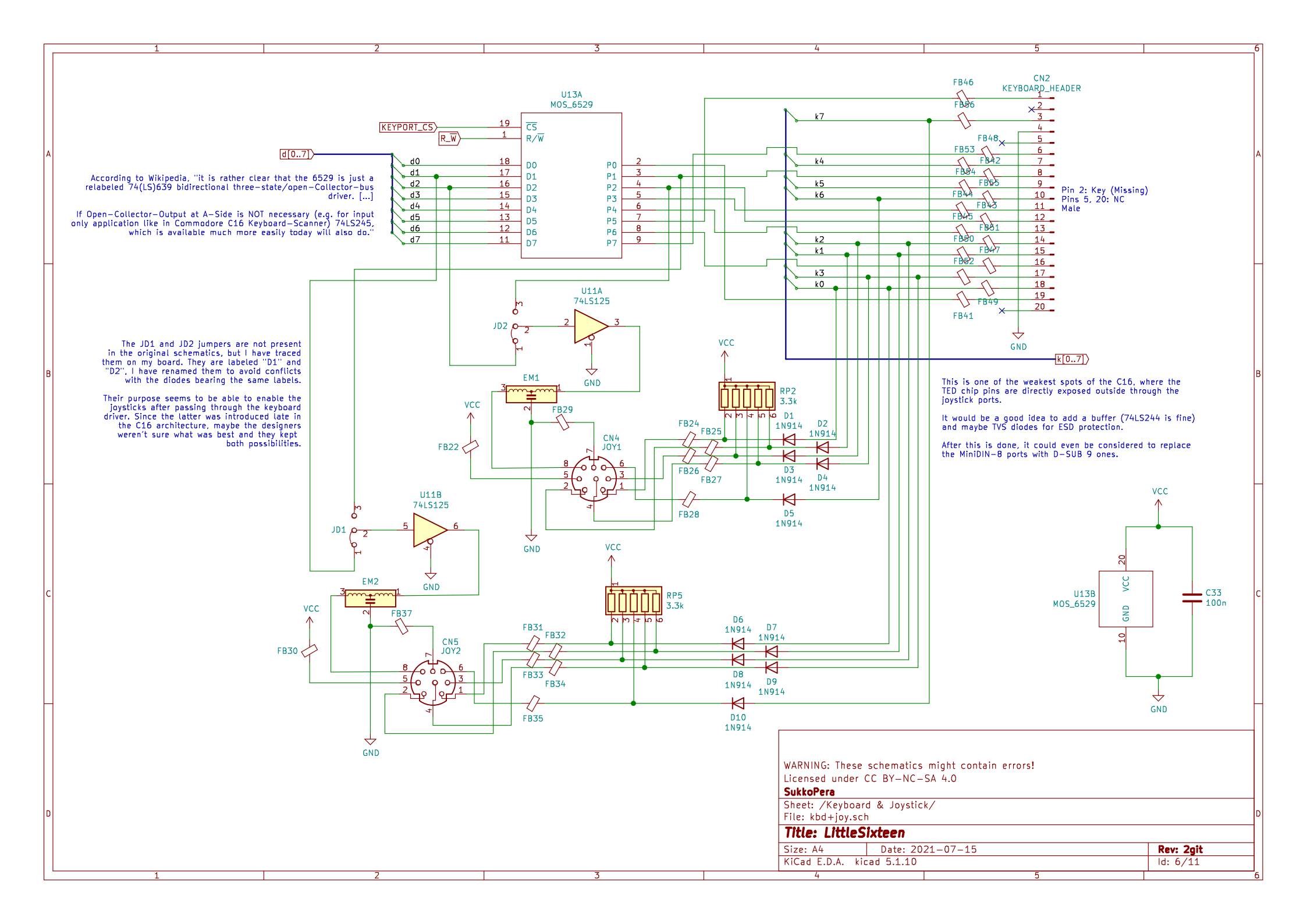


SukkoPera

Sheet: /ROMs/
File: rom.sch

Title: LittleSixteen

Size: A4	Date: 2020-01-03	**Rev: 2git**
KiCad E.D.A. kicad 5.1.10		Id: 5/11


U13A
MOS_6529
KEYPORT_CS
R_W
d[0..7]
d0
d1
d2
d3
d4
d5
d6
d7
D0
D1
D2
D3
D4
D5
D6
D7
P0
P1
P2
P3
P4
P5
P6
P7
CN2
KEYBOARD_HEADER
Pin 2: Key (Missing)
Pins 5, 20: NC
Male
k[0..7]
k7
k4
k5
k6
k2
k1
k3
k0
GND
VCC
U11A
74LS125
JD2
U11B
JD1
EM1
EM2
FB22
FB29
FB37
FB30
FB24
FB25
FB26
FB27
FB28
FB31
FB32
FB33
FB34
FB35
FB36
FB46
FB48
FB53
FB42
FB54
FB55
FB44
FB43
FB45
FB51
FB50
FB47
FB52
FB49
FB41
CN4
JOY1
CN5
JOY2
RP2
3.3k
RP5
3.3k
D1
1N914
D2
1N914
D3
1N914
D4
1N914
D5
1N914
D6
1N914
D7
1N914
D8
1N914
D9
1N914
D10
1N914
U13B
MOS_6529
C33
100n
According to Wikipedia, "it is rather clear that the 6529 is just a relabeled 74(LS)639 bidirectional three-state/open-Collector-bus driver. [...]
If Open-Collector-Output at A-Side is NOT necessary (e.g. for input only application like in Commodore C16 Keyboard-Scanner) 74LS245, which is available much more easily today will also do."
The JD1 and JD2 jumpers are not present in the original schematics, but I have traced them on my board. They are labeled "D1" and "D2", I have renamed them to avoid conflicts with the diodes bearing the same labels.
Their purpose seems to be able to enable the joysticks after passing through the keyboard driver. Since the latter was introduced late in the C16 architecture, maybe the designers weren't sure what was best and they kept both possibilities.
This is one of the weakest spots of the C16, where the TED chip pins are directly exposed outside through the joystick ports.
It would be a good idea to add a buffer (74LS244 is fine) and maybe TVS diodes for ESD protection.
After this is done, it could even be considered to replace the MiniDIN-8 ports with D-SUB 9 ones.
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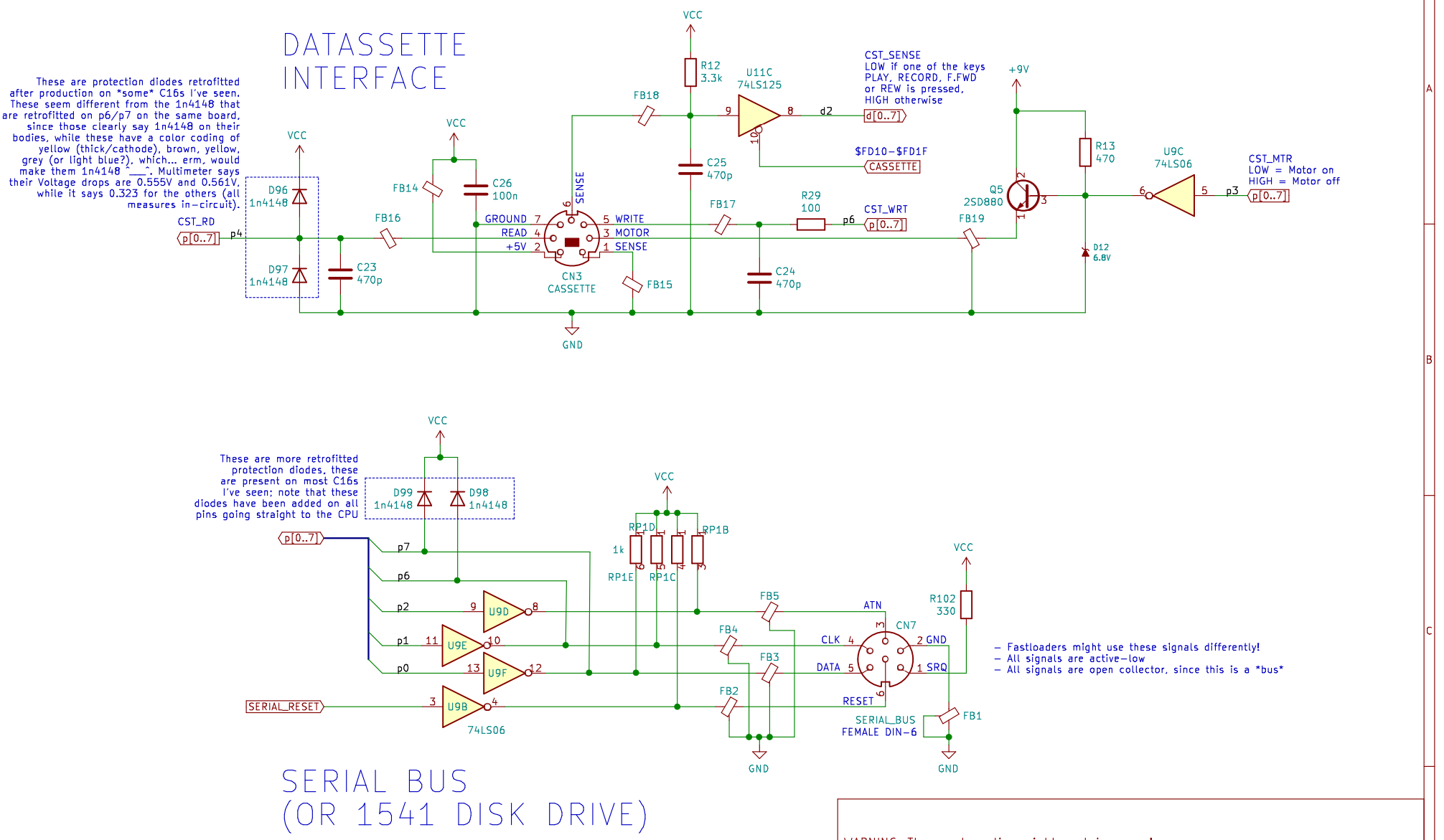
SukkoPera
Sheet: /Keyboard & Joystick/
File: kbd+joy.sch
Title: LittleSixteen
Size: A4
Date: 2021-07-15
Rev: 2git
KiCad E.D.A. kicad 5.1.10
Id: 6/11

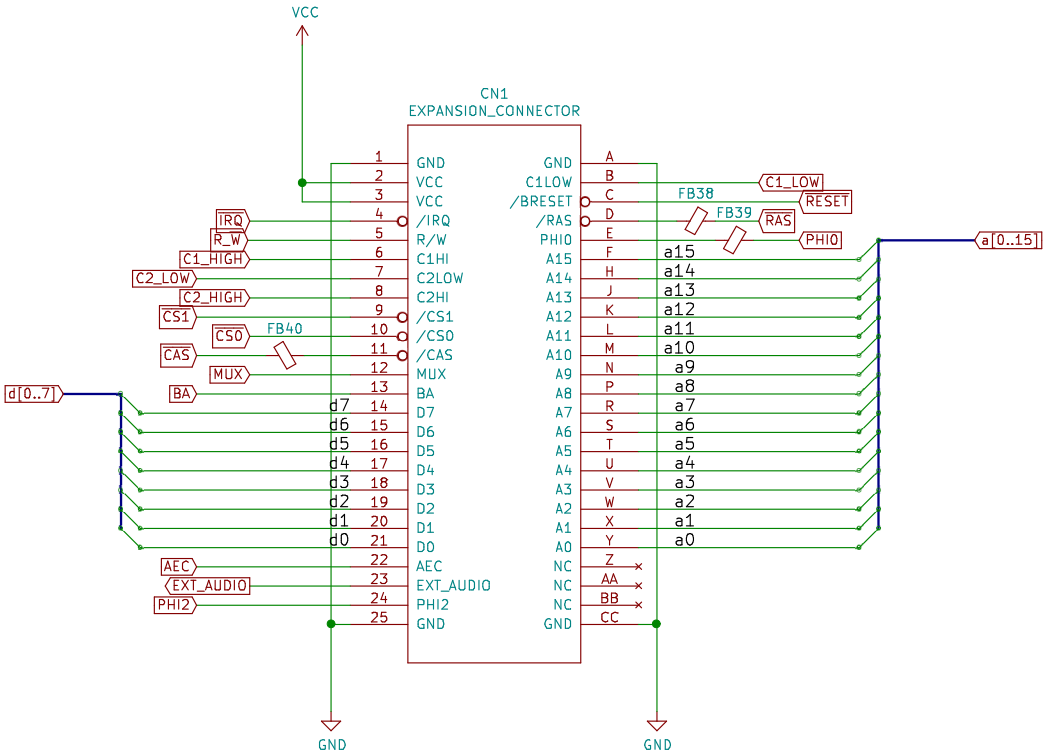


SukkoPera

Sheet: /Datassette & Serial Bus/
File: datasette.sch

Title: LittleSixteen

Size: A4	Date: 2021-10-31	**Rev: 2git**
KiCad E.D.A. kicad 5.1.10		Id: 7/11

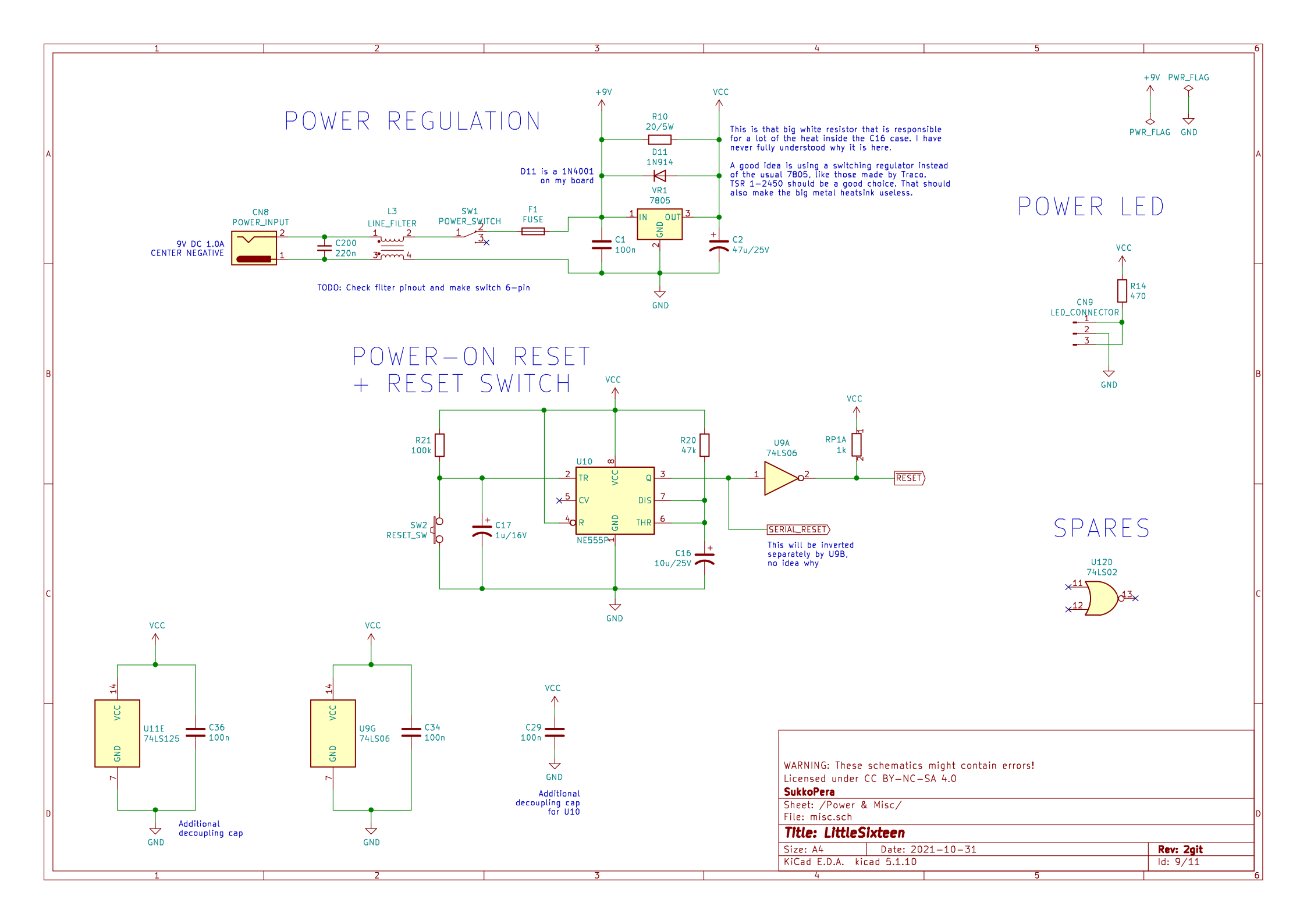


SukkoPera

Sheet: /Expansion Port/
File: exp_port.sch

Title: LittleSixteen

Size: A4	Date: 2020-01-03	**Rev: 2git**
KiCad E.D.A. kicad 5.1.10		Id: 8/11


POWER REGULATION
+9V
VCC
R10
20/5W
D11
1N914
D11 is a 1N4001
on my board
VR1
7805
IN
OUT
GND
This is that big white resistor that is responsible
for a lot of the heat inside the C16 case. I have
never fully understood why it is here.
A good idea is using a switching regulator instead
of the usual 7805, like those made by Traco.
TSR 1-2450 should be a good choice. That should
also make the big metal heatsink useless.
CN8
POWER_INPUT
9V DC 1.0A
CENTER NEGATIVE
C200
220n
L3
LINE_FILTER
SW1
POWER_SWITCH
F1
FUSE
C1
100n
C2
47u/25V
TODO: Check filter pinout and make switch 6-pin
PWR_FLAG
GND
POWER LED
R14
470
CN9
LED_CONNECTOR
POWER-ON RESET
+ RESET SWITCH
R21
100k
R20
47k
U10
TR
CV
R
Q
DIS
THR
NE555P
U9A
74LS06
RP1A
1k
RESET
SW2
RESET_SW
C17
1u/16V
C16
10u/25V
SERIAL_RESET
This will be inverted
separately by U9B,
no idea why
SPARES
U12D
74LS02
U11E
74LS125
C36
100n
U9G
74LS06
C34
100n
C29
100n
Additional
decoupling cap
Additional
decoupling cap
for U10
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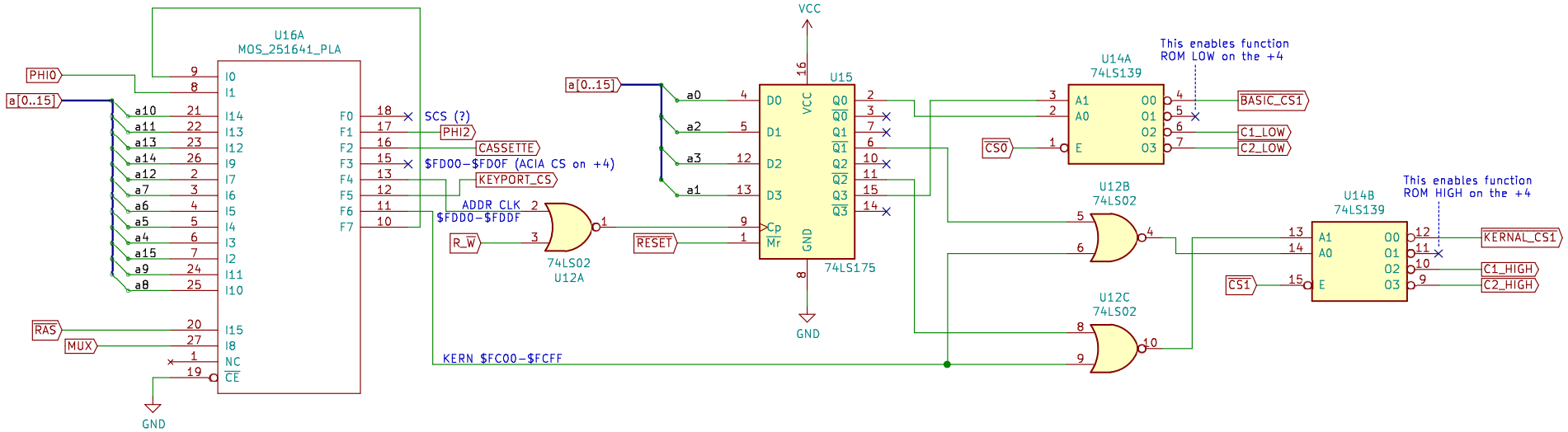
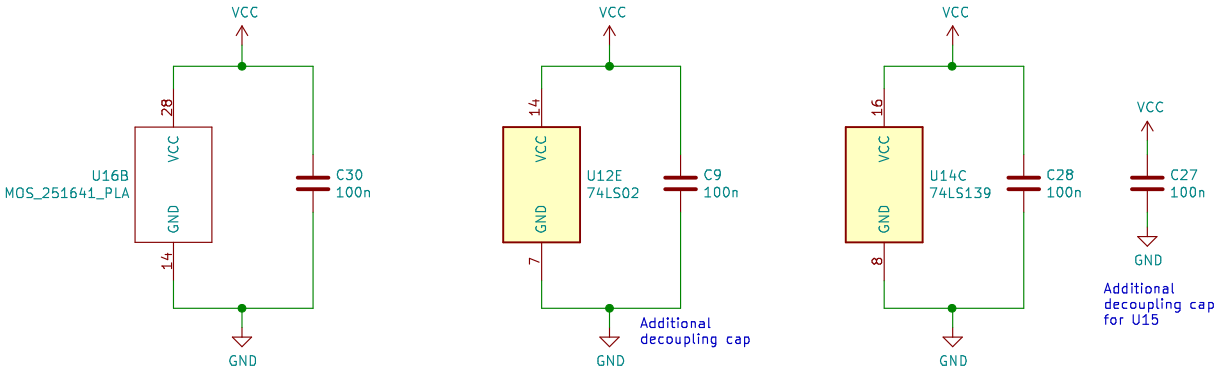
SukkoPera
Sheet: /Power & Misc/
File: misc.sch
Title: LittleSixteen
Size: A4
Date: 2021-10-31
Rev: 2git
KiCad E.D.A. kicad 5.1.10
Id: 9/11



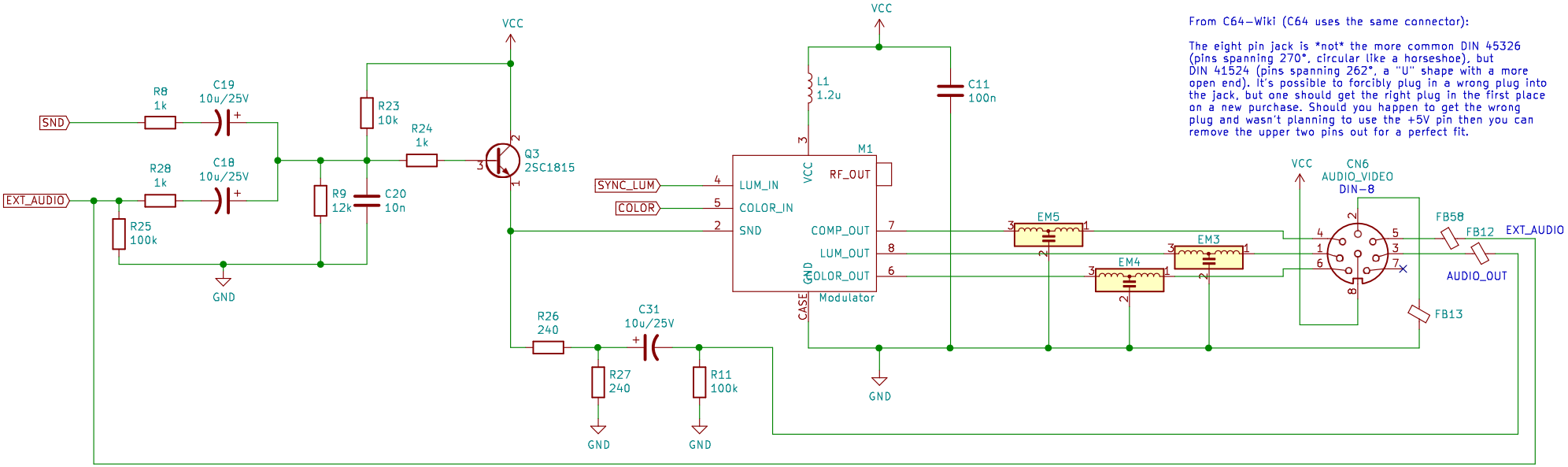


SukkoPera

Sheet: /PLA & Chip Selection/
File: pla.sch

Title: LittleSixteen

Size: A4	Date: 2021-07-20	Rev: 2git
KiCad E.D.A. kicad 5.1.10		Id: 10/11



SukkoPera

Sheet: /Audio/Video Output/
File: avout.sch

Title: LittleSixteen

Size: A4	Date: 2021-07-20	**Rev: 2git**
KiCad E.D.A. kicad 5.1.10		Id: 11/11