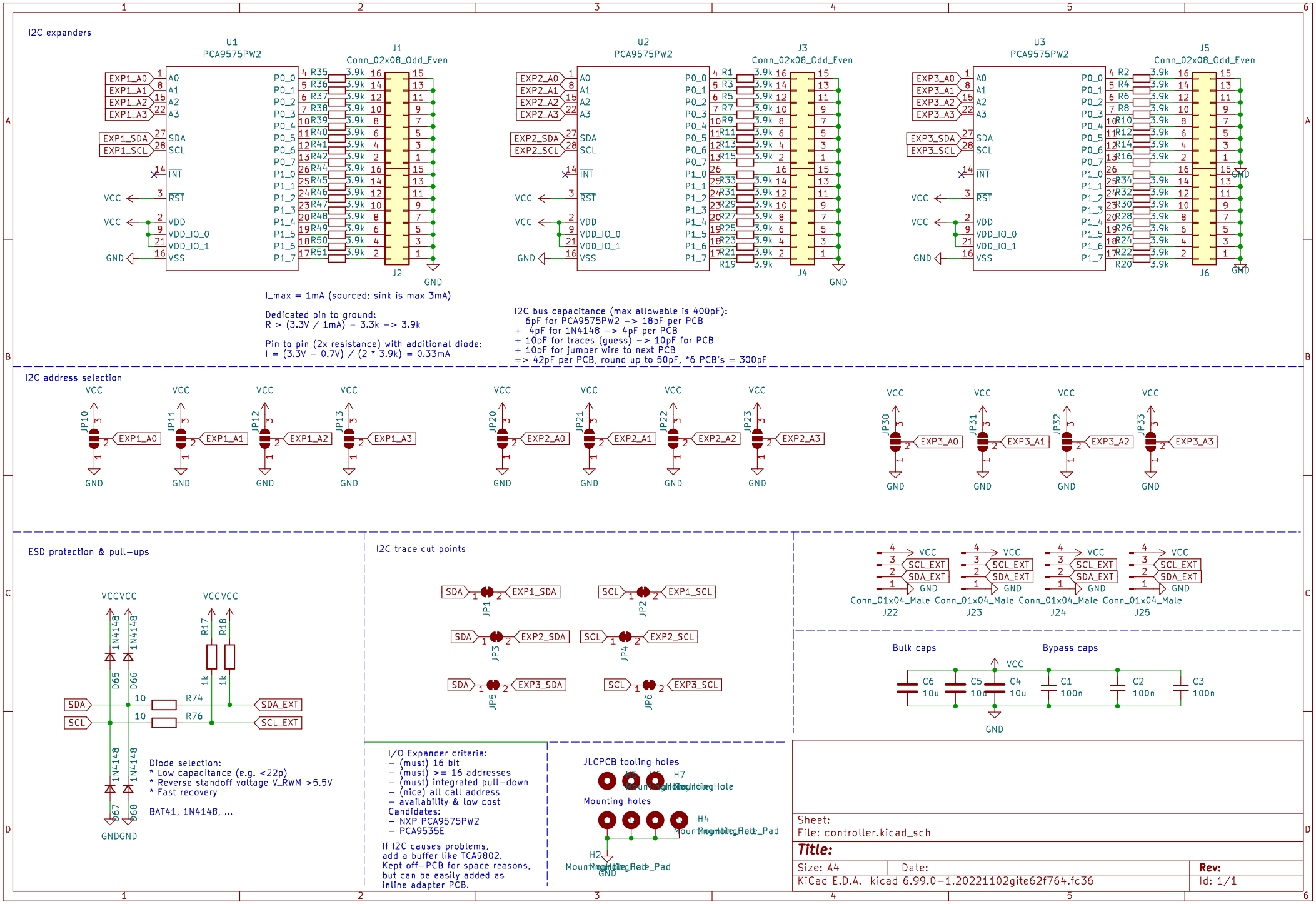
I2C expanders
U1
PCA9575PW2
J1
Conn_02x08_Odd_Even
J2
U2
PCA9575PW2
J3
Conn_02x08_Odd_Even
J4
U3
PCA9575PW2
J5
Conn_02x08_Odd_Even
J6
EXP1_A0
EXP1_A1
EXP1_A2
EXP1_A3
EXP1_SDA
EXP1_SCL
EXP2_A0
EXP2_A1
EXP2_A2
EXP2_A3
EXP2_SDA
EXP2_SCL
EXP3_A0
EXP3_A1
EXP3_A2
EXP3_A3
EXP3_SDA
EXP3_SCL
VCC
GND
I_max = 1mA (sourced; sink is max 3mA)
Dedicated pin to ground:
R > (3.3V / 1mA) = 3.3k –> 3.9k
Pin to pin (2x resistance) with additional diode:
I = (3.3V – 0.7V) / (2 * 3.9k) = 0.33mA
I2C bus capacitance (max allowable is 400pF):
6pF for PCA9575PW2 –> 18pF per PCB
+ 4pF for 1N4148 –> 4pF per PCB
+ 10pF for traces (guess) –> 10pF for PCB
+ 10pF for jumper wire to next PCB
=> 42pF per PCB, round up to 50pF, *6 PCB's = 300pF
I2C address selection
JP10
JP11
JP12
JP13
JP20
JP21
JP22
JP23
JP30
JP31
JP32
JP33
ESD protection & pull-ups
VCCVCC
GNDGND
D65
D66
D67
D68
1N4148
R17
R18
1k
R74
R76
10
SDA
SCL
SDA_EXT
SCL_EXT
Diode selection:
* Low capacitance (e.g. <22p)
* Reverse standoff voltage V_RWM >5.5V
* Fast recovery
BAT41, 1N4148, ...
I2C trace cut points
JP1
JP2
JP3
JP4
JP5
JP6
I/O Expander criteria:
– (must) 16 bit
– (must) >= 16 addresses
– (must) integrated pull-down
– (nice) all call address
– availability & low cost
Candidates:
– NXP PCA9575PW2
– PCA9535E
If I2C causes problems,
add a buffer like TCA9802.
Kept off-PCB for space reasons,
but can be easily added as
inline adapter PCB.
JLCPCB tooling holes
H5
H6
H7
MountingHole
Mounting holes
H1
H2
H3
H4
MountingHole_Pad
Conn_01x04_Male
J22
J23
J24
J25
SCL_EXT
SDA_EXT
Bulk caps
Bypass caps
C6
10u
C5
10u
C4
10u
C1
100n
C2
100n
C3
100n
Sheet:
File: controller.kicad_sch
Title:
Size: A4
Date:
Rev:
KiCad E.D.A. kicad 6.99.0-1.20221102gite62f764.fc36
Id: 1/1