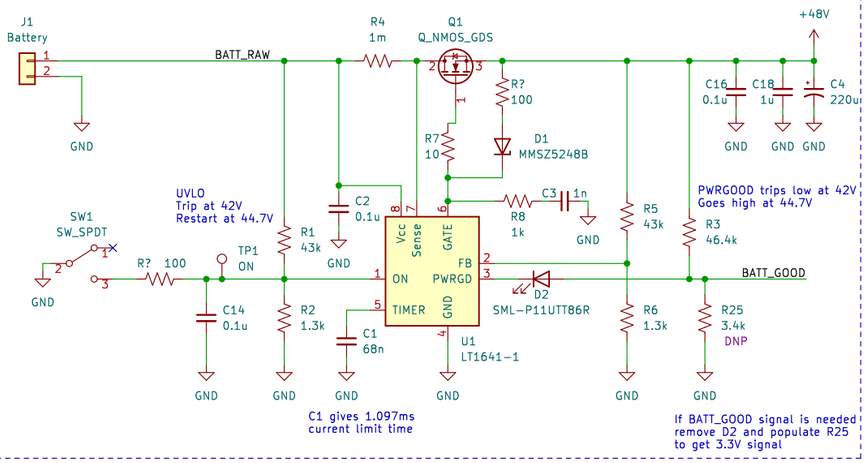
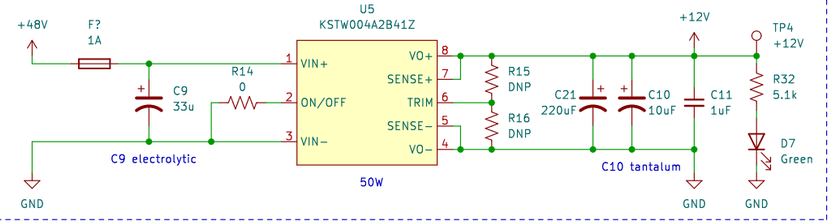
POWER INTAKE

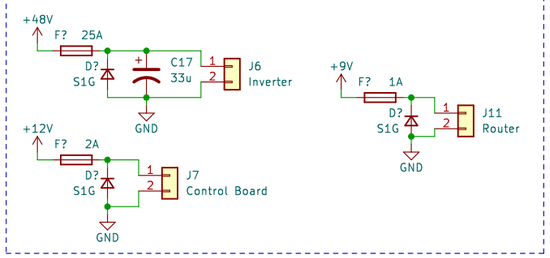
R4 is sense resistor
Vsense=47mV
1mohm gives 47A limits, R dissipates 2.21W at max I
0.75mohm gives 62.67A limit, R dissipates 2.95W at max I
0.5mohm gives 94A limit, R dissipates 4.42W at max I
Footprint compatible options available for all 3 values
Can also short R to defeat current limit



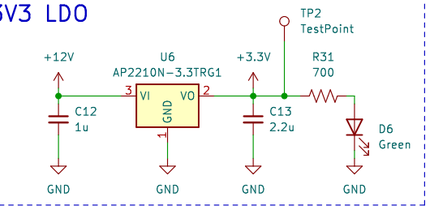
12V CONVERTER



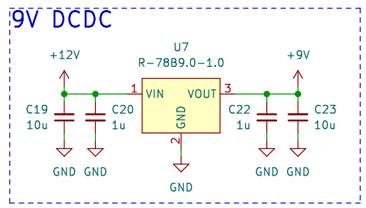
POWER OUTPUT CONNECTORS



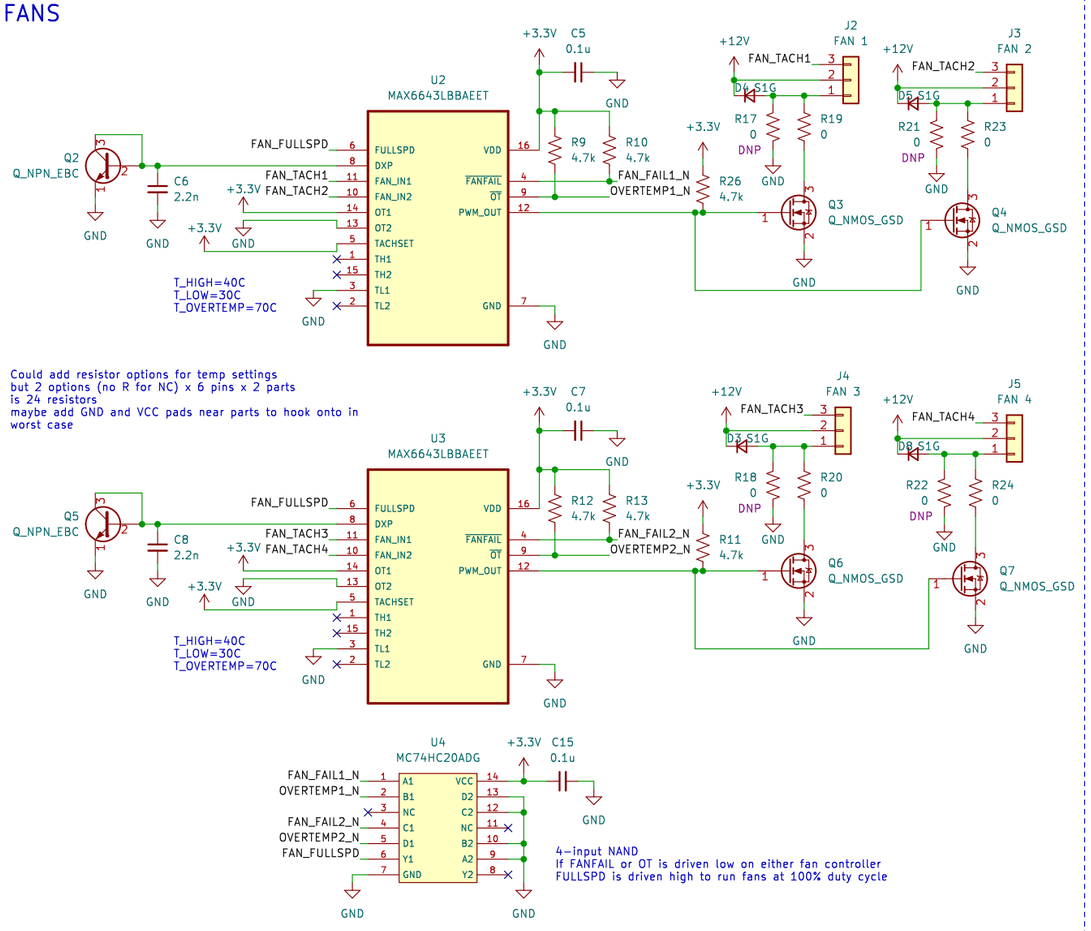
3V3 LDO



9V DCDC



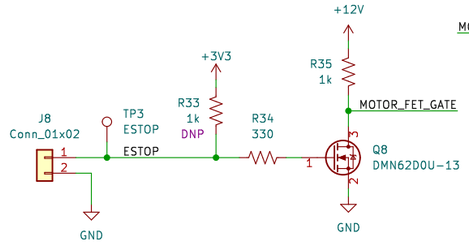
FANS



Could add resistor options for temp settings
but 2 options (no R for NC) x 6 pins x 2 parts
is 24 resistors
maybe add GND and VCC pads near parts to hook onto in
worst case

MOTOR POWER

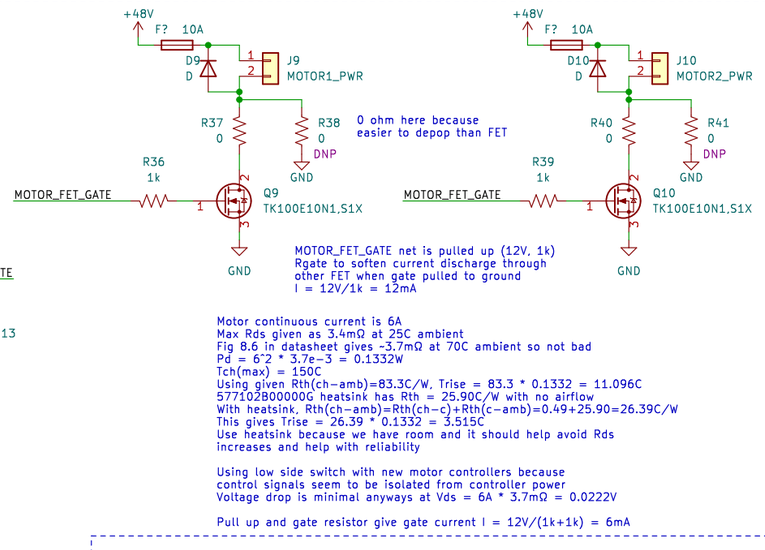
ESTOP is signal from 74LVC1G97W6-7 logic IC on control board
3.3V output, can sink max 24mA
Say we want IC on control board to sink 10mA
Rgate = 3.3V/10mA = 330Ω
Check current of motor driver EN signals on control board



FET to control motor power fets from ESTOP signals
If ESTOP active (high), this FET is on and gates of
motor power FETs are pulled low, cutting motor power
If ESTOP not active (low), this fet is off and gates
of motor power FETs are on, enabling motor power

Want 3.3V pull up to keep motor power off by default, but
could the ESTOP signal cause issues with the LDO if
ESTOP_H > 3V3 on this board?
Use pull down to have FET gate in defined state and accept
that motor power will always be on when ESTOP not connected
from control board
Motors will need control board to be driven anyway so likely low risk?

Steady state current through FET is I = 12V/1k = 12mA
When motor power FETs switched off, pulse of I=3*(12V/1k)=36mA
Rds(max) = 2.5Ω @ Ta = 25C
Pd = 2.5*(12e-3)^2 = 0.36mW
Rth(J to A) = 338C/W, Trise = 338*0.36e-3 = 0.1217C
SOA in fig 12 shows 36mA pulse should be fine if 100ms or shorter
Gate charge of motor power FETs is 140nC
Discharge time -= 5RC = 5(1kΩ)(140nC) = 0.7ms



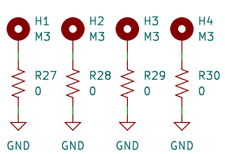
MOTOR_FET_GATE net is pulled up (12V, 1k)
Rgate to soften current discharge through
other FET when gate pulled to ground
I = 12V/1k = 12mA

Motor continuous current is 6A
Max Rds given as 3.4mΩ at 25C ambient
Fig 8.6 in datasheet gives ~3.7mΩ at 70C ambient so not bad
Pd = 6^2 * 3.7e-3 = 0.1332W
Tch(max) = 150C
Using given Rth(ch-amb)=83.3C/W, Trise = 83.3 * 0.1332 = 11.096C
577102B00000G heatsink has Rth = 25.90C/W with no airflow
With heatsink, Rth(ch-amb)=Rth(ch-c)+Rth(c-amb)=0.49+25.90=26.39C/W
This gives Trise = 26.39 * 0.1332 = 3.515C
Use heatsink because we have room and it should help avoid Rds
increases and help with reliability

Using low side switch with new motor controllers because
control signals seem to be isolated from controller power
Voltage drop is minimal anyways at Vds = 6A * 3.7mΩ = 0.0222V

Pull up and gate resistor give gate current I = 12V/(1k+1k) = 6mA

REVIEW V0.2



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