Inductor calculation the higher of:

Vin_nom = 13.8 volts
Vin_min = 9 volts
Vin_max = 18 volts
I_mas = 200 Amp
Freq = 20000 hz
L> (Vin_min * (Vout_nom−Vin_min) / (Imax * 0.2 * freq * Vout_nom)

or (Vout_nom * (Vin_max−Vout_nom) / (Imax * 0.2 * freq * Vin_max)

L > 4.025 uH or 3.913

Choosen 4.5 uH

Duty cycles

Dbuck_min = Vout_mon / Vin_max = 0.766

Dboost max = Vin_min/Vout_nom = 0.652

Capacitor min

Vripple = 0.2

Cin have to be he higher of
Cin_buck = I_max * * (1 − Dbuck_min) / (freq x Vripple) or

Cin boost = I_max * 0.2 / (8 * freq * Vripple * (1 − Dboost_max))

Cin_buck= 8962 uf

Cin_boost= 3591 uf

Choosen 10000uf

DV_removal= maximun voltatage change for load remove

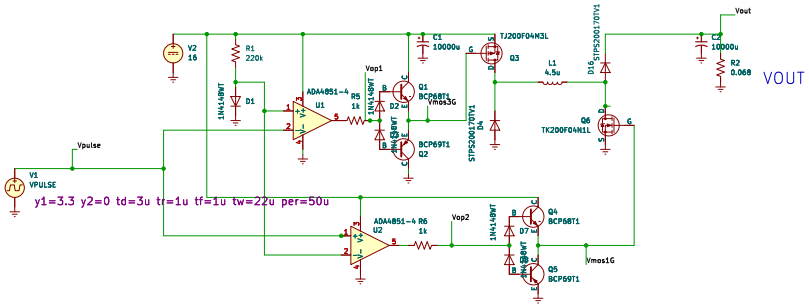
DV= 0.8V

Cout = I_load^2 x L / (2 x Vout_nom x DV)

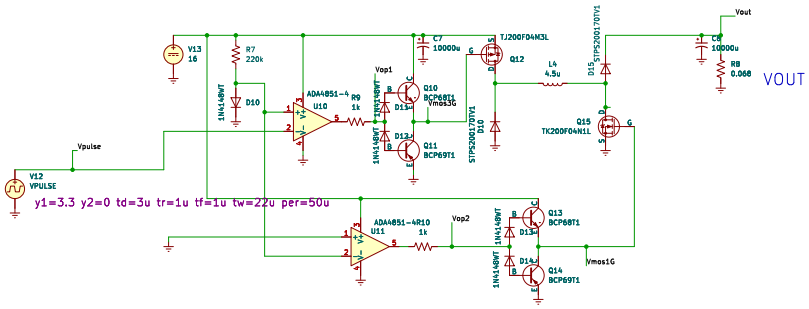
Cout = 8272 uf

choosen 10000uf

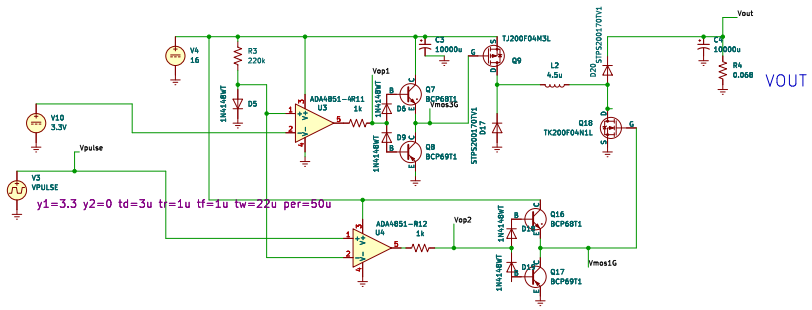
CONDITION ABS(VIN − VOUT) < 1 V (BUCK−BOOST CONVERTER)



CONDITION VIN − VOUT > 1 V (BUCK CONVERTER)



CONDITION VOUT − VIN > 1 V (BOOST CONVERTER)



CONDITIONS MUST BE PROGRAMMED
CIRCUIT IS SIMPLIFIED NEED TO BE ADDED POWER TO HANDLE MOSFET GATES

fist release,
Pending simulation and esp32 program
Darlo Martin Lobos (patent pending)

Sheet: /
File: buck+boost battery charge.kicad_sch

Title: Buck and Booster converter for battery charge

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