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

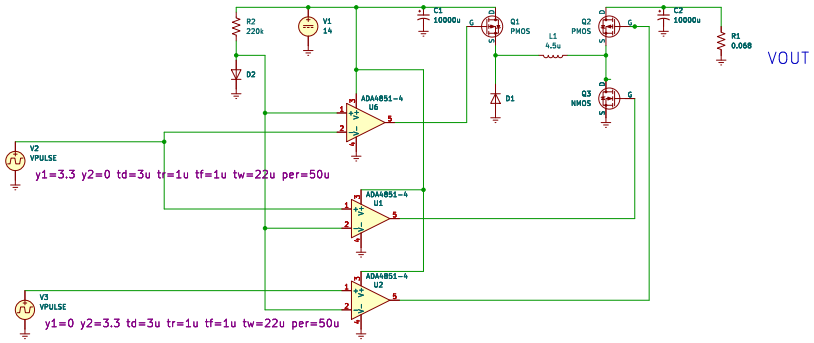
DV= 0.8V

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

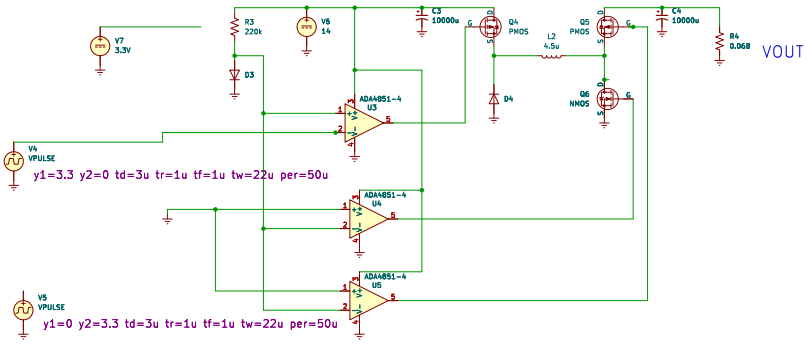
Cout = 8272 uf

choosen 10000uf

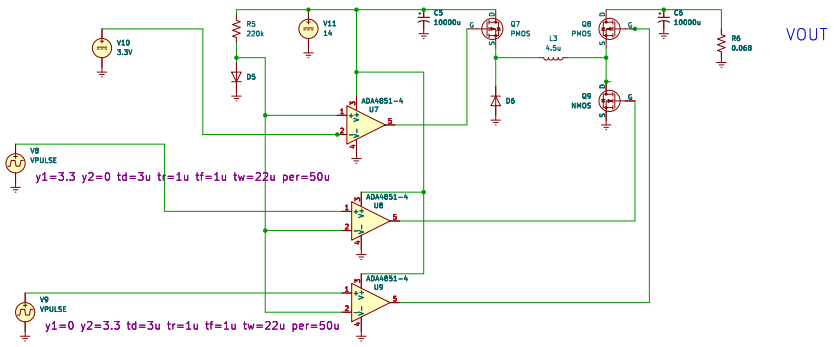
CONDITION ABS(VIN − VOUT) < 1 V



CONDITION VIN − VOUT > 1 V



CONDITION VOUT − VIN > 1 V



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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