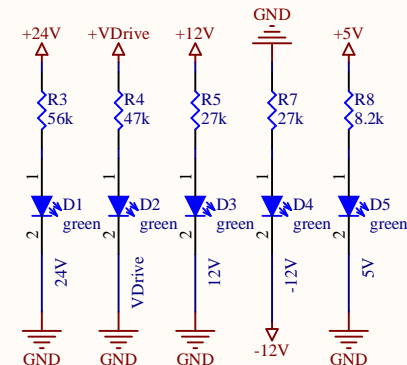
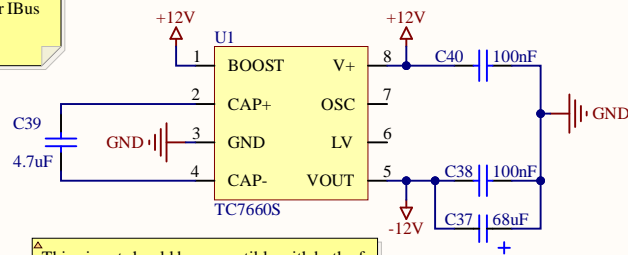
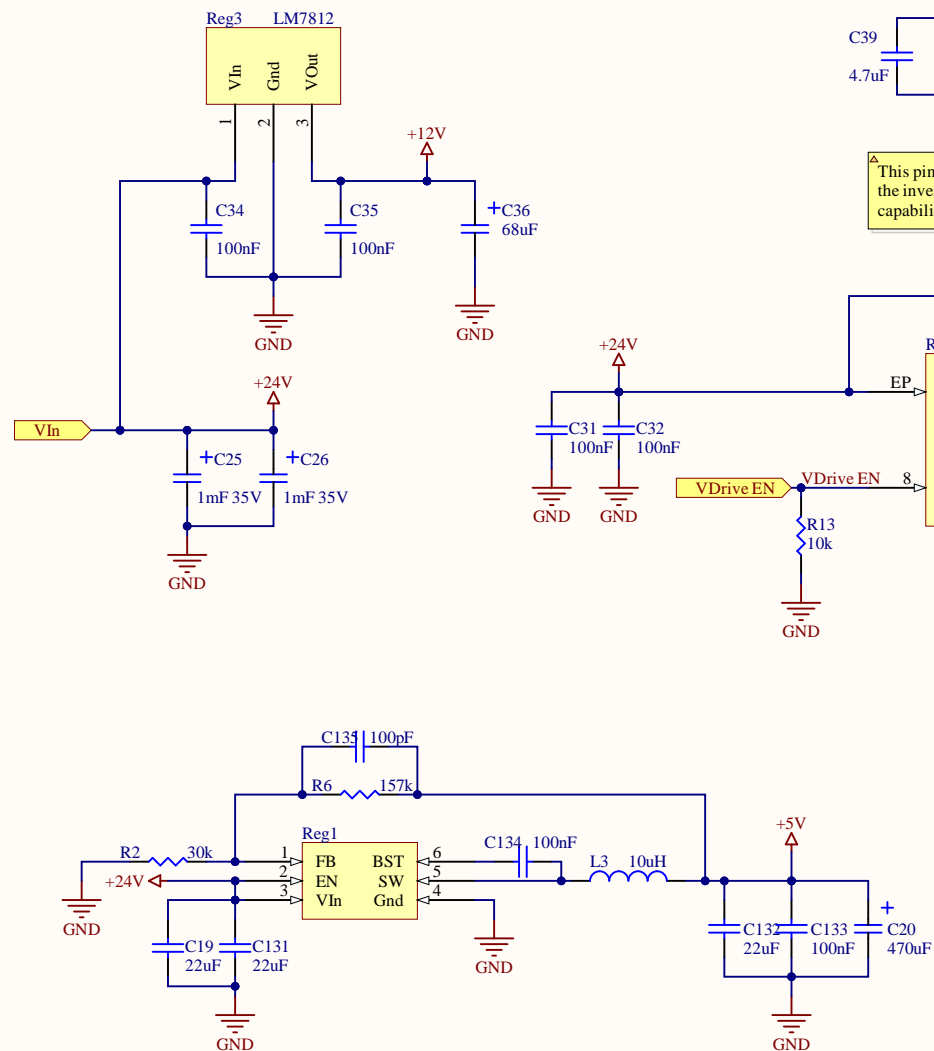
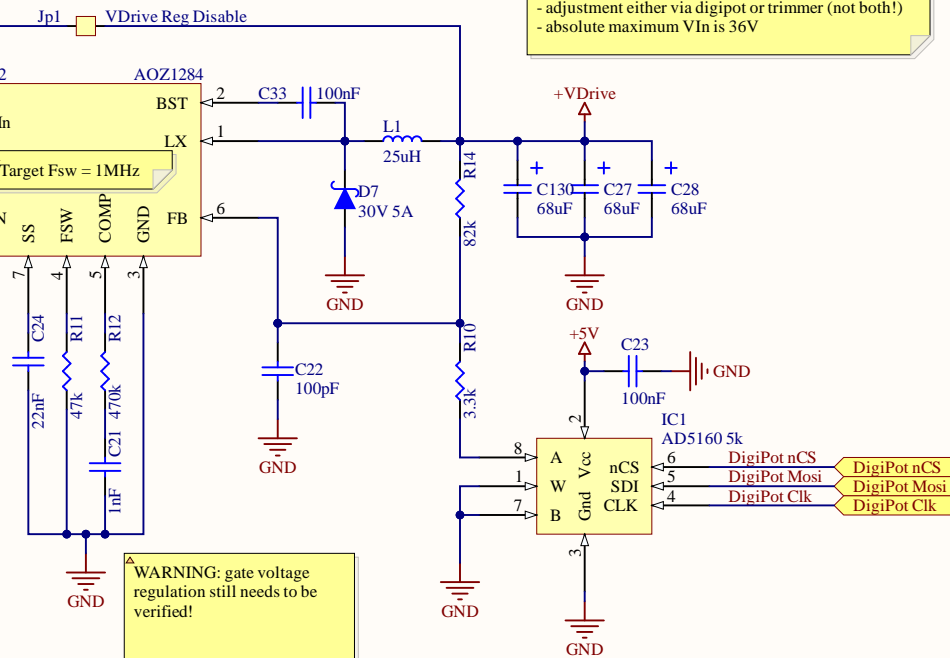


▲ +12V Regulator and -12V generator only required for bipolar LEM Current Sensors for IBUS
No need to populate these for use with 5V Hall effect sensors

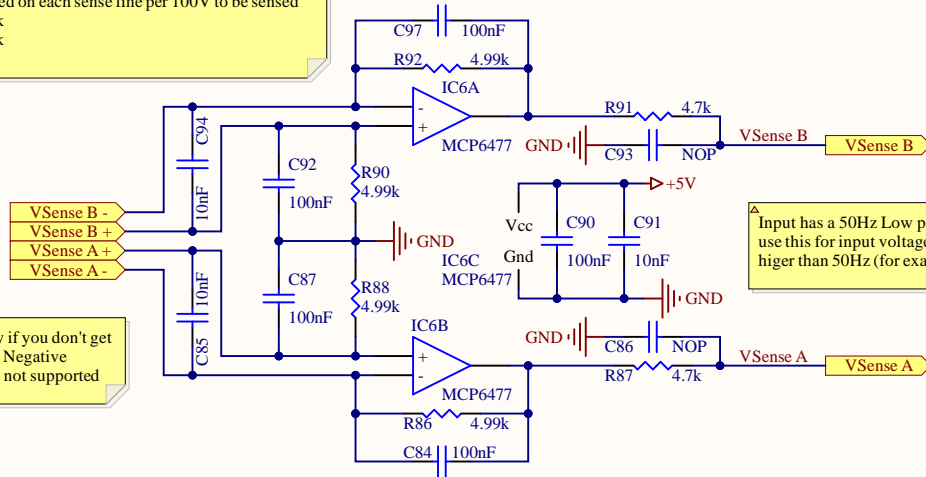


▲ VDrive Regulator dimensioning:
- 3A 20V (little more current with less output voltage)
- VOut Adjustable between 10V and 19V (for more the regulator must be bridged with solder jumper Jp1)
- adjustment either via digipot or trimmer (not both!)
- absolute maximum Vin is 36V



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A4		
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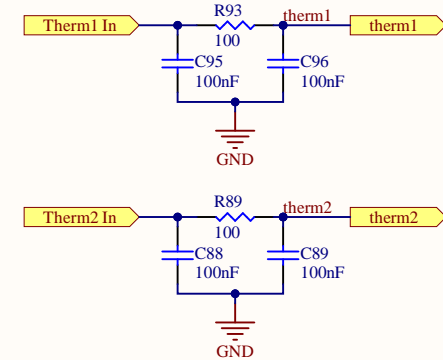
external 100k required on each sense line per 100V to be sensed
 350V VBus => 400k
 565V VBus => 600k
 etc...



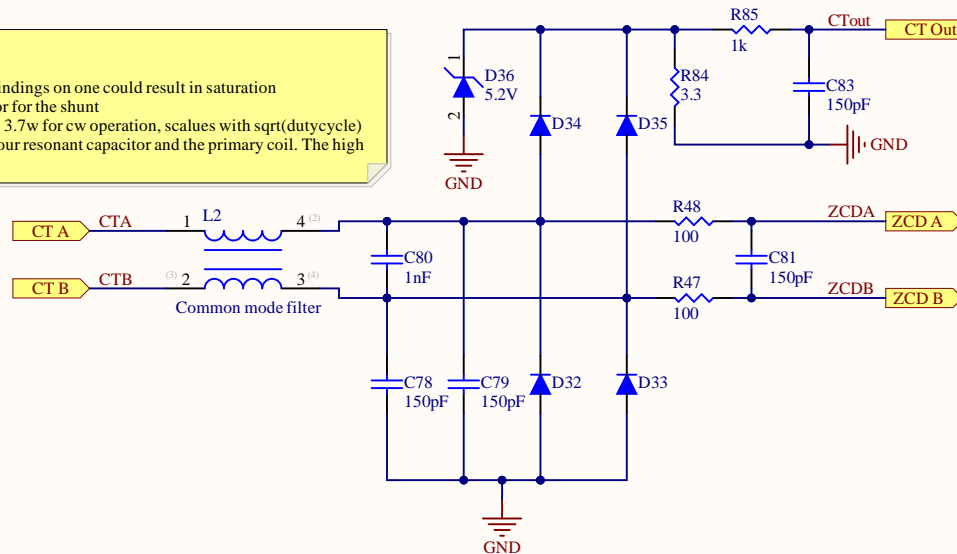
Check the polarity if you don't get a voltage reading. Negative voltage sensing is not supported

Input has a 50Hz Low pass filter. Keep this in mind if you want to use this for input voltage sense of a pfc stage with frequencies higher than 50Hz (for example 120hz for rectified 60Hz)

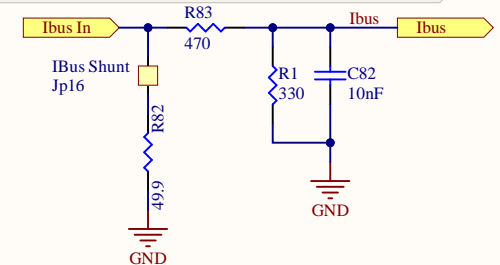
Designed for use with 10k NTCs, but can be calibrated for different types if required



CT Design considerations:
 - Ict,max = 1.5A with 3.3Ohm shunt
 - wind at least two stages, too many windings on one could result in saturation
 - use thick film (non-inductive) resistor for the shunt
 - shunt power dissipation maximum is 3.7w for cw operation, scales with sqrt(dutycycle)
 - DO NOT connect the ct inbetween your resonant capacitor and the primary coil. The high voltage could kill the UD3



Omit 49.9 Ohm shunt for use with voltage mode current sensors
 Voltage offset calibration is supported in software



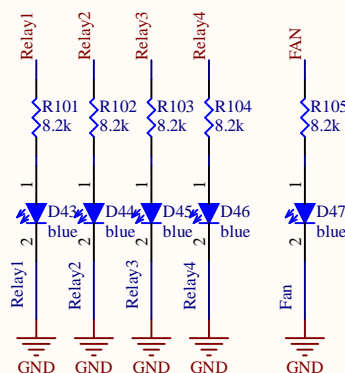
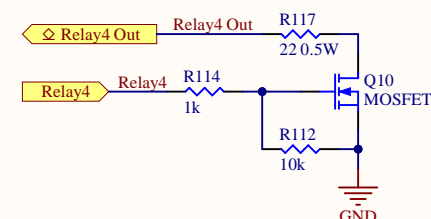
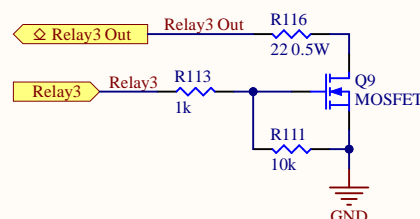
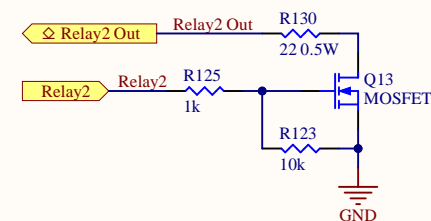
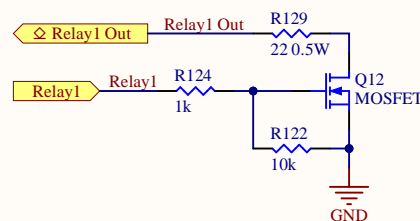
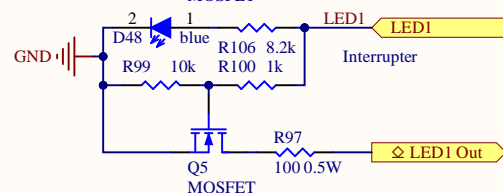
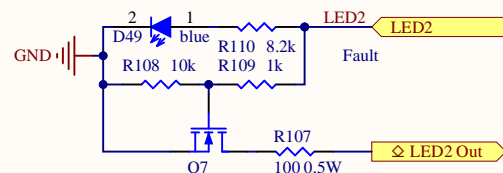
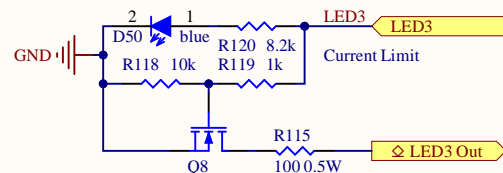
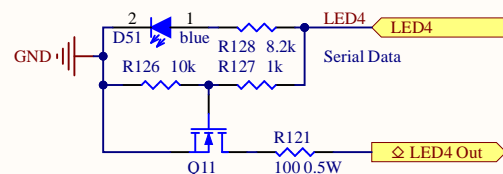
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CAUTION:

working method of LED outputs has changed from UD3.0. They used to be high side controlled, with permanent ground.

Changed to low side switched since UD3.1 to also allow use of 24V indicators.

This is only backwards compatible if you used each ground pin on the old connector



External open drain inputs are current limited by 22 Ohms, except the fan output. Short circuits on any output will probably blow the current limiting resistor. Keep some replacements on hand

Current rating per relay and LED pin is 150mA. If you need more remove the 22 ohm protection resistor. That increases the rating to (TO BE CALCULATED) mA, but a short might kill the PSOC

△ Fan pin output current rating:
- screw terminal 10A
- plug in header 1A

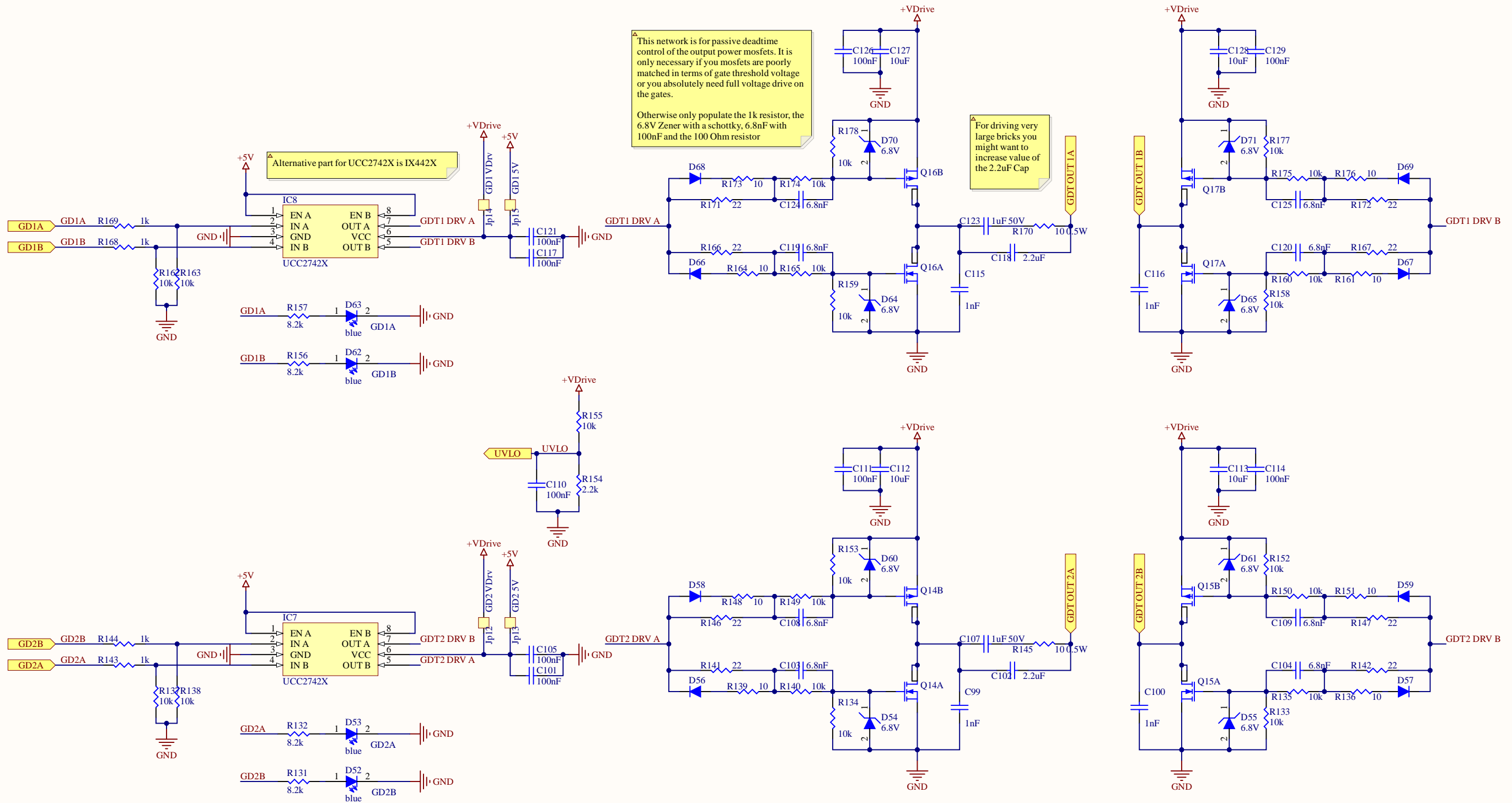
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Date:	9/04/2023	Sheet of
File:	F:\OneDrive\...UD3.1 Digital IQ_SchDoc	Drawn By:

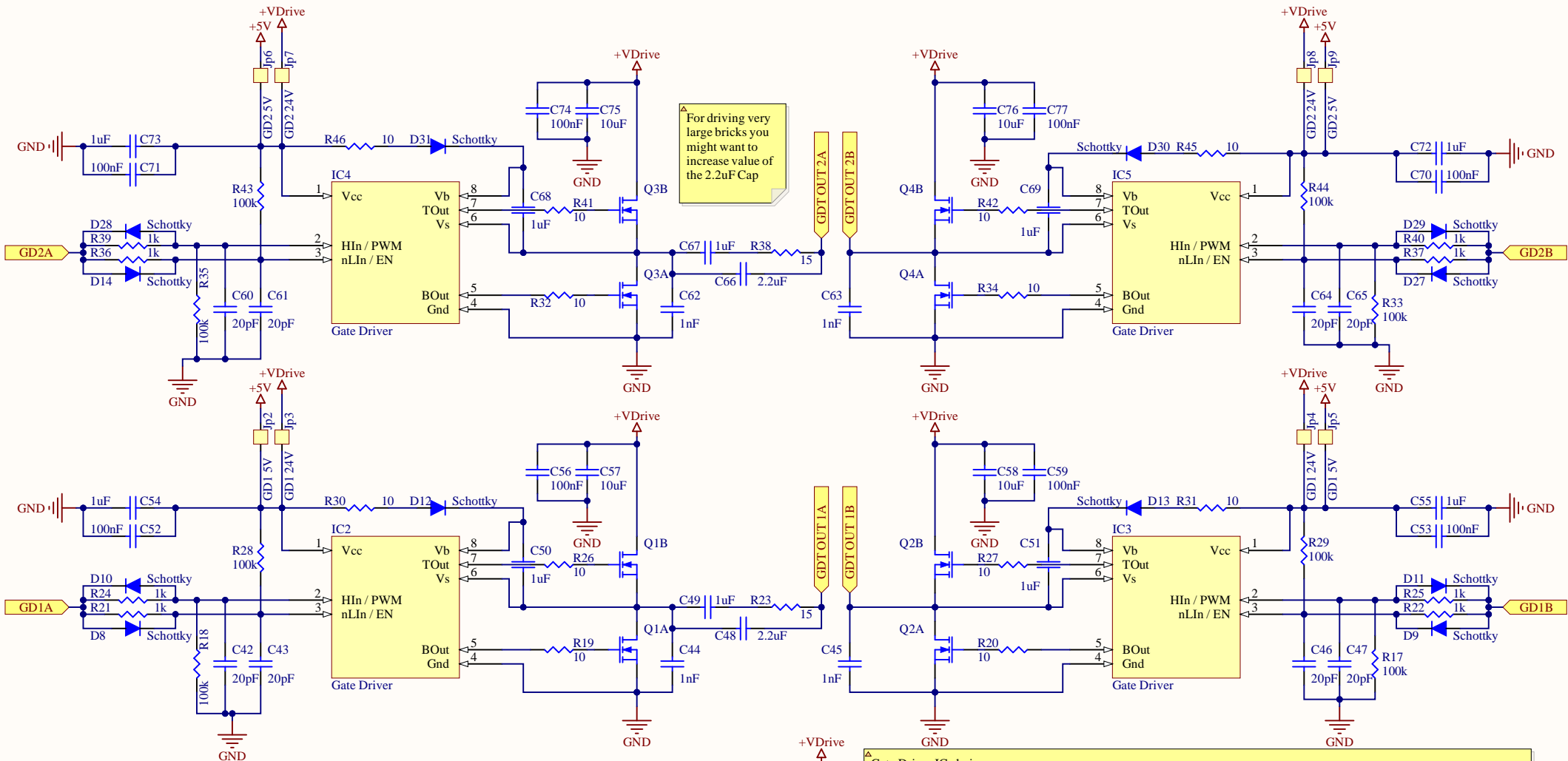
This network is for passive deadtime control of the output power mosfets. It is only necessary if you mosfets are poorly matched in terms of gate threshold voltage or you absolutely need full voltage drive on the gates.

Otherwise only populate the 1k resistor, the 6.8V Zener with a schottky, 6.8nF with 100nF and the 100 Ohm resistor

For driving very large bricks you might want to increase value of the 2.2uF Cap

Alternative part for UCC2742X is IX442X





GDT power stage current requirement calculation:

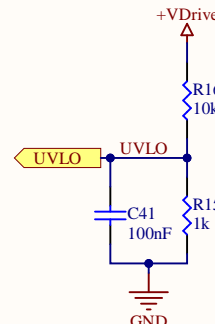
$$\text{with } I_{\text{charge}}(t) = I_{\text{ch}}(t) = \frac{U}{R} \cdot e^{-\frac{t}{\tau}} \text{ and } I_{\text{ch,rms}} = \sqrt{\frac{1}{T} \int_0^T I_{\text{ch}}^2(t) dt}$$

$$\begin{aligned} I_{\text{ch,rms}} &= \sqrt{\frac{1}{T} \int_0^T \left(\frac{U}{R} \cdot e^{-\frac{t}{\tau}} \right)^2 dt} \\ &= \sqrt{\frac{1}{T} \cdot \frac{U^2}{R^2} \int_0^T e^{-\frac{2t}{\tau}} dt} \\ &= \sqrt{\frac{U^2}{R^2 \cdot T} \cdot \left(-\frac{\tau}{2} \right) \left[e^{-\frac{2t}{\tau}} \right]_0^T} \\ &= \sqrt{\frac{U^2 \cdot \tau}{2 \cdot R^2 \cdot T} \cdot \left(e^{-\frac{2T}{\tau}} - e^{-\frac{2 \cdot 0}{\tau}} \right)} \end{aligned}$$

$$\begin{aligned} \text{with } T \gg \tau &= \sqrt{\frac{U^2 \cdot \tau}{2 \cdot R^2 \cdot T} \cdot (0 - 1)} \\ &= \sqrt{\frac{U^2 \cdot \tau}{2 \cdot R^2 \cdot T}} \end{aligned}$$

Mosfet Selection:
You can more or less use any dual N-Fet you can find. I do however recommend you stay at less than 0.5W dissipation per mosfet.

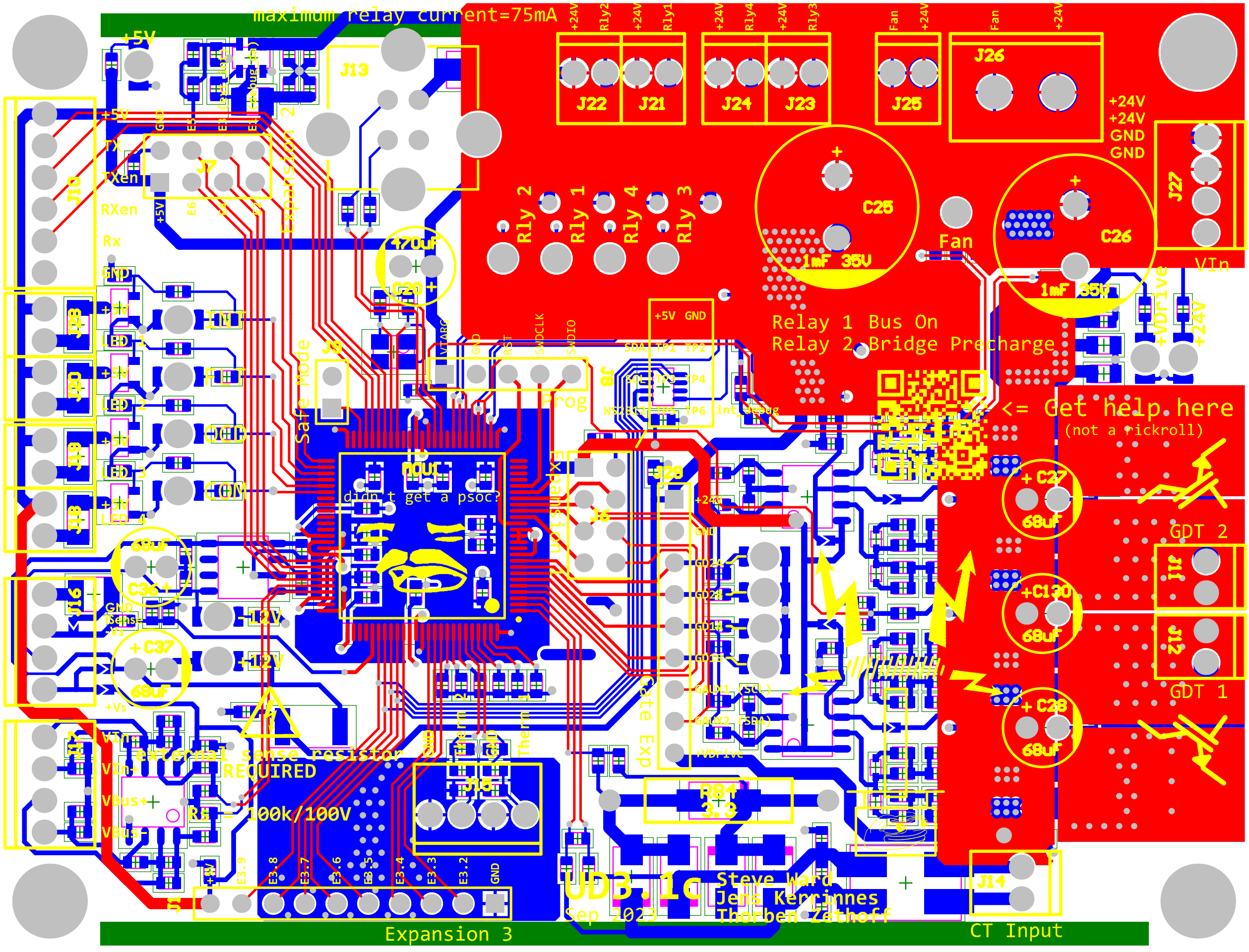
If you don't want to calculate anything (which I totally understand :P) you should go with <50mOhm Rds,on.



Gate Driver IC choice:
You can use most of the Bootstrap drivers available on LCSC. Just make sure that you have:
-either one inverting low input and a not inverting high input OR
-a PWM input

Depending on the chosen Part you will need to fit different support components:
- When the Part doesn't have built in deadtime you will need to fit the schottky diodes as well as capacitors to ground on the input lines
-When using parts with a pwm input you have to omit the resistor between the input signal and the enable input of the driver.

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maximum relay current=75mA

+24V Rly2 +24V Rly1 +24V Rly4 +24V Rly3

Fan +24V Fan +24V

+24V
+24V
GND
GND

+24V
+VDrive
+24V

J22 J21

J24 J23

J25

J26

J27

470uF
C20

C25
1mF 35V

C26
1mF 35V

Relay 1 Bus On
Relay 2 Bridge Precharge

<= Get help here
(not a rickroll)

didn't get a psoc?

+ C27
68uF

+ C130
68uF

+ C28
68uF

GDT 2
1uF

GDT 1
2uF

68uF
C36

+ C37
68uF

external sense resistor
REQUIRED

R8 = 100k/100V

Gate Exp

6ANV1 (SCL)
6ANV2 (SDA)
+VDrive

R84
3.3

UD3.1C Steve Ward
Jens Kernnnes
Thorben Zethoff
Sep 2023

Expansion 3

CT Input