Projecte EDD-Llums

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Eines de Disseny
2024/2025

Diagrama de blocs

De què tracta el projecte?

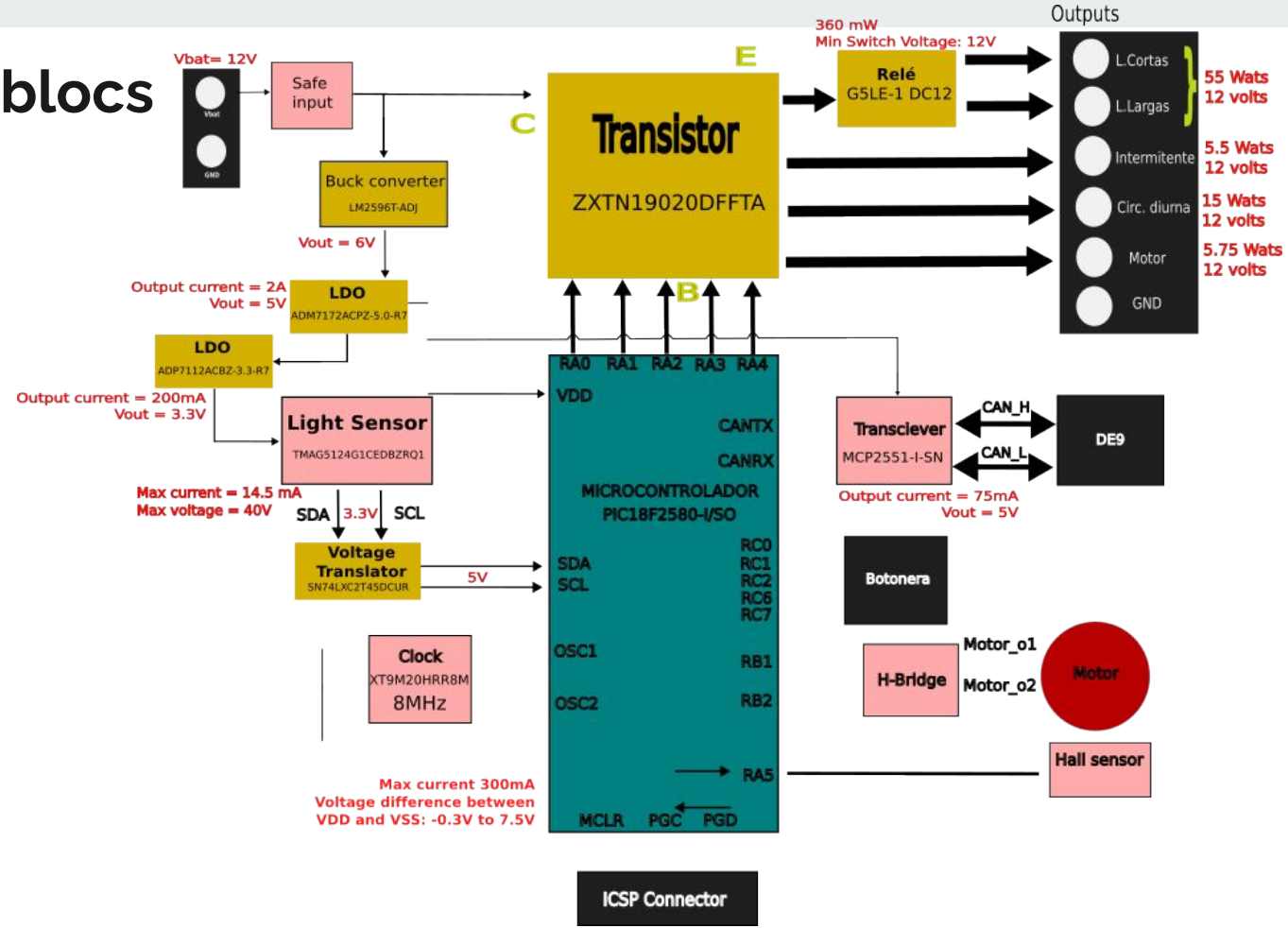
Disseny del sistema de control d'il·luminació d'un cotxe mitjançant un microcontrolador.

Requisits del projecte

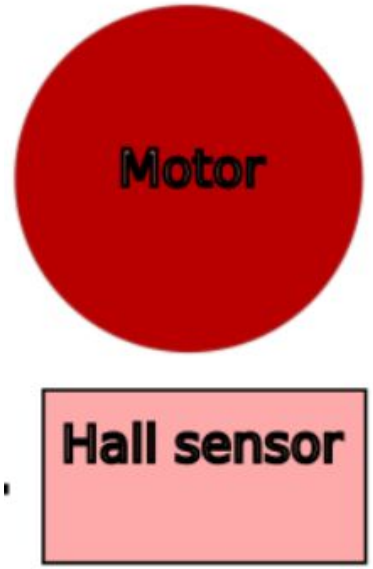
Parts clau del diagrama:

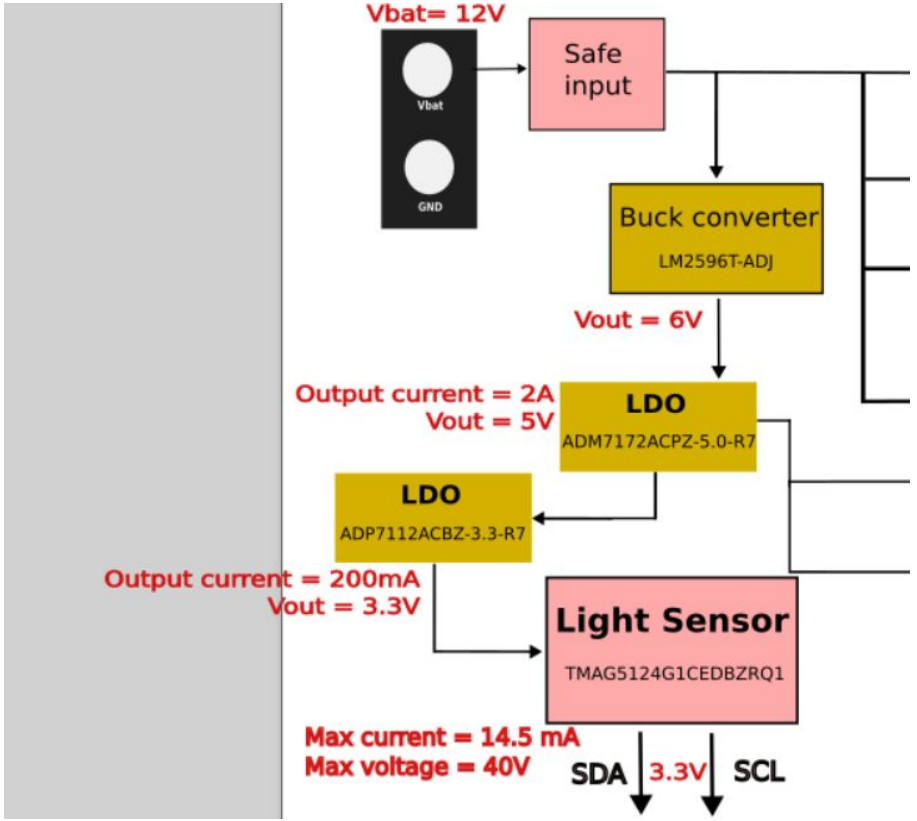
- Llums de carretera.
- Llums d'encreuament.
- Llums de circulació diürna.
- Intermitents
- Motor escombreta neteja-fars.
- Sensor digital de llum, per activar les llums.

Diagrama de blocs

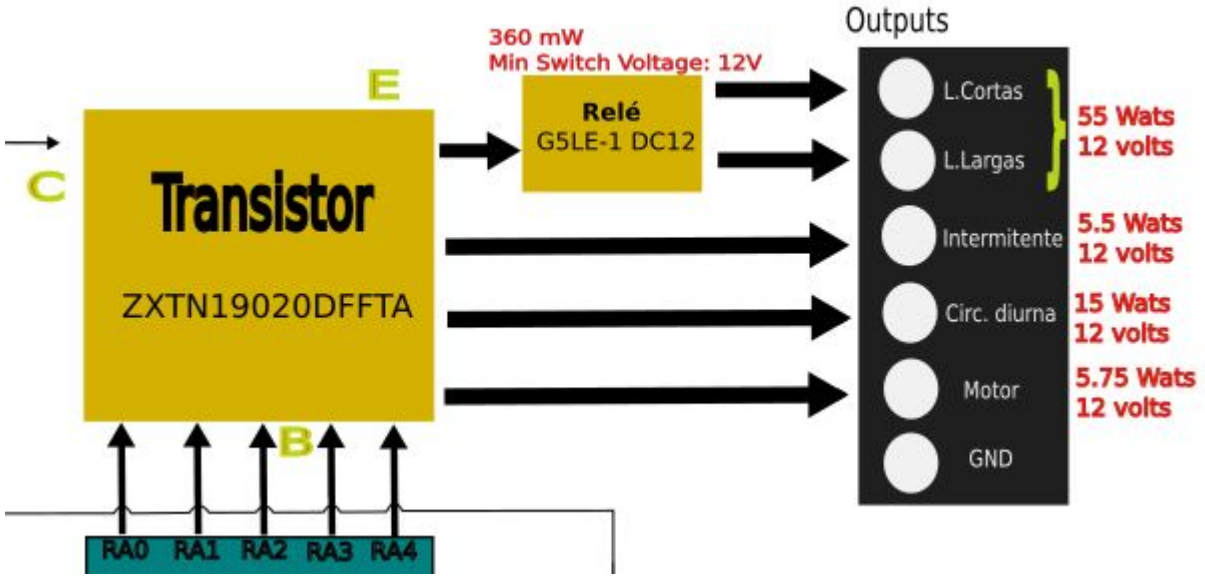


Inputs

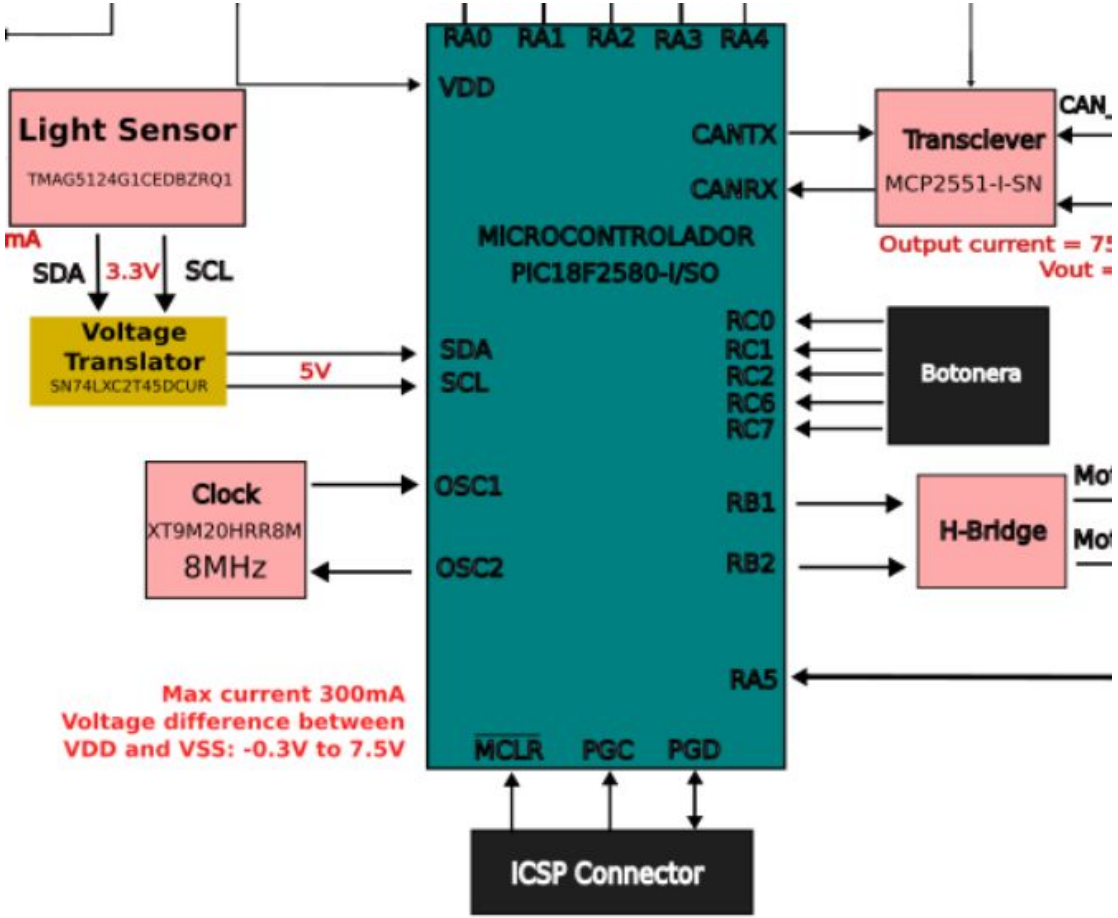

Motor
Hall sensor


Vbat= 12V
Vbat
GND
Safe input
Buck converter
LM2596T-ADJ
Vout = 6V
Output current = 2A
Vout = 5V
LDO
ADM7172ACPZ-5.0-R7
LDO
ADP7112ACBZ-3.3-R7
Output current = 200mA
Vout = 3.3V
Light Sensor
TMAG5124G1CEDBZRQ1
Max current = 14.5 mA
Max voltage = 40V
SDA
3.3V
SCL

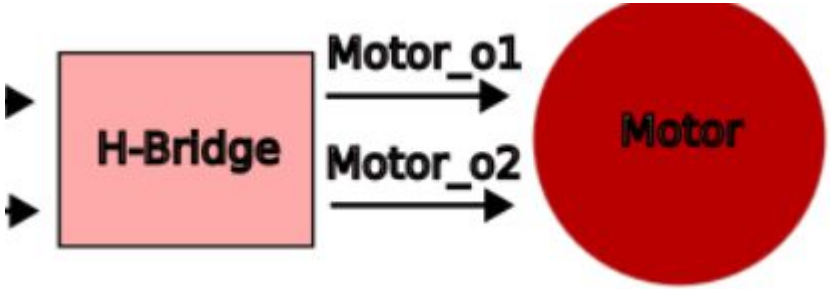
Output selection stage



Microcontrolador

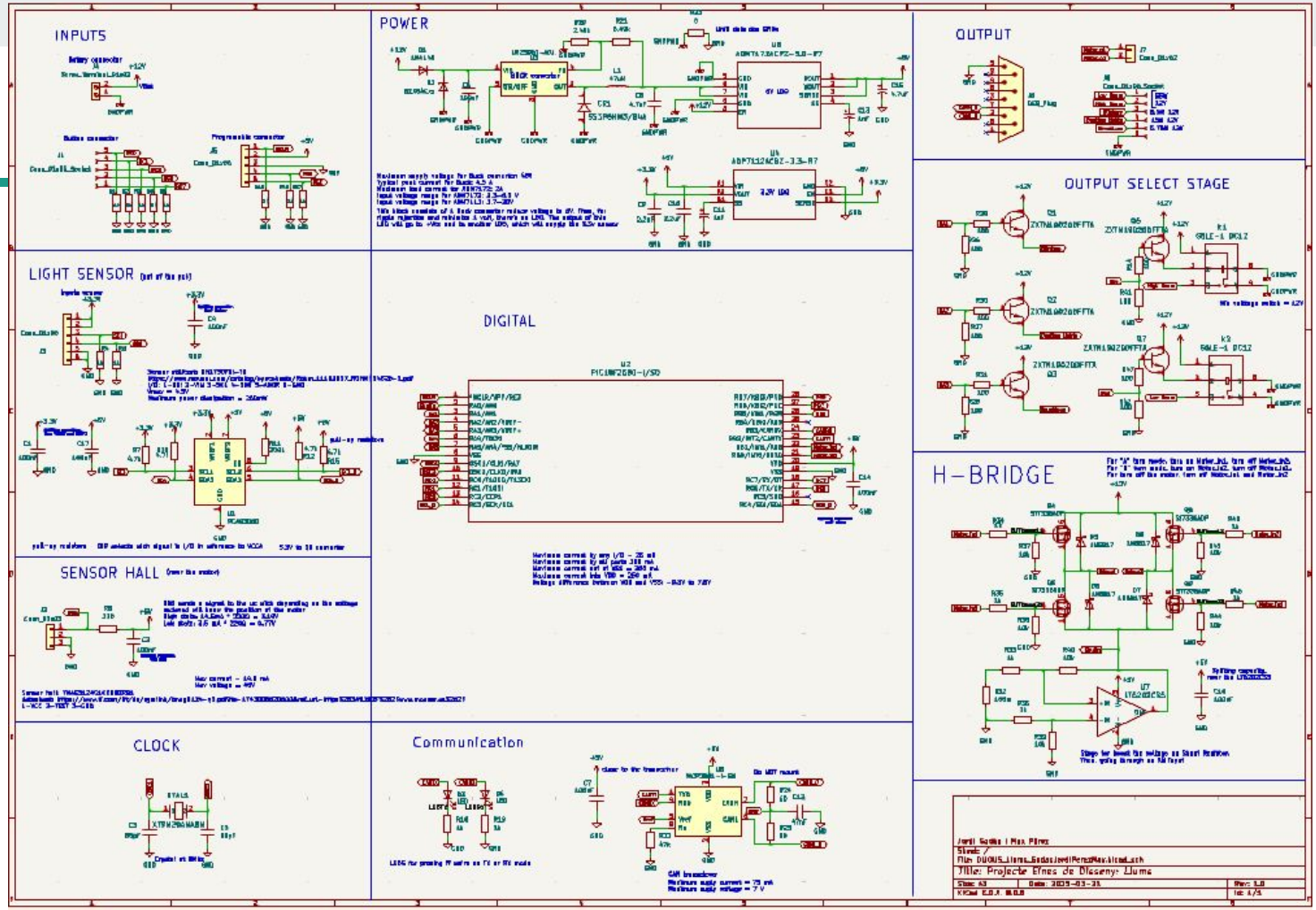


Outputs

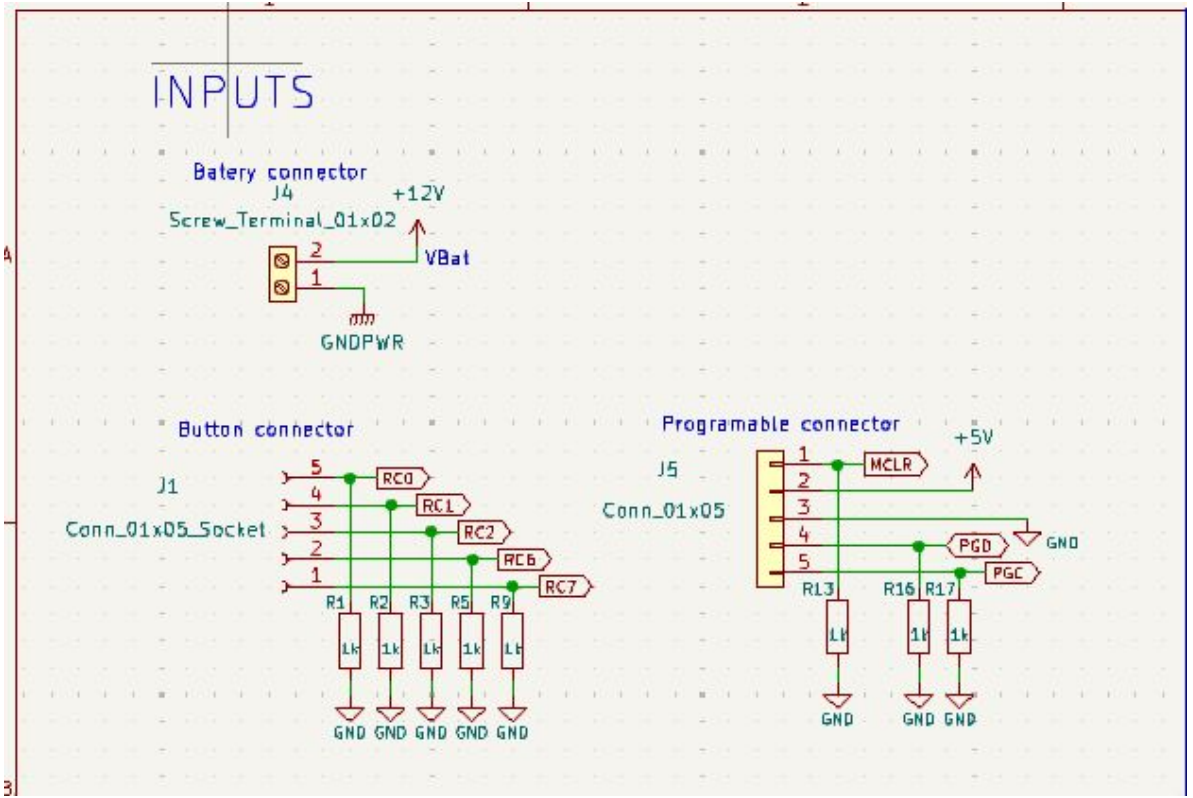

H-Bridge
Motor_o1
Motor_o2
Motor


Outputs
L.Cortas
L.Largas
Intermitente
Circ. diurna
Motor
GND
55 Wats
12 volts
5.5 Wats
12 volts
15 Wats
12 volts
5.75 Wats
12 volts

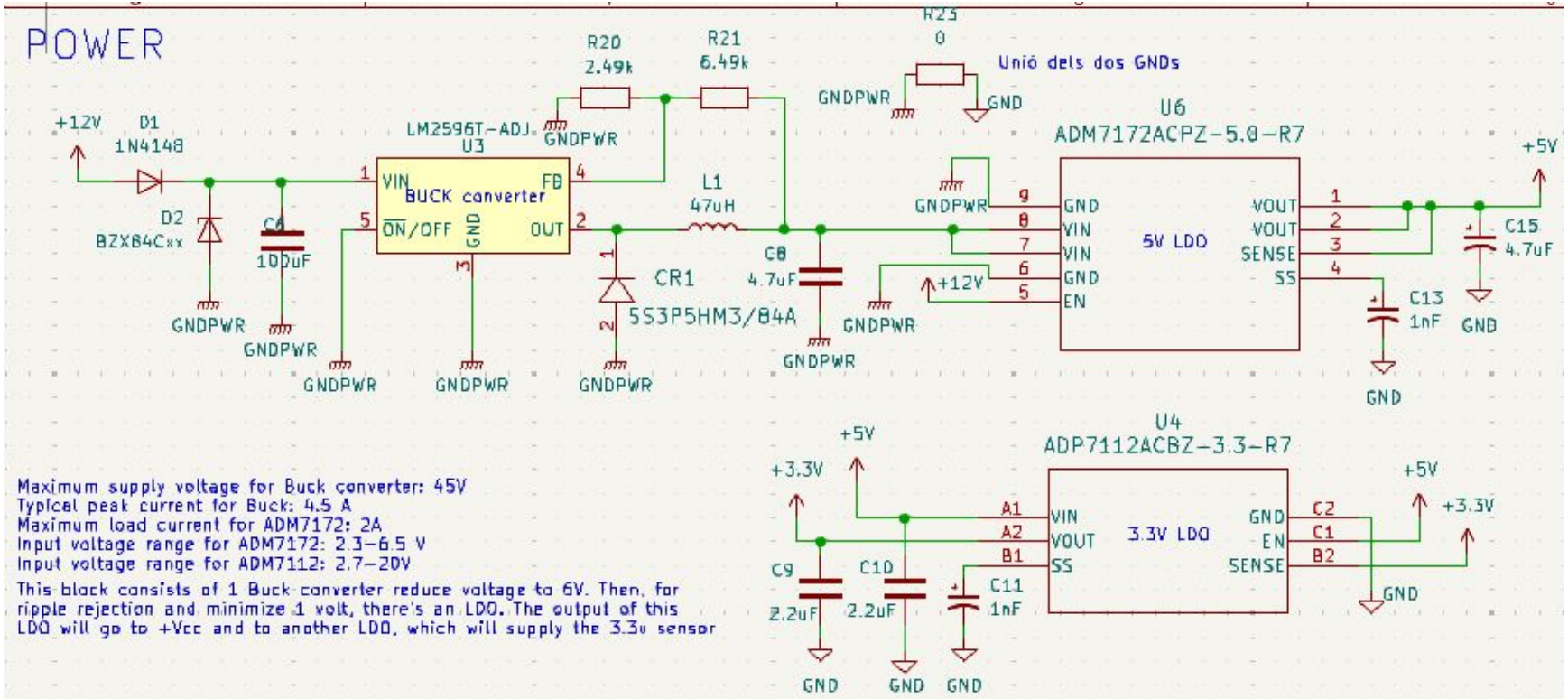
Esquemàtic


INPUTS
POWER
OUTPUT
OUTPUT SELECT STAGE
LIGHT SENSOR
DIGITAL
H-BRIDGE
SENSOR HALL
CLOCK
Communication

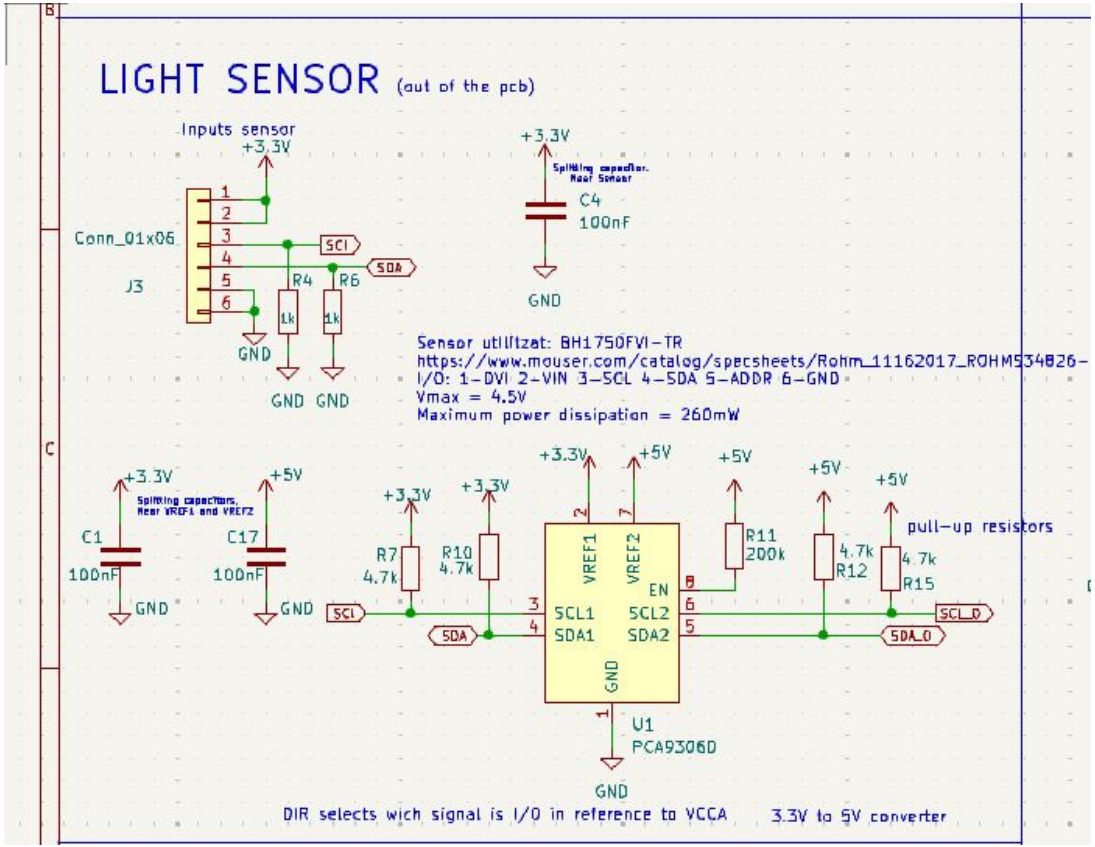
Inputs


INPUTS
Batery connector
J4
Screw_Terminal_01x02
+12V
VBat
2
1
GNDPWR
Button connector
J1
Conn_01x05_Socket
5
4
3
2
1
RC0
RC1
RC2
RC6
RC7
R1
R2
R3
R5
R9
1k
GND GND GND GND GND
Programable connector
J5
Conn_01x05
+5V
MCLR
PGD
PGC
GND
R13
R16
R17
1k
GND GND GND

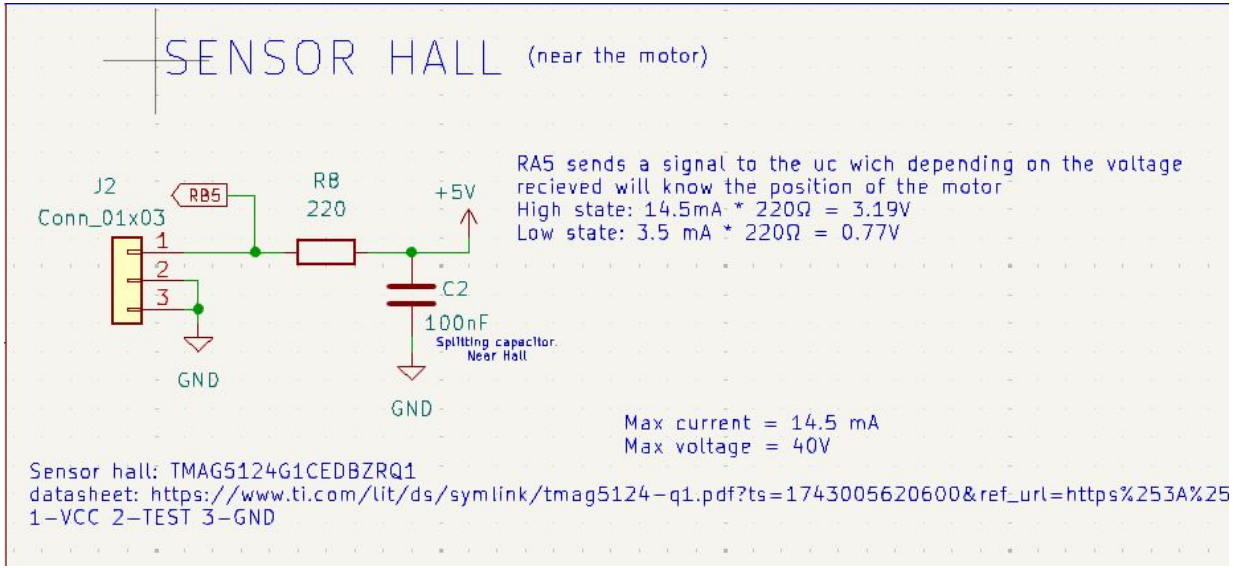
Power

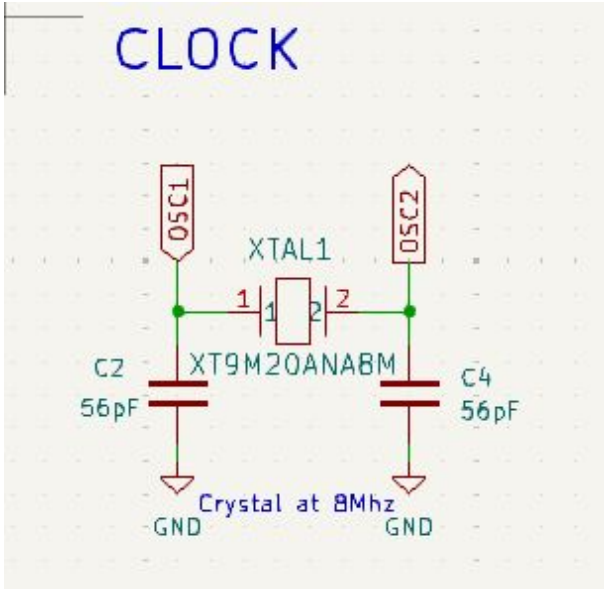

POWER
+12V
D1
1N4148
D2
BZX84Cxx
C6
100uF
GNDPWR
R20
2.49k
R21
6.49k
LM2596T-ADJ
U3
VIN
BUCK converter
FB
ON/OFF
GND
OUT
L1
47uH
CR1
SS3P5HM3/84A
C8
4.7uF
R23
0
Unió dels dos GNDs
U6
ADM7172ACPZ-5.0-R7
5V LDO
GND
VIN
EN
VOUT
SENSE
SS
+5V
C15
4.7uF
C13
1nF
+12V
U4
ADP7112ACBZ-3.3-R7
3.3V LDO
+3.3V
C9
2.2uF
C10
2.2uF
C11
1nF
C2
C1
B2
B1
A1
A2
Maximum supply voltage for Buck converter: 45V
Typical peak current for Buck: 4.5 A
Maximum load current for ADM7172: 2A
Input voltage range for ADM7172: 2.3-6.5 V
Input voltage range for ADM7112: 2.7-20V
This block consists of 1 Buck converter reduce voltage to 6V. Then, for ripple rejection and minimize .1 volt, there's an LDO. The output of this LDO will go to +Vcc and to another LDO, which will supply the 3.3v sensor

Light Sensor

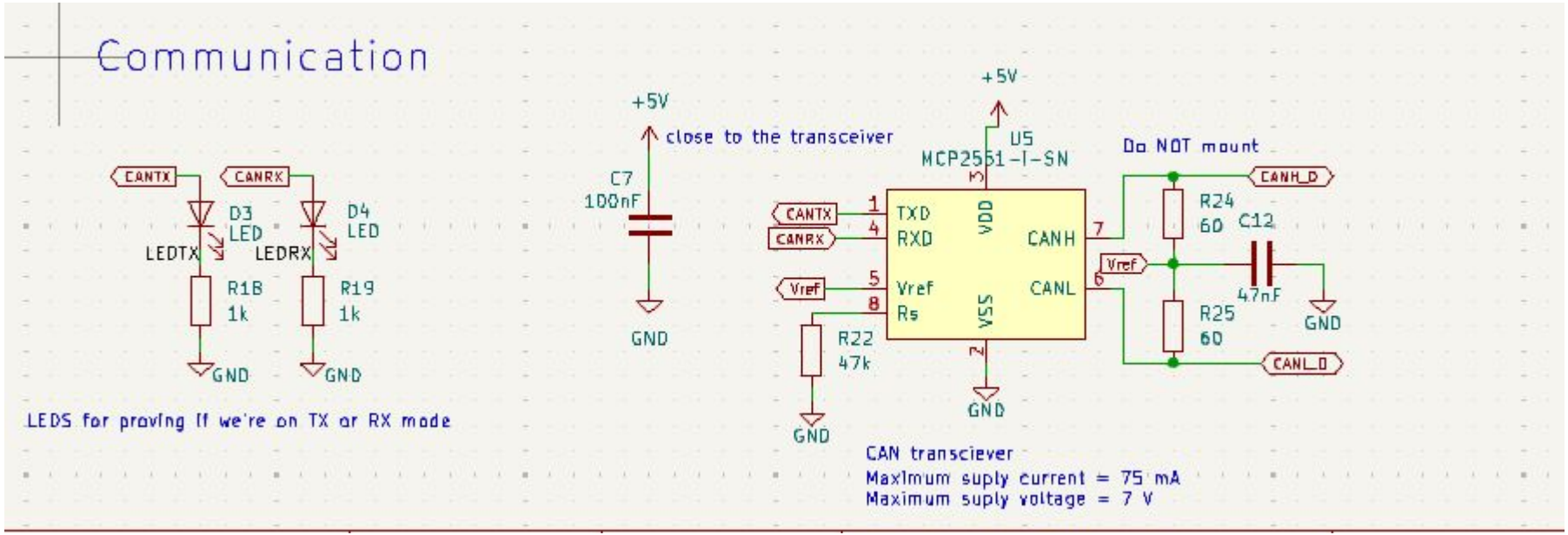


Sensor Hall i Clock

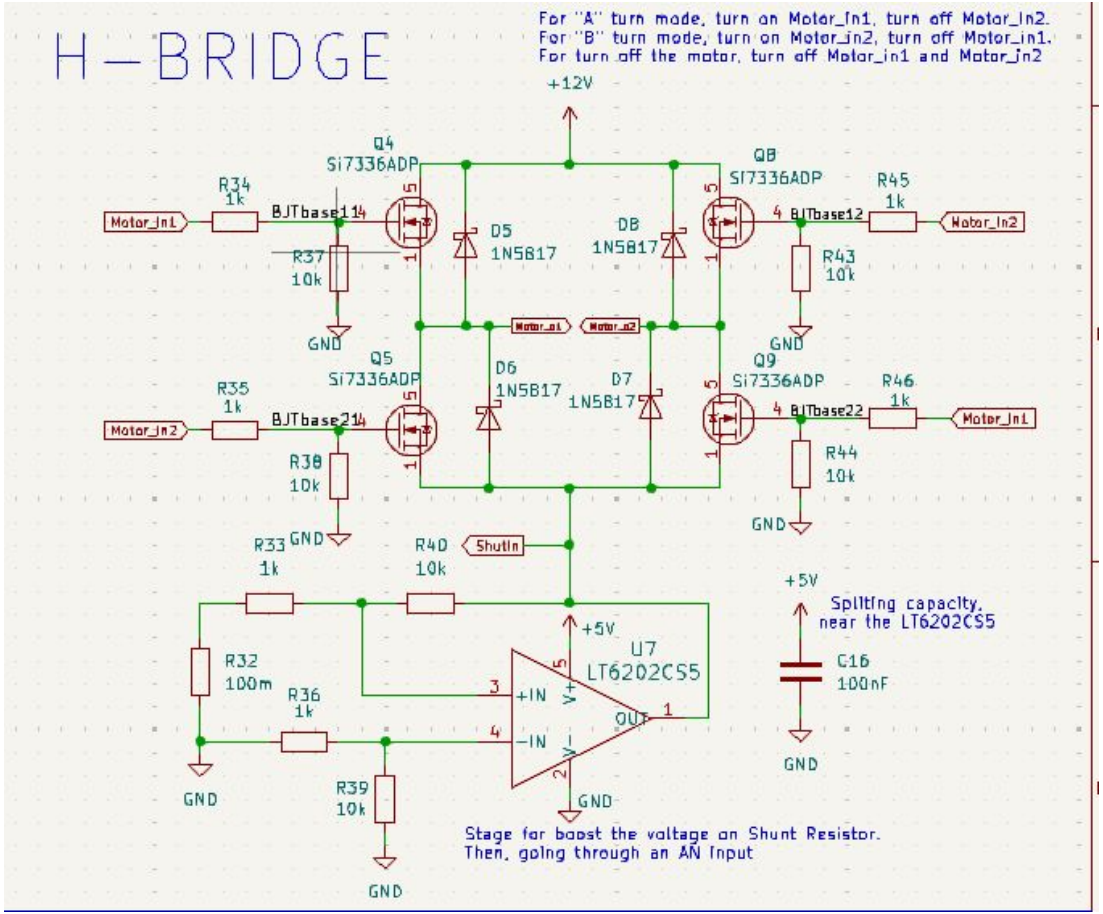




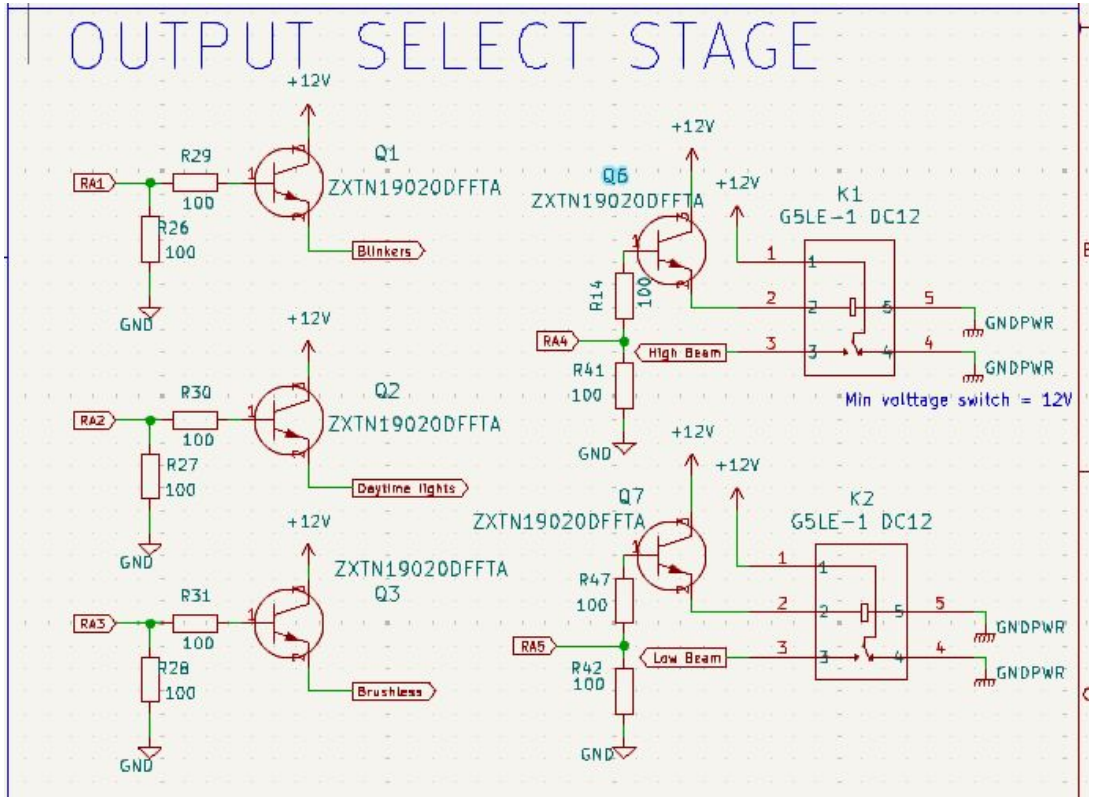
Transceiver i leds



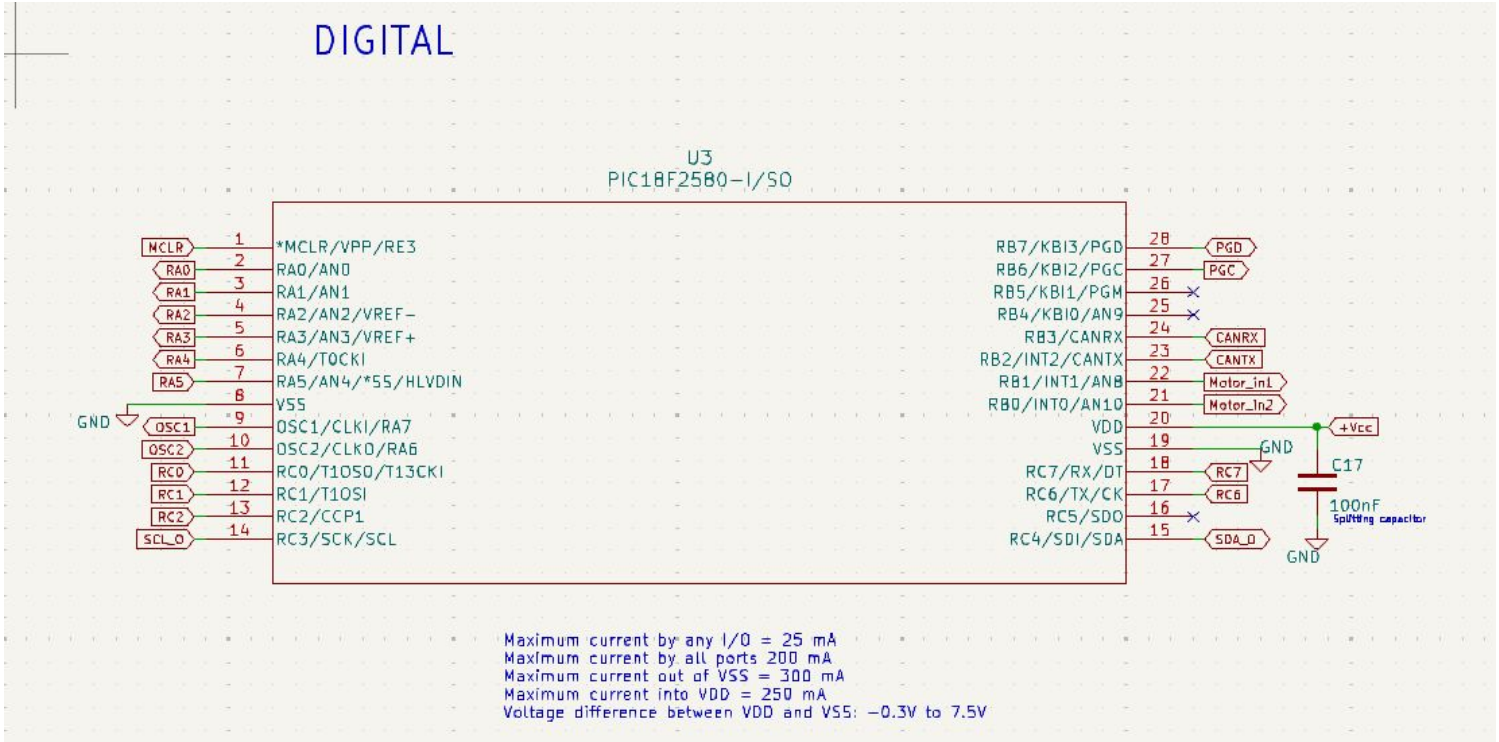
H-bridge


H—BRIDGE
For "A" turn mode, turn on Motor_in1, turn off Motor_in2.
For "B" turn mode, turn on Motor_in2, turn off Motor_in1.
For turn off the motor, turn off Motor_in1 and Motor_in2
+12V
Q4
Si7336ADP
Q8
Si7336ADP
Q5
Si7336ADP
Q9
Si7336ADP
R34
1k
R35
1k
R45
1k
R46
1k
R37
10k
R38
10k
R43
10k
R44
10k
R33
1k
R40
10k
R32
100m
R36
1k
R39
10k
D5
1N5817
D6
1N5817
D7
1N5817
D8
1N5817
Motor_in1
Motor_in2
BJTbase11
BJTbase21
BJTbase12
BJTbase22
Motor_o1
Motor_o2
ShutIn
GND
+5V
U7
LT6202CS5
+IN
-IN
OUT
V+
V-
Spliting capacity,
near the LT6202CS5
C16
100nF
Stage for boost the voltage on Shunt Resistor.
Then, going through an AN Input

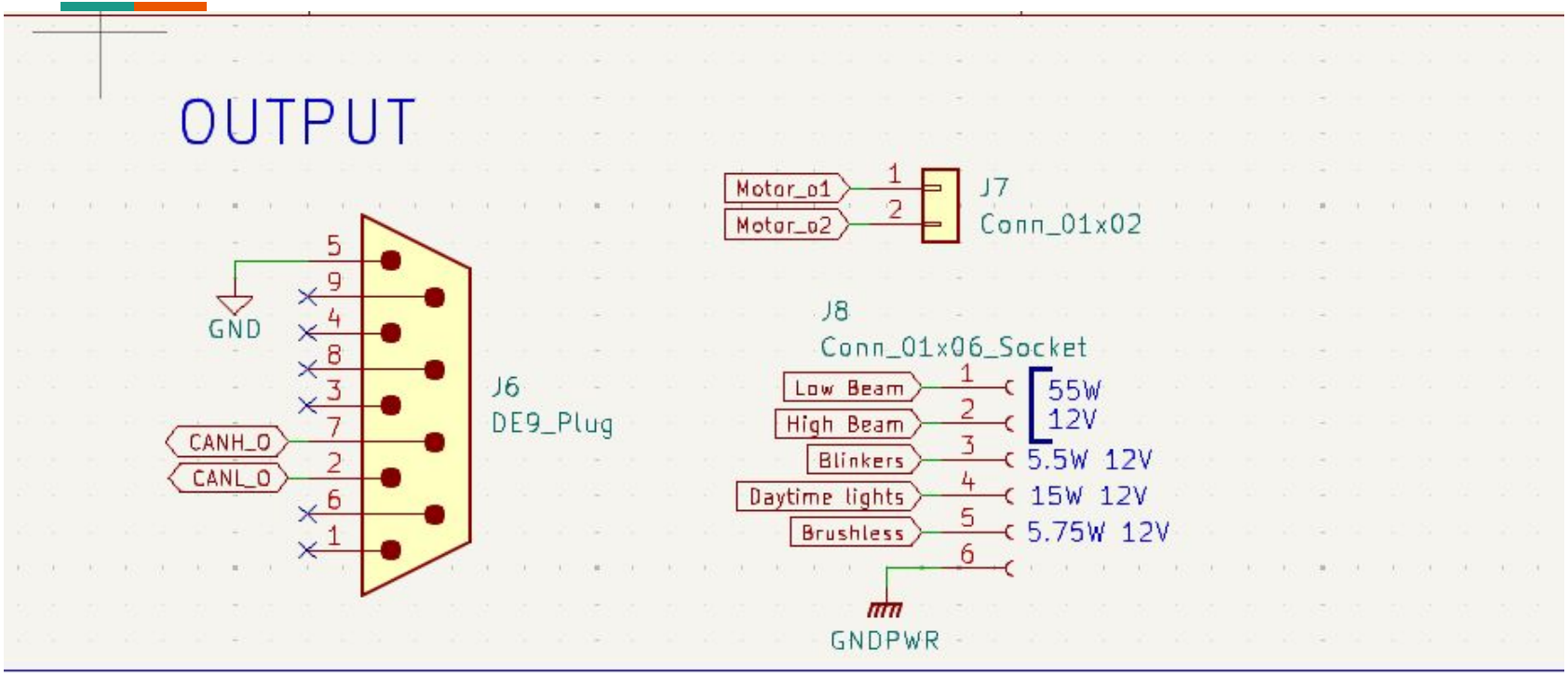
Output select stage



Microcontrolador



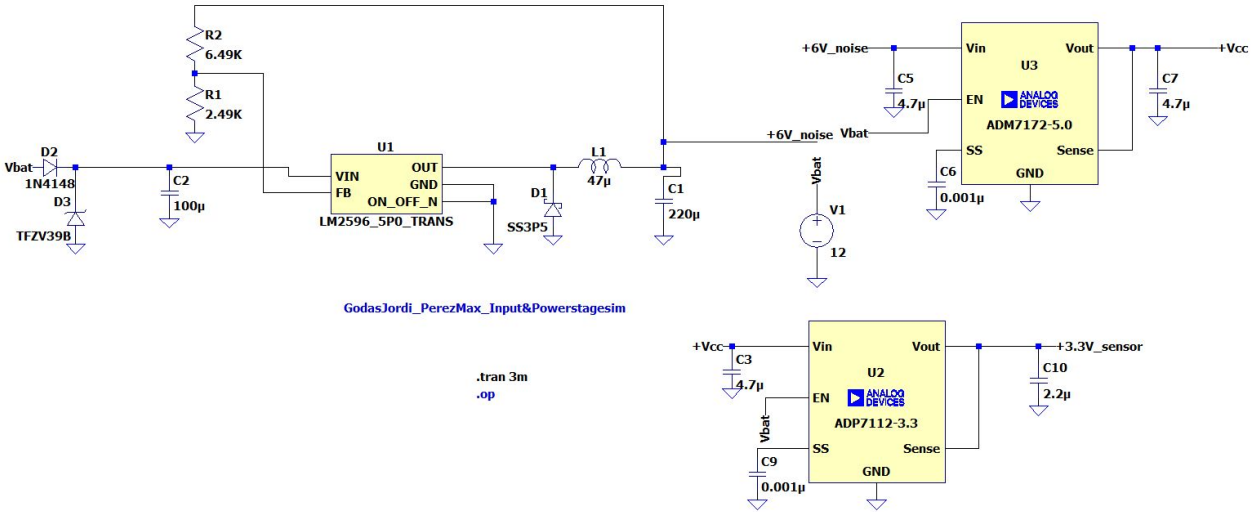
Outputs


OUTPUT
Motor_o1
Motor_o2
1
2
J7
Conn_01x02
J8
Conn_01x06_Socket
Low Beam
High Beam
Blinkers
Daytime lights
Brushless
1
2
3
4
5
6
55W
12V
5.5W 12V
15W 12V
5.75W 12V
GNDPWR
5
9
4
8
3
7
2
6
1
GND
CANH_O
CANL_O
J6
DE9_Plug

Simulacions

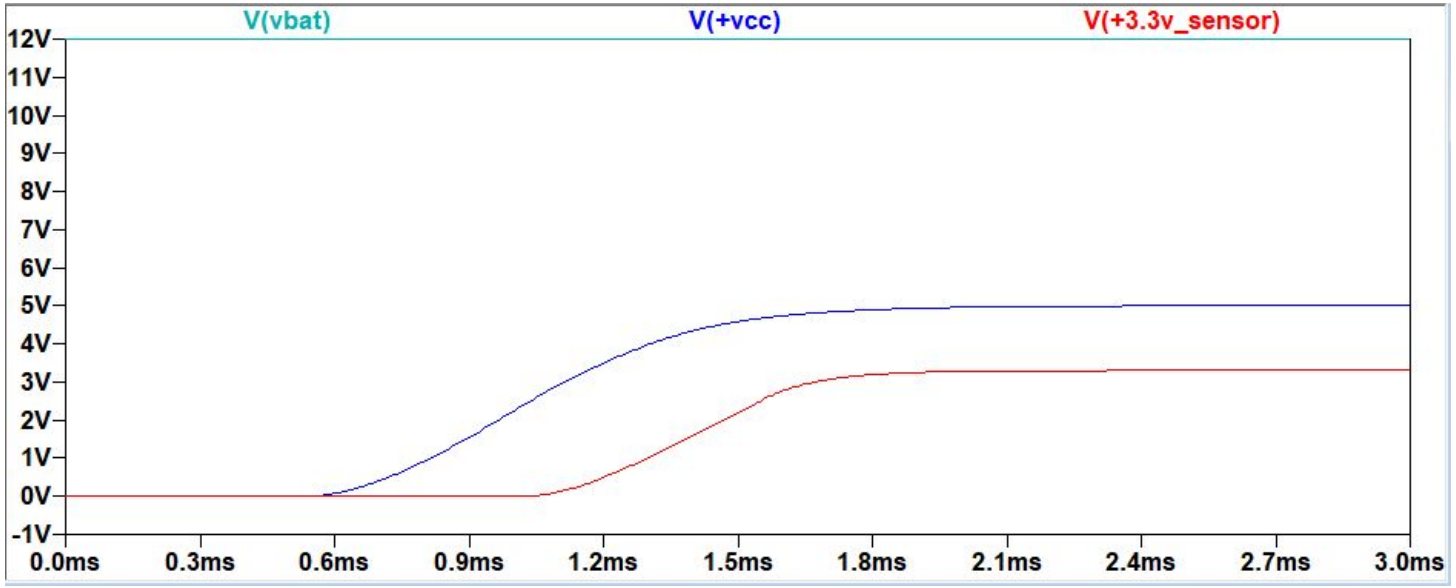
Power stage

Ripple LM2596:



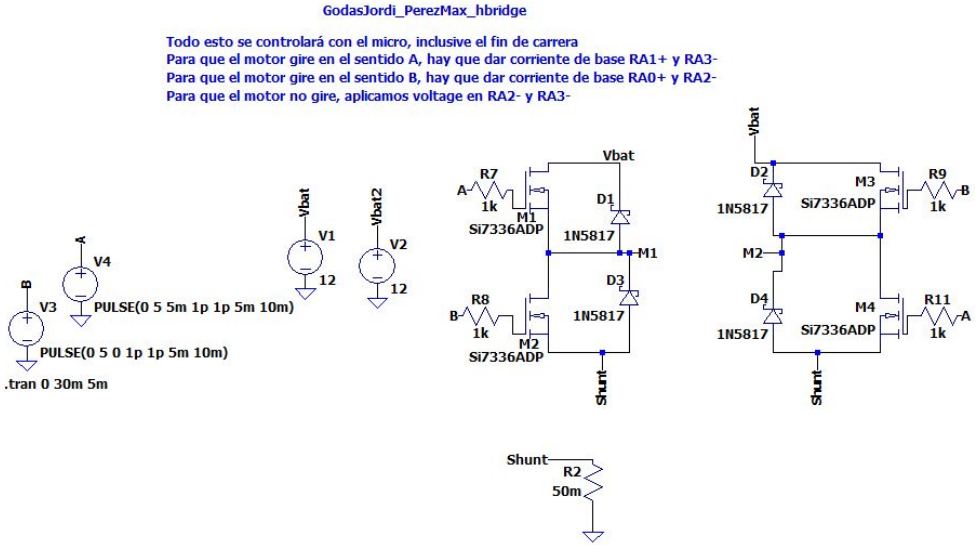
Etapa de potència

Power stage



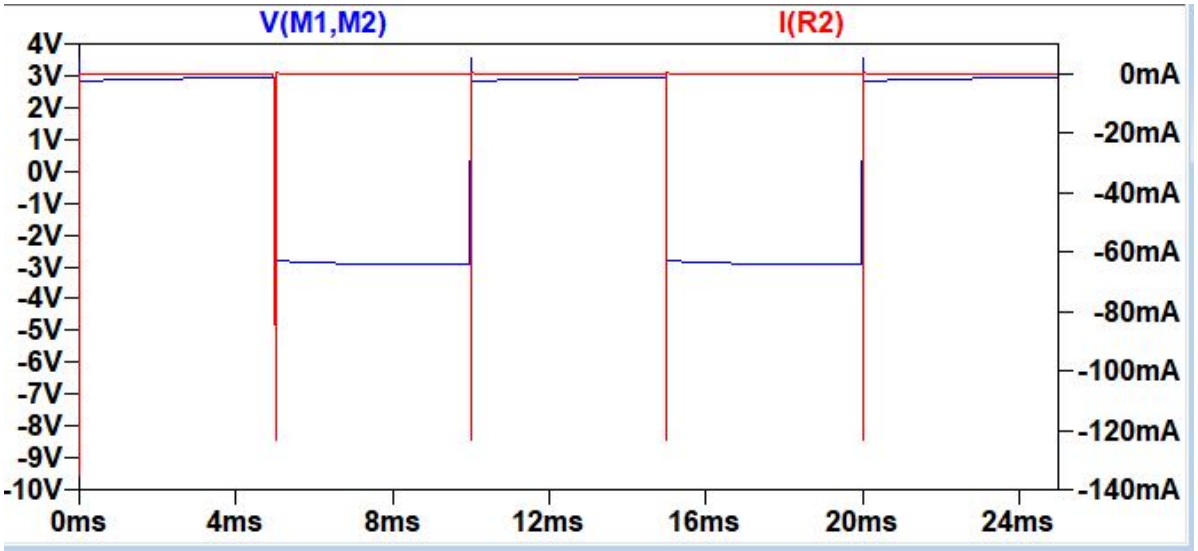
Representació gràfica dels diferents voltatges de l'etapa de potència en funció del temps

H-Bridge



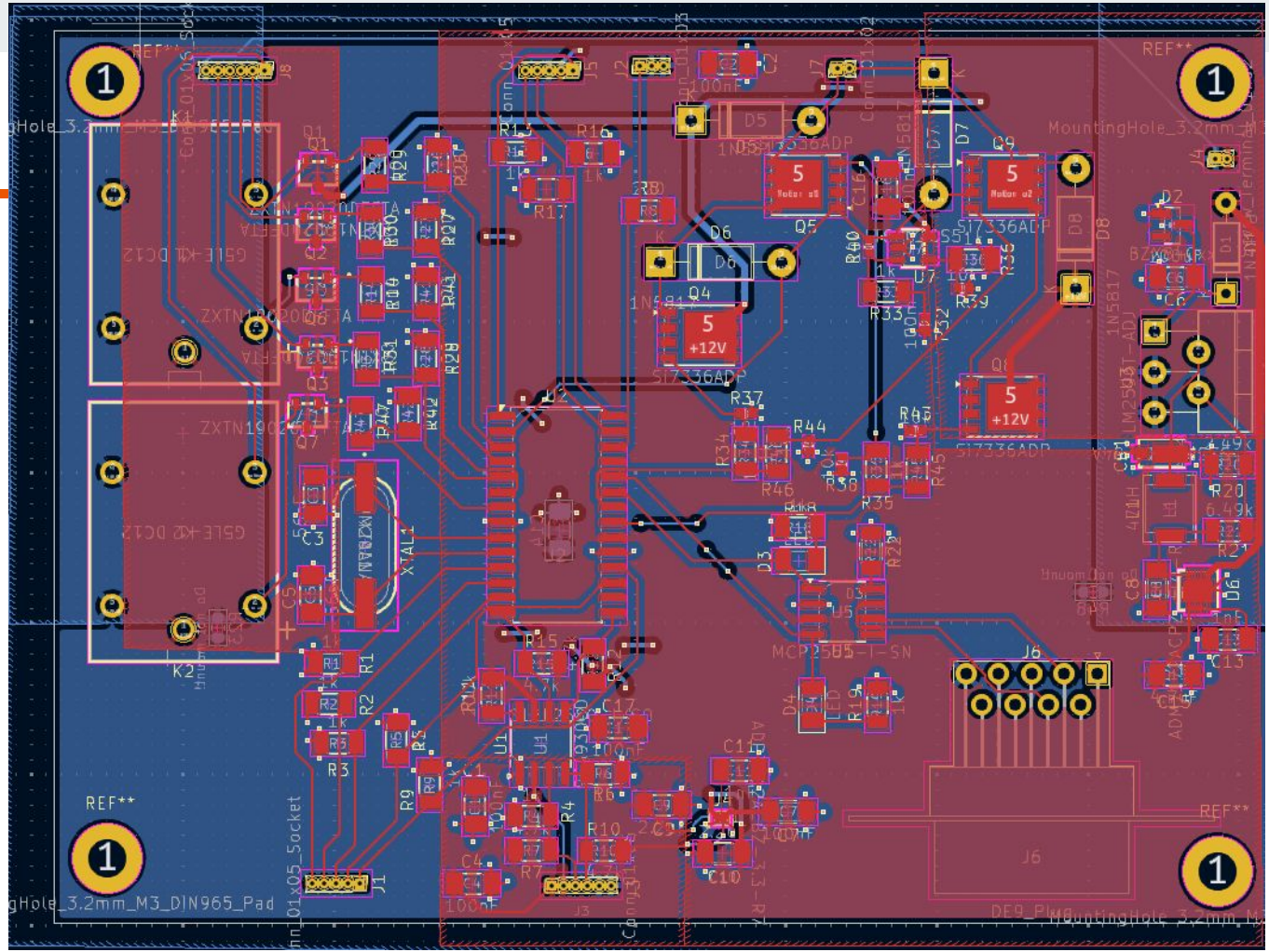
Pont H per controlar el sentit de gir del motor i final de carrera

H-Bridge

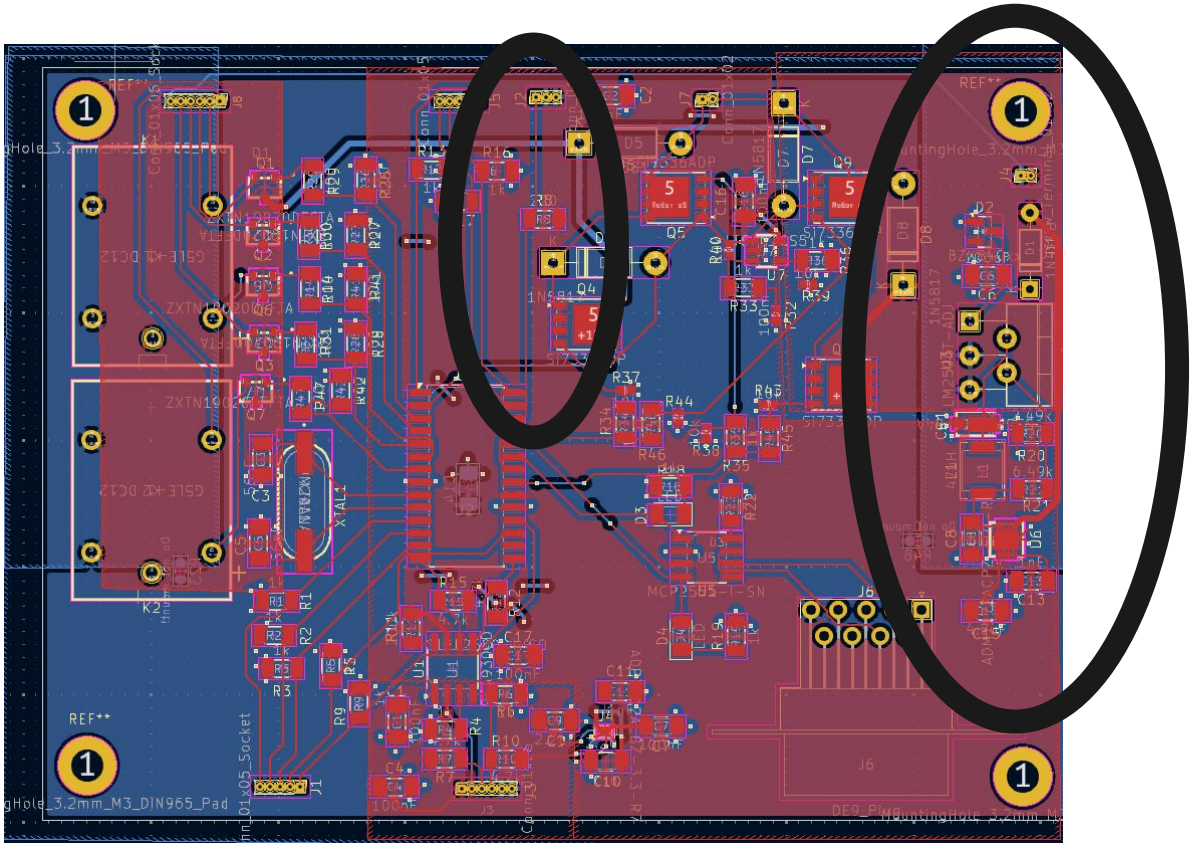


Representació gràfica dels voltatges en el Pont H i corrent resistència Shunt

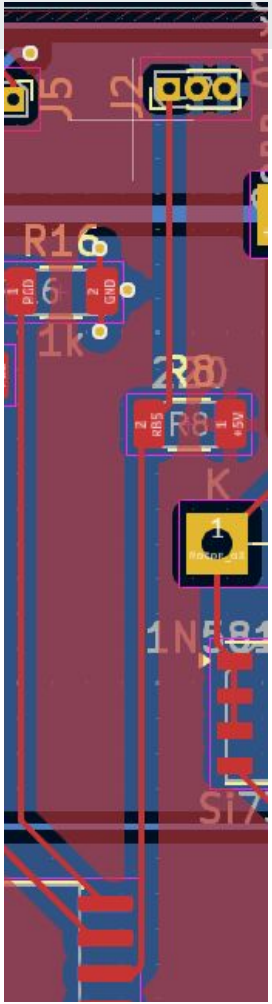
Layout

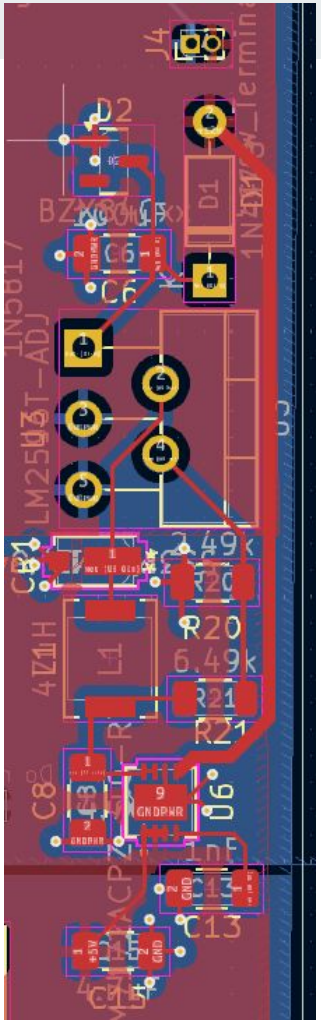

REF**
MountingHole_3.2mm_M3_DIN965_Pad
SI7336ADP
MCP2515-I-SN
XTAL1
J1
J6
K2

Power i Sensor Hall

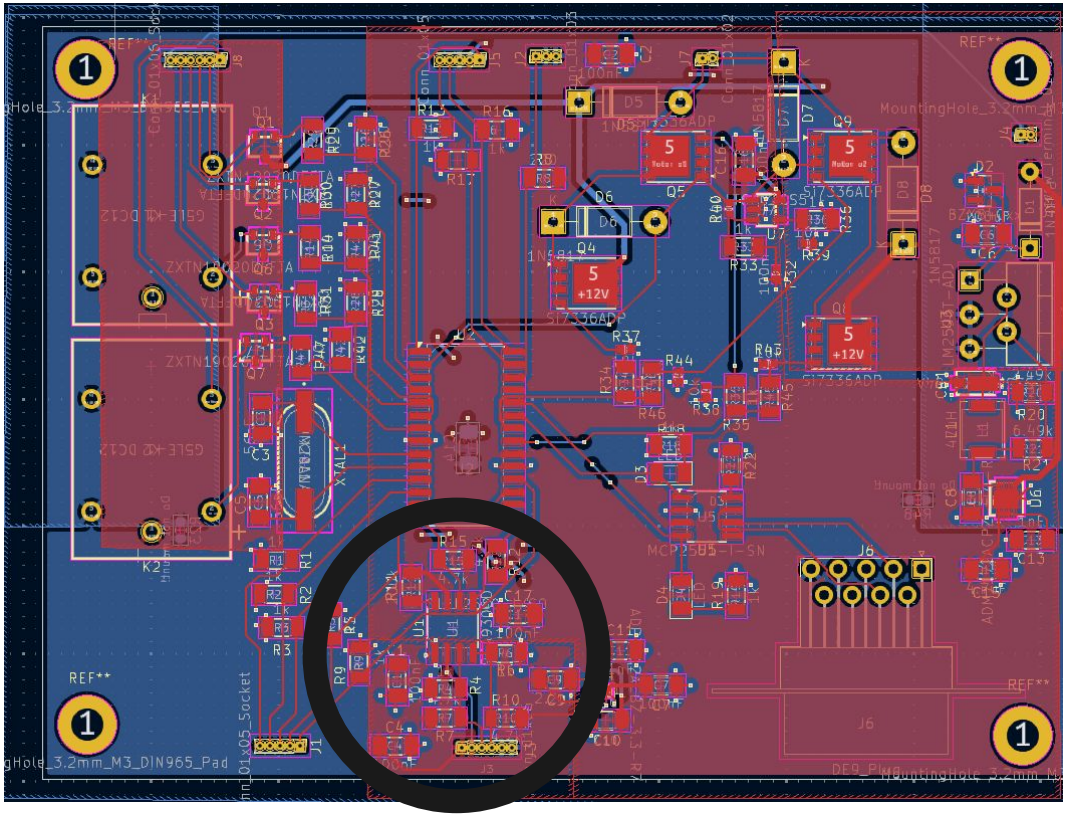


Power i Sensor Hall

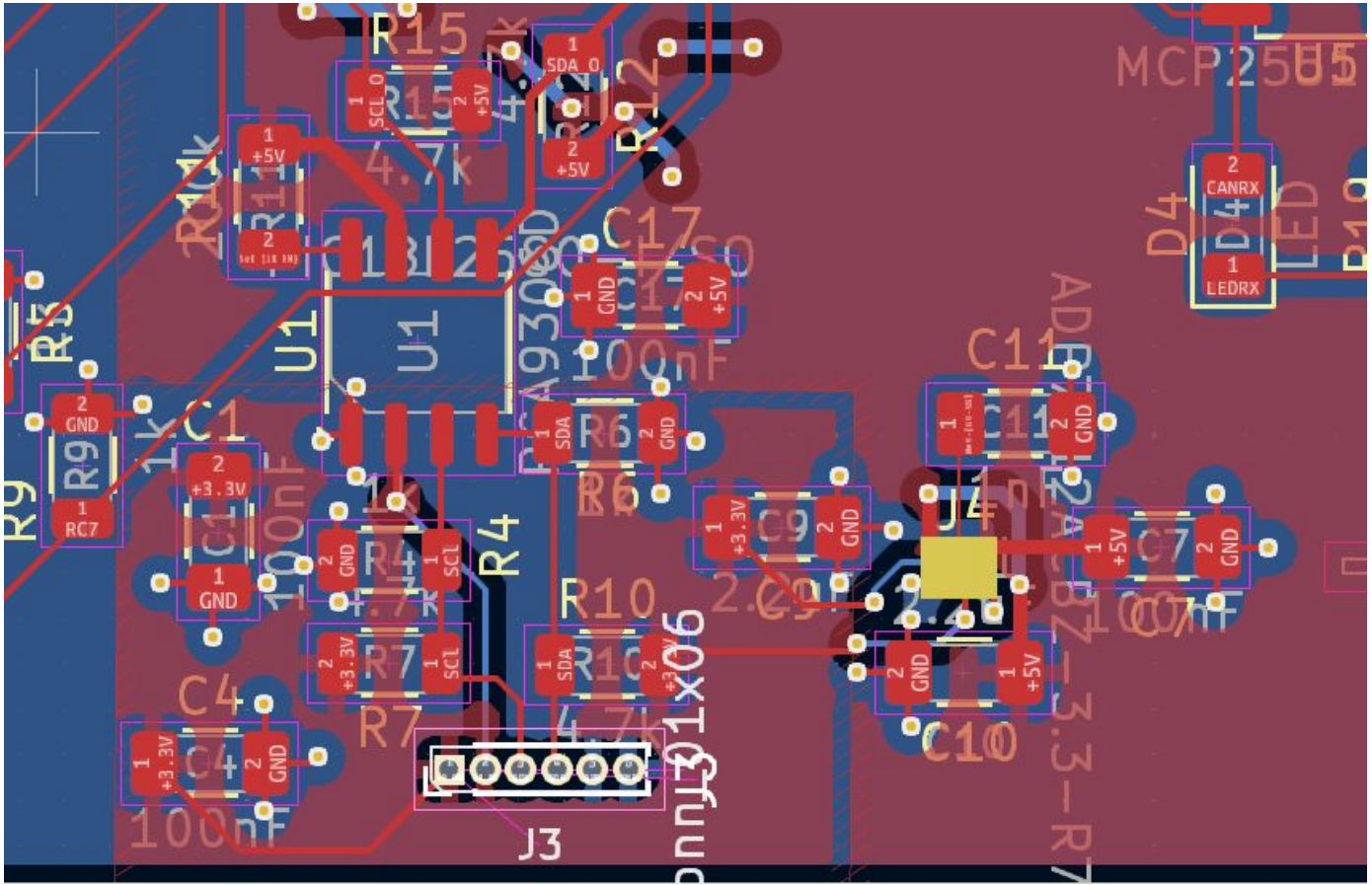




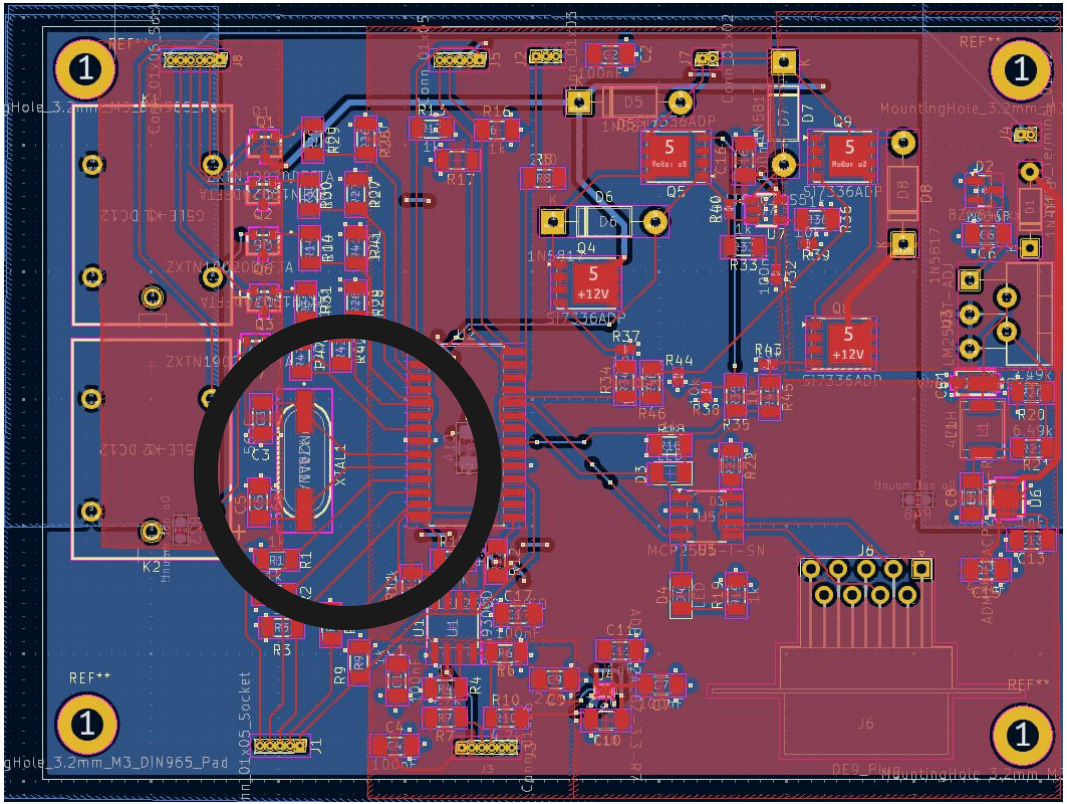
Light Sensor



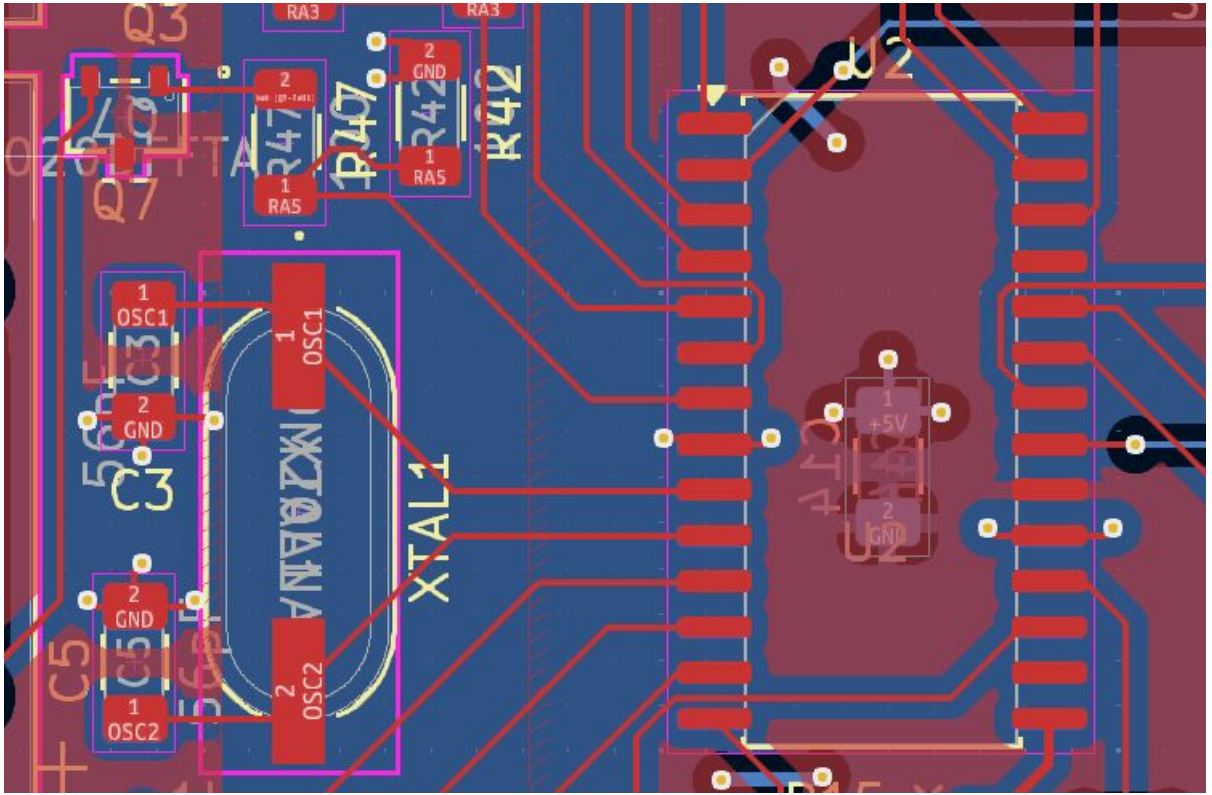
Light Sensor



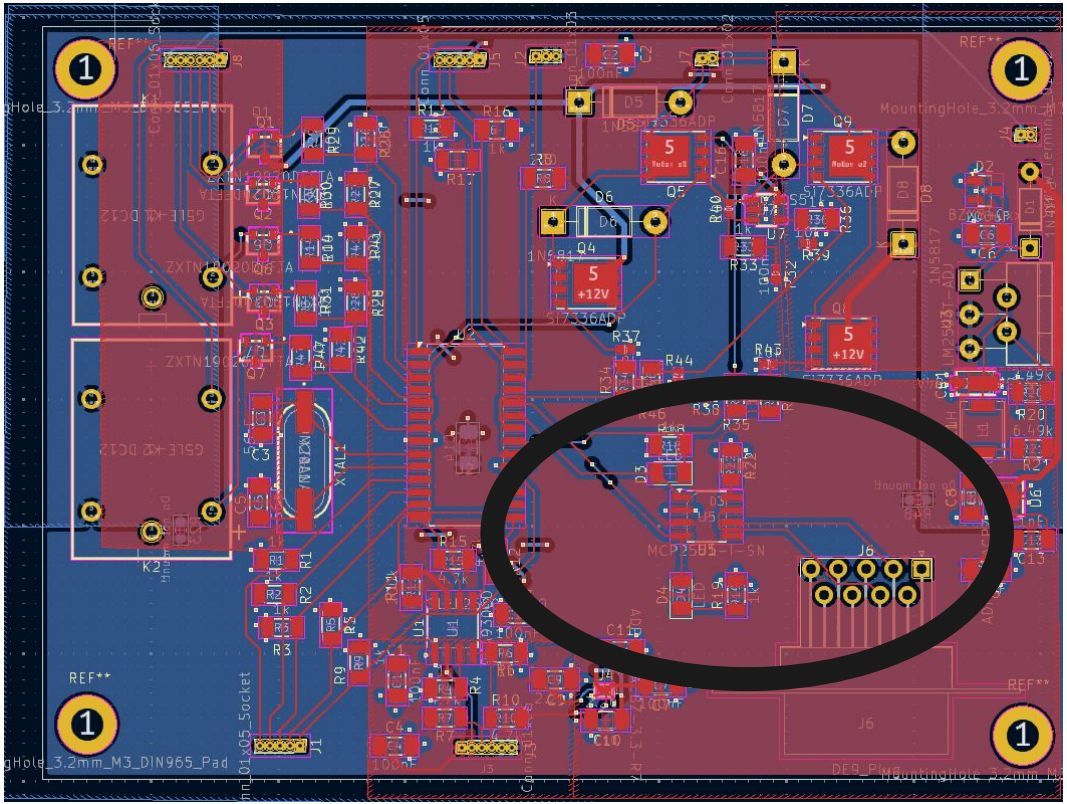
Clock



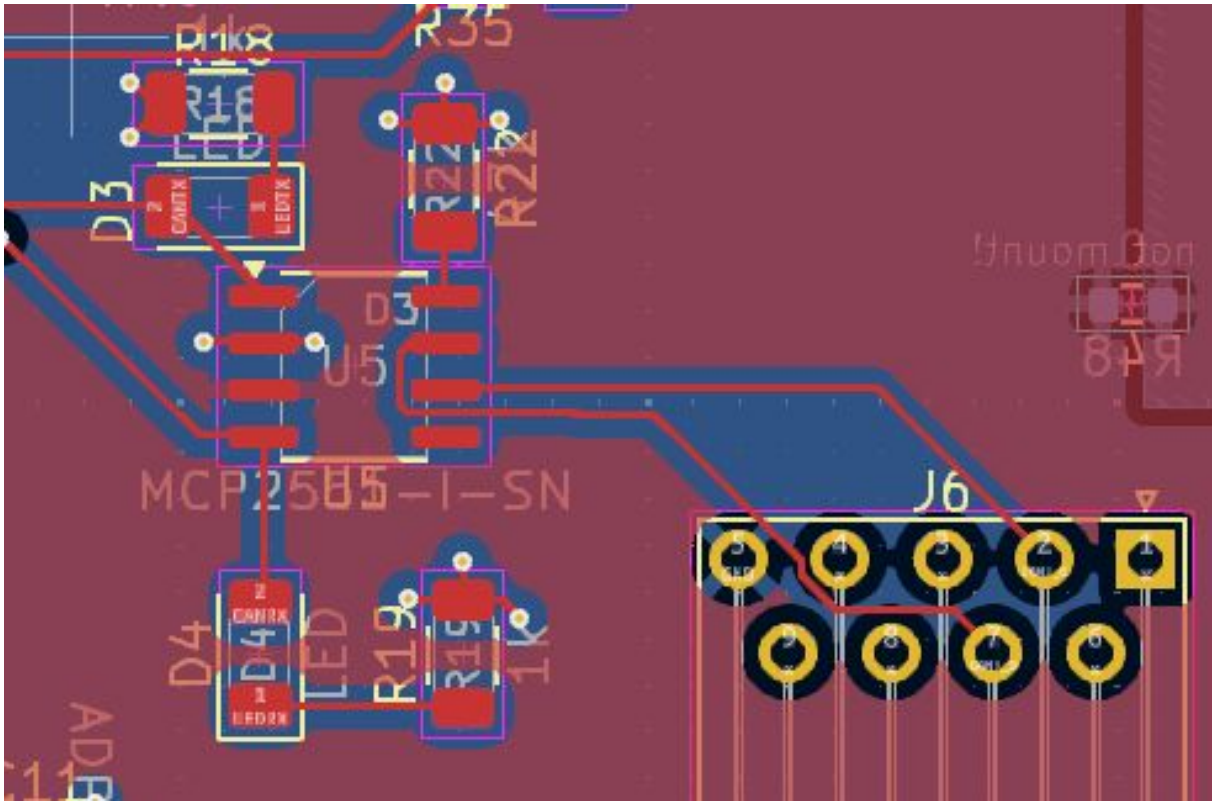
Clock


RA3
RA3
Q3
Q7
2
GND
R42
1
RA5
R47
2
1
RA5
R47
R42
U2
1
OSC1
C3
2
GND
C3
1
OSC1
XTAL1
2
GND
C5
1
OSC2
2
OSC2
1
+5V
2
GND

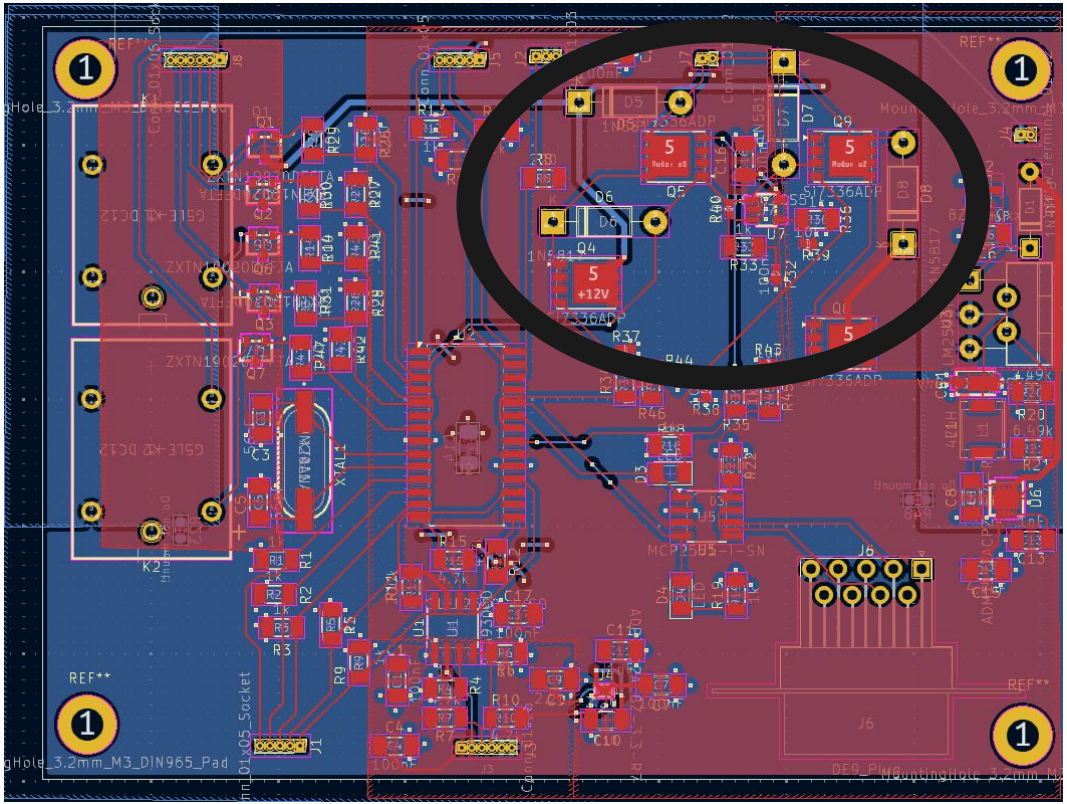
Transceiver i leds



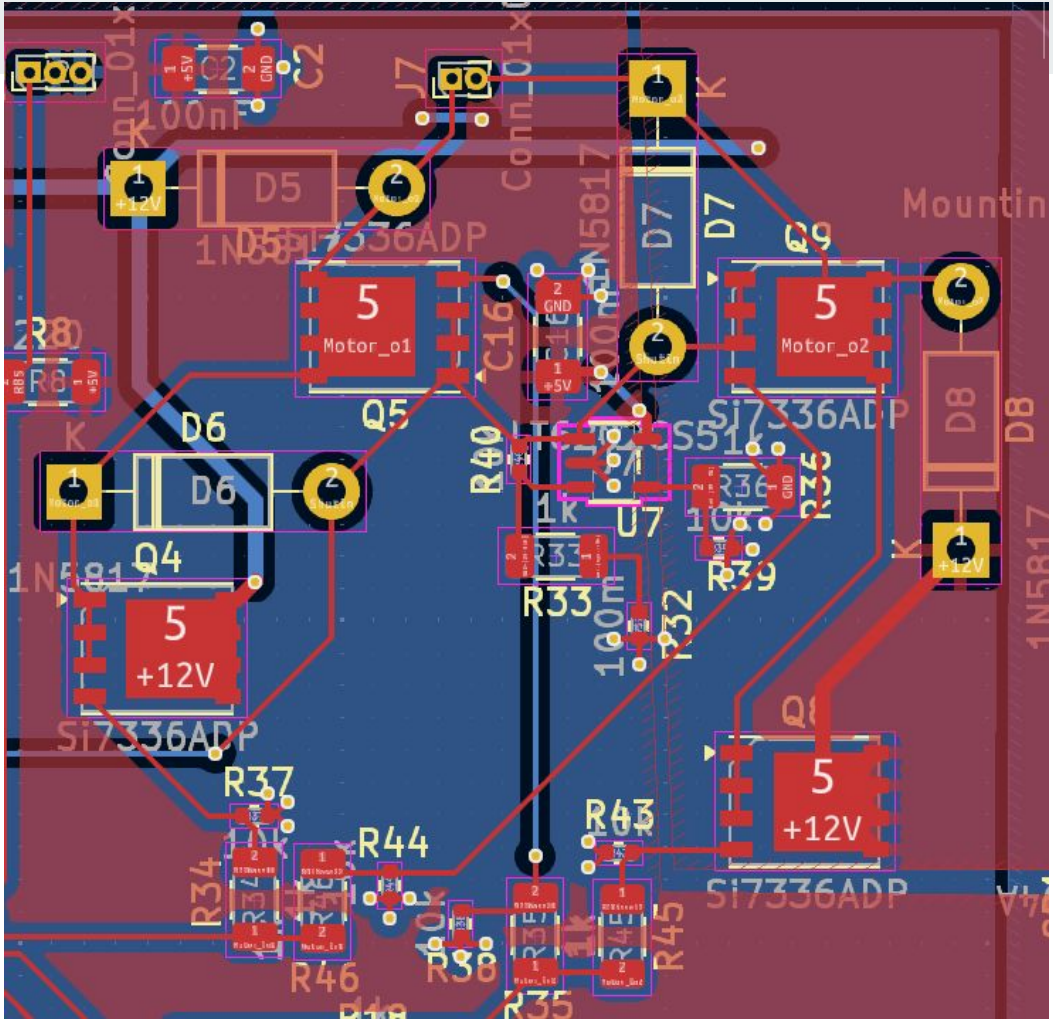
Transceiver i leds



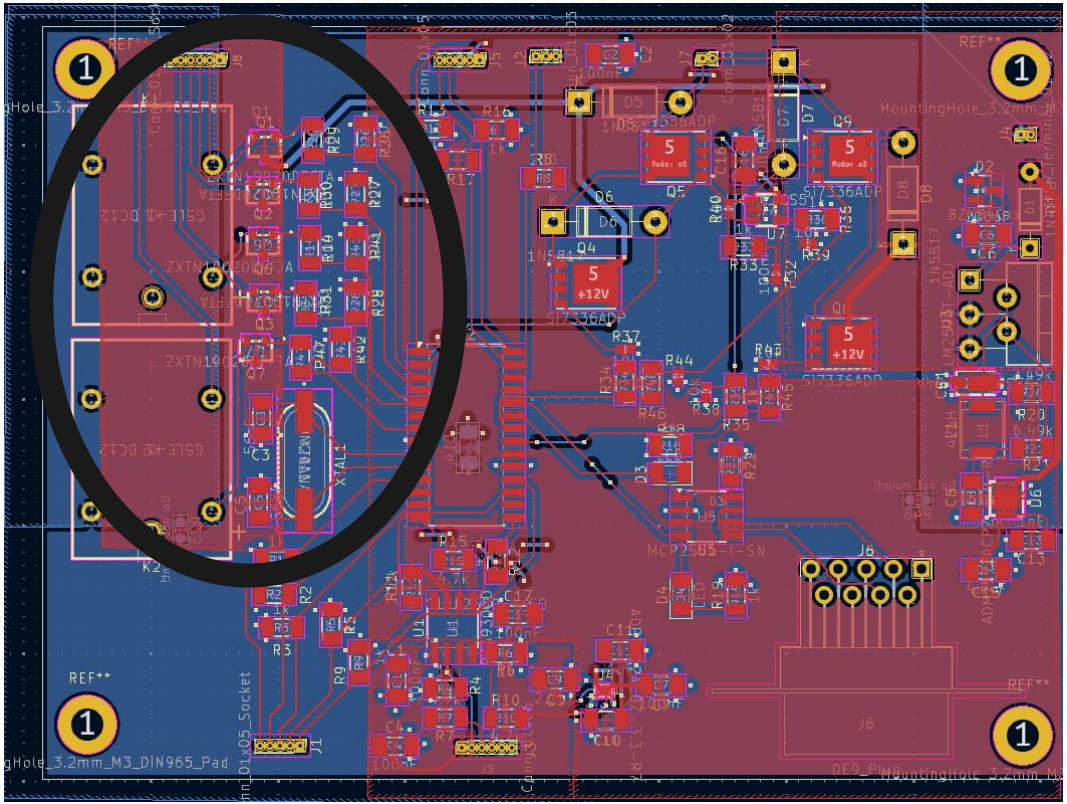
H-bridge



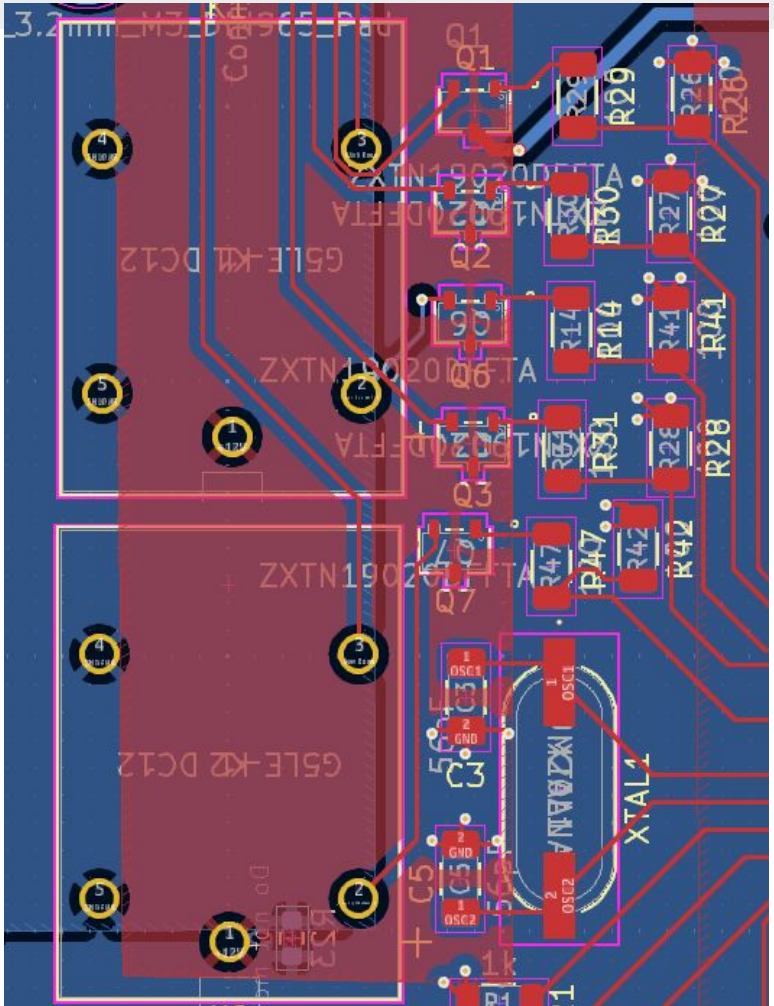
H-bridge


Conn_01x
C2
100nF
+12V
D5
1N5817
Si7336ADP
5
Motor_o1
Q5
C16
GND
+5V
D7
Q9
Motor_o2
D8
R8
D6
Q4
R40
1k
U7
R33
R39
R32
+12V
R37
R44
R43
R34
R45
R46
R38
R35

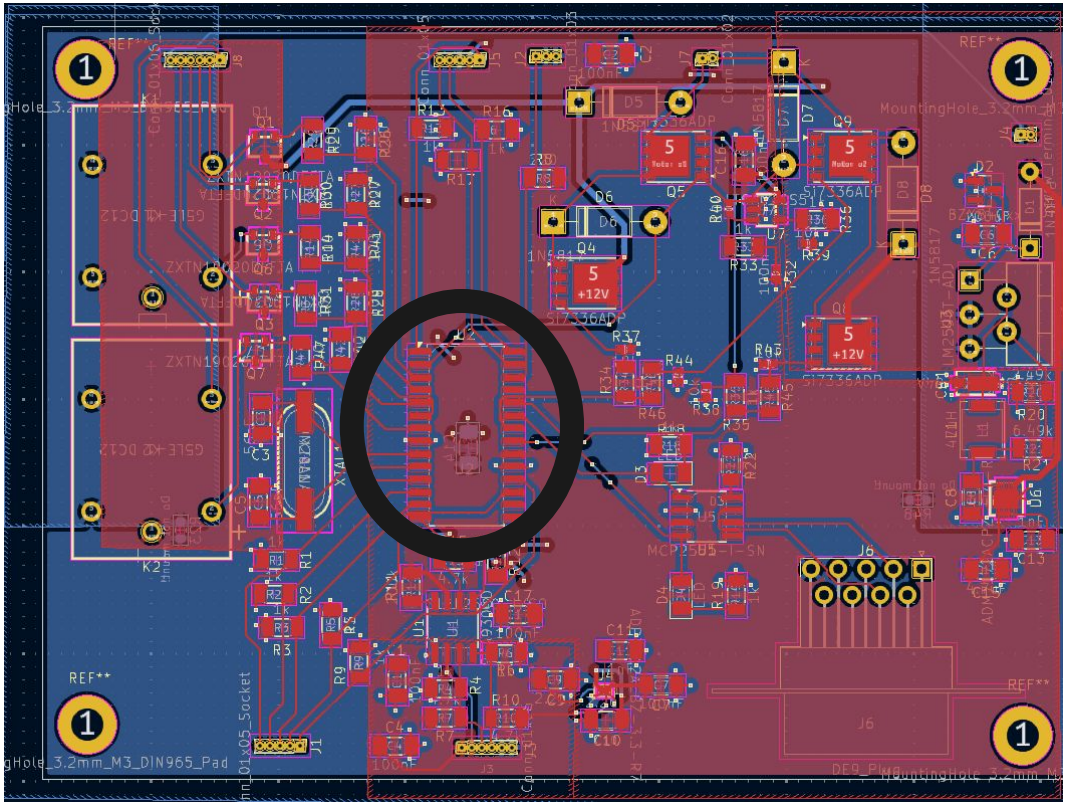
H-bridge



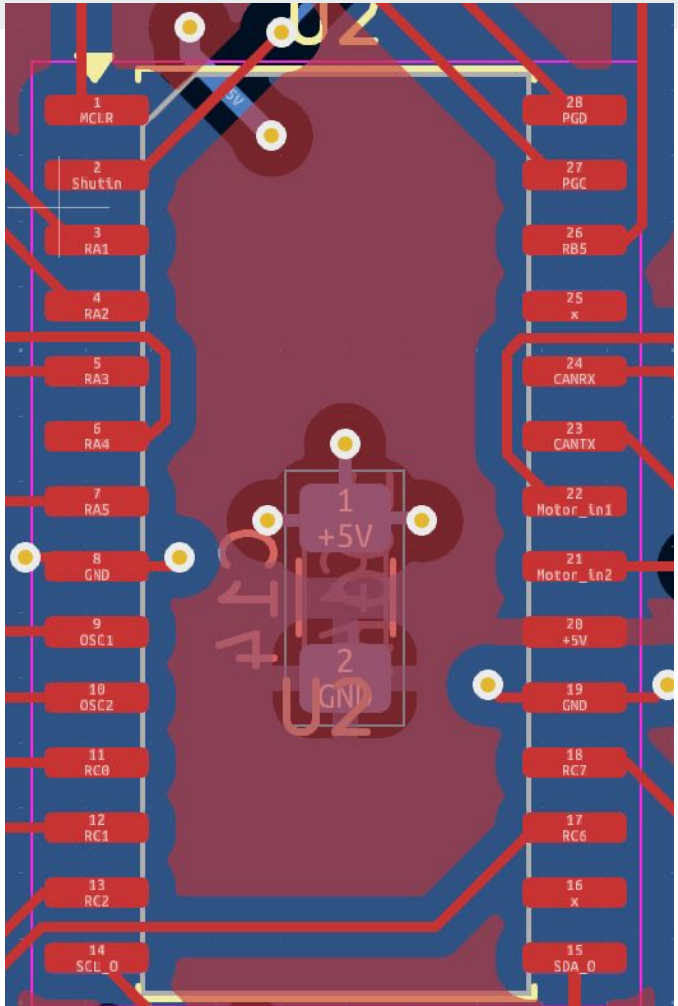
Output select stage



H-bridge



Microcontrolador



Components

Nom del component	Funció	Datasheet
ADM7172ACPZ-5.0-R7	LDO 5V	ADM7172ACPZ-5.0-R7
ADP7112ACBZ-3.3-R7	LDO 3.3V	ADP7112ACBZ-3.3-R7
BH1750FVI-TR	Sensor de llum	BH1750FVI-TR
G5LE-1 DC12	Relé	G5LE-1 DC12
LM2596T-ADJ	BUCK converter	LM2596T-ADJ
MCP2551-I-SN	Transciever	MCP2551-I-SN
PIC18F2580-I/SO	Microprocesador	PIC18F2580-I/SO
Si7336ADP	Transistor BJT	Si7336ADP
SN74LXC2T45DCUR	Traductor de 5V a 3.3V	SN74LXC2T45DCUR
TMAG5124G1CEDBZRQ1	Sensor hall	TMAG5124G1CEDBZRQ1
ZXTN19020DFFTA	Transistor mosfet	ZXTN19020DFFTA
PCA9036	Tracuctor de nivells	PCA9036
XT9M20HRR8M	Cristall	XT9M20HRR8M