# Projecte EDD-Llums

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Eines de Disseny
2024/2025

# Diagrama de blocs

# De què tracta el projecte?

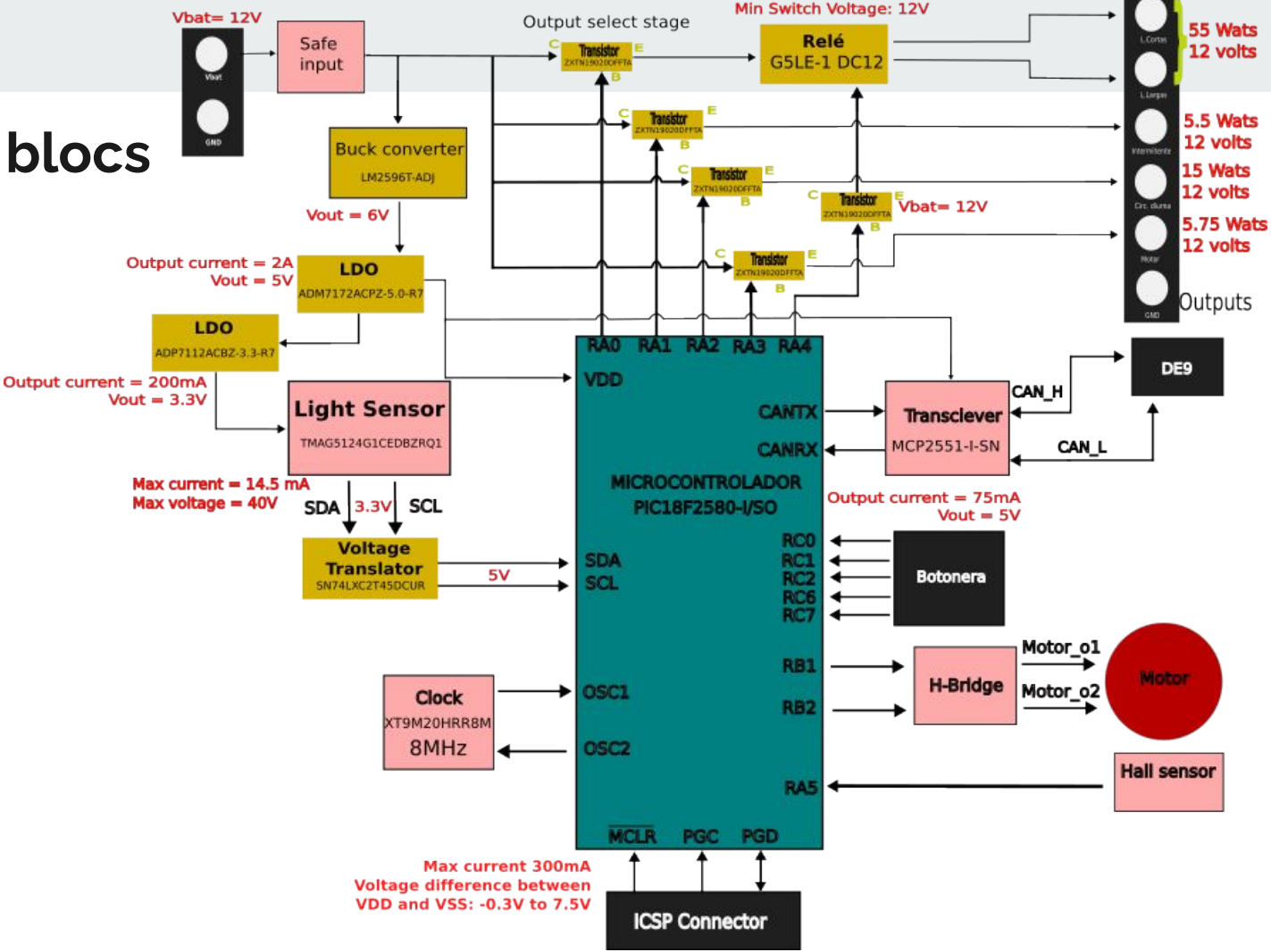
Disseny del sistema de control d'il·luminació d'un cotxe mitjançant un microcontrolador.

# Requisits del projecte

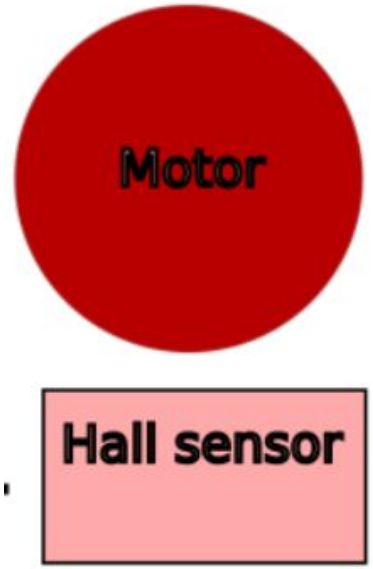
Parts clau del diagrama:

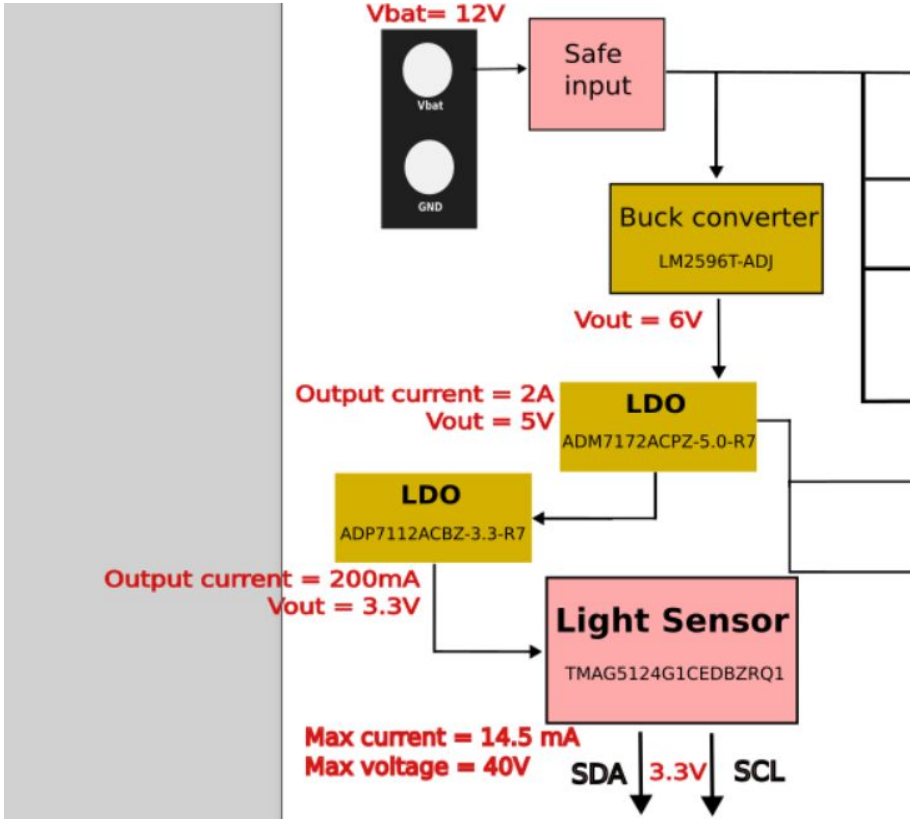
- Llums de carretera.
- Llums d'encreuament.
- Llums de circulació diürna.
- Intermitents
- Motor escombreta neteja-fars.
- Sensor digital de llum, per activar les llums.

# Diagrama de blocs

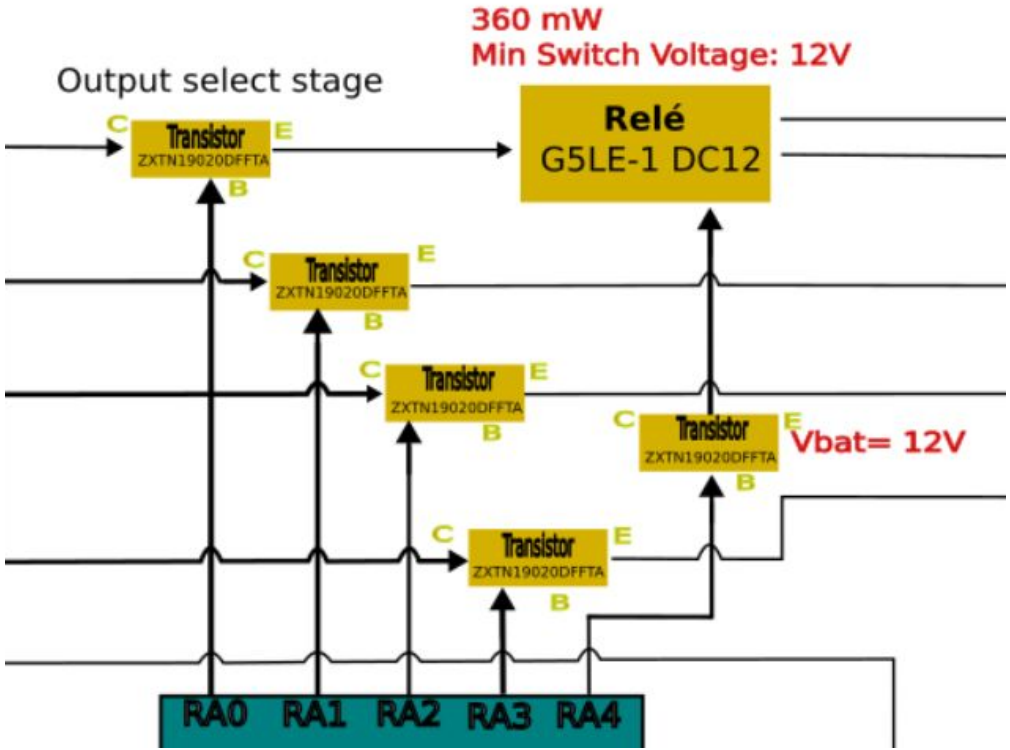


# Inputs

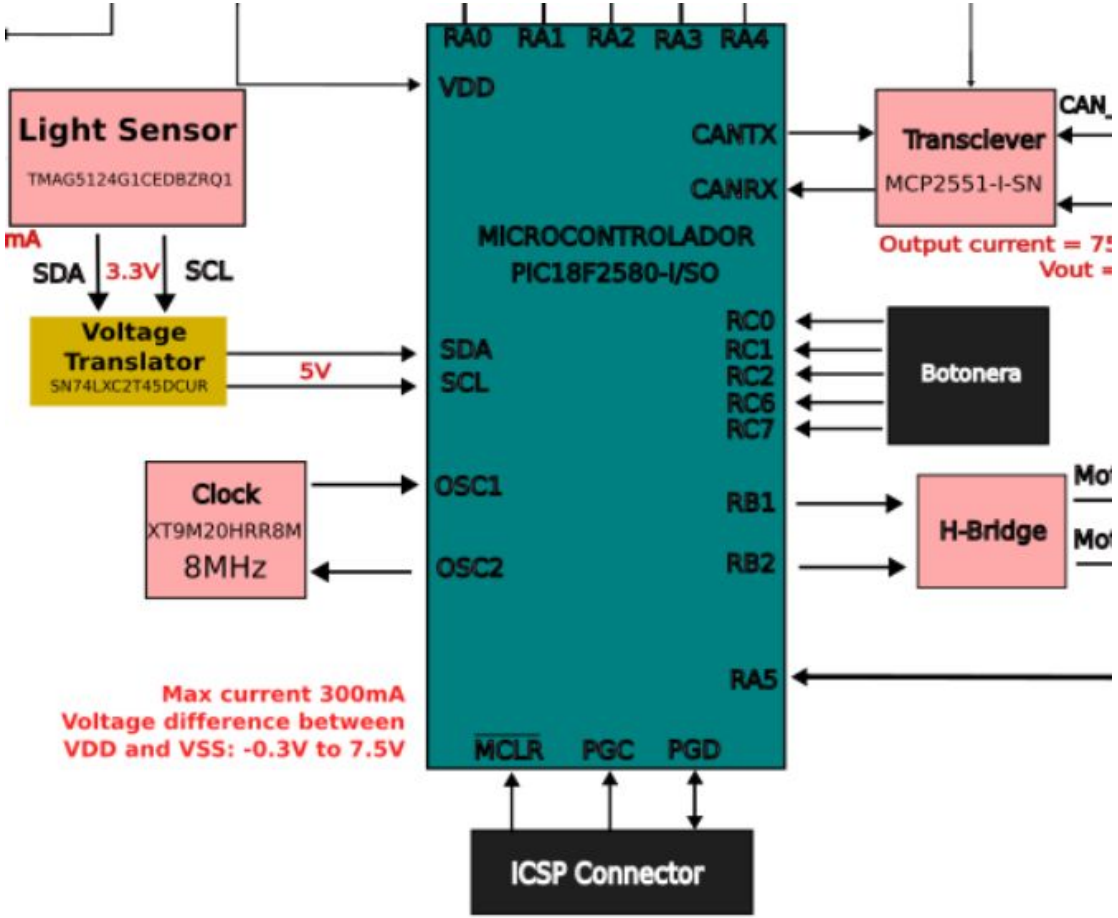

Motor
Hall sensor


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

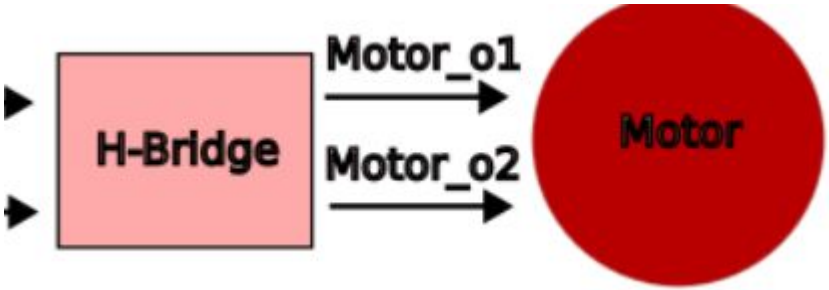
# Output selection stage

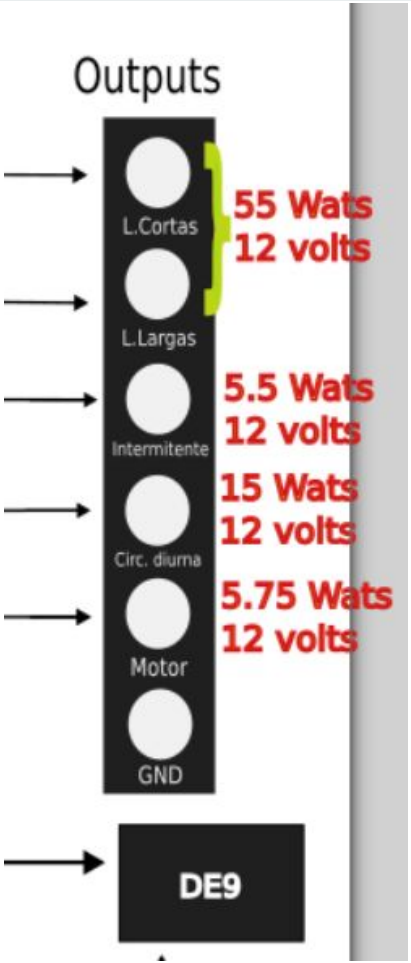


# Microcontrolador

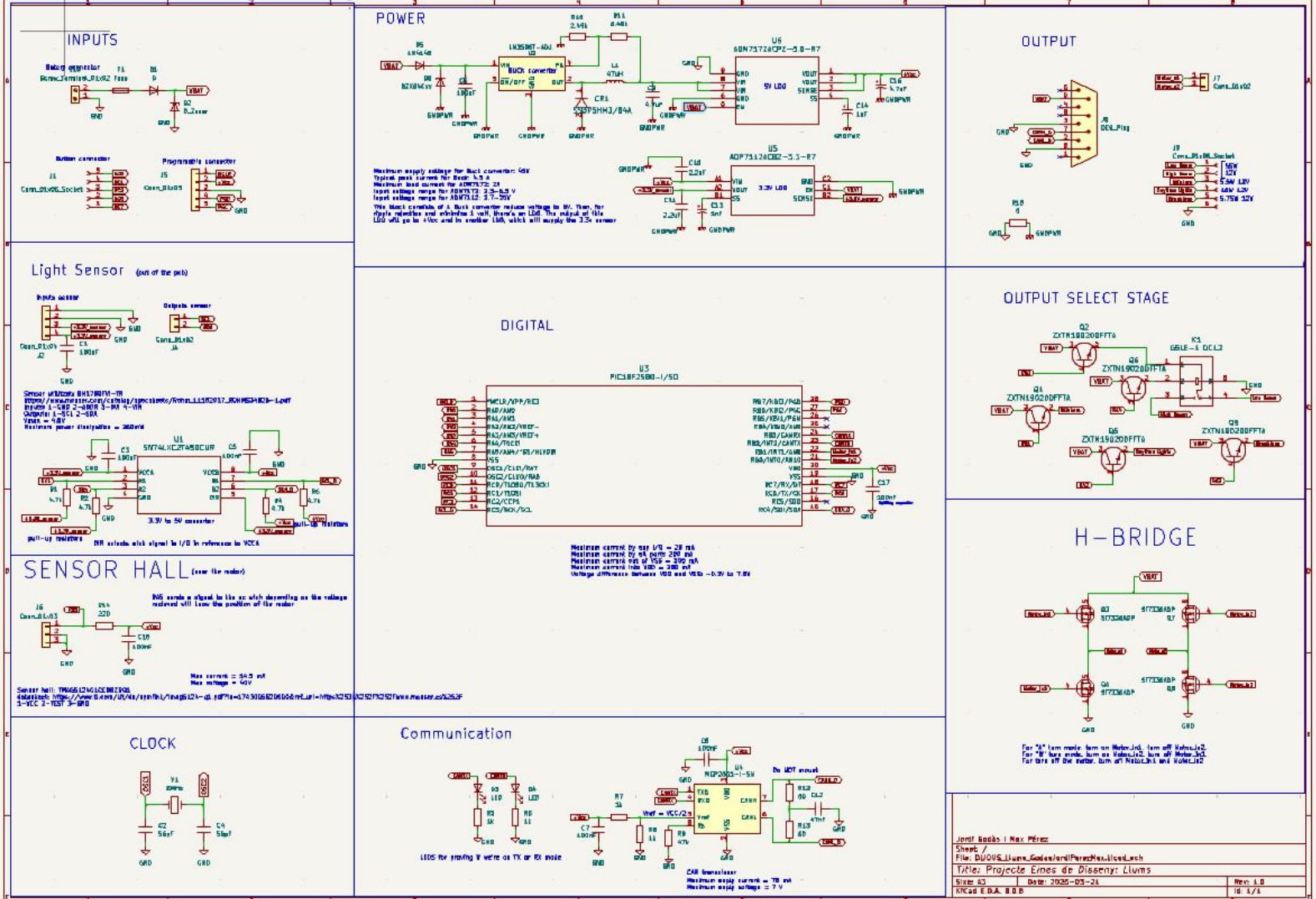


# Outputs

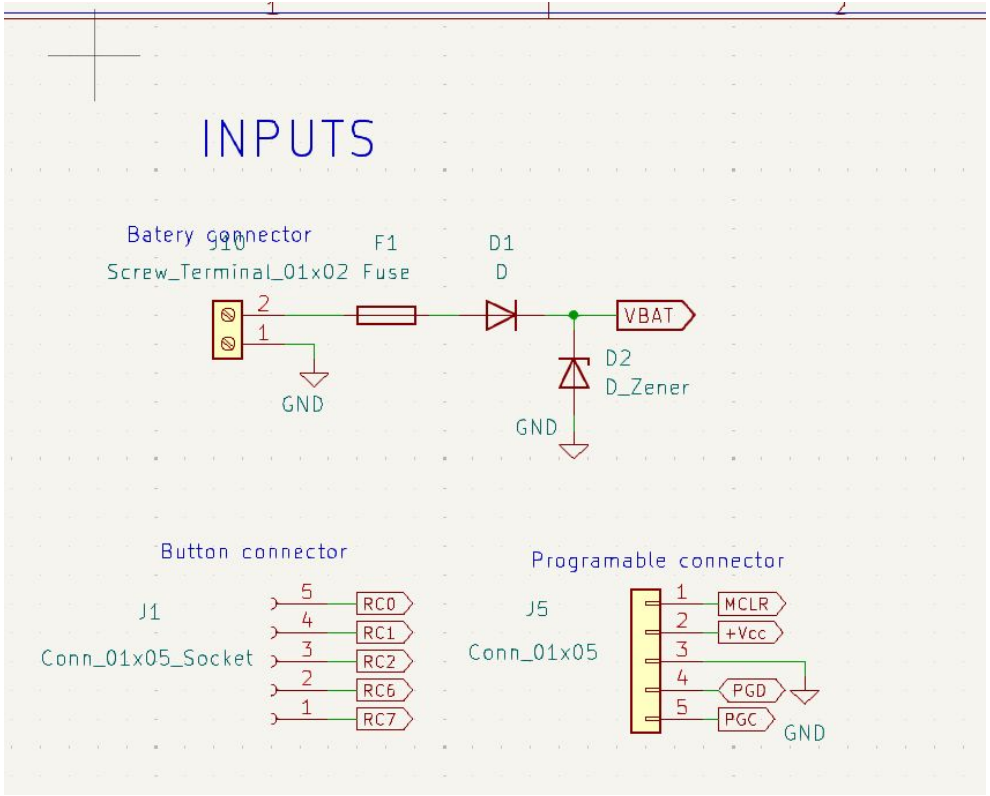

H-Bridge
Motor_o1
Motor_o2
Motor


Outputs
L.Cortas
L.Largas
Intermitente
Circ. diurna
Motor
GND
DE9
55 Wats
12 volts
5.5 Wats
12 volts
15 Wats
12 volts
5.75 Wats
12 volts

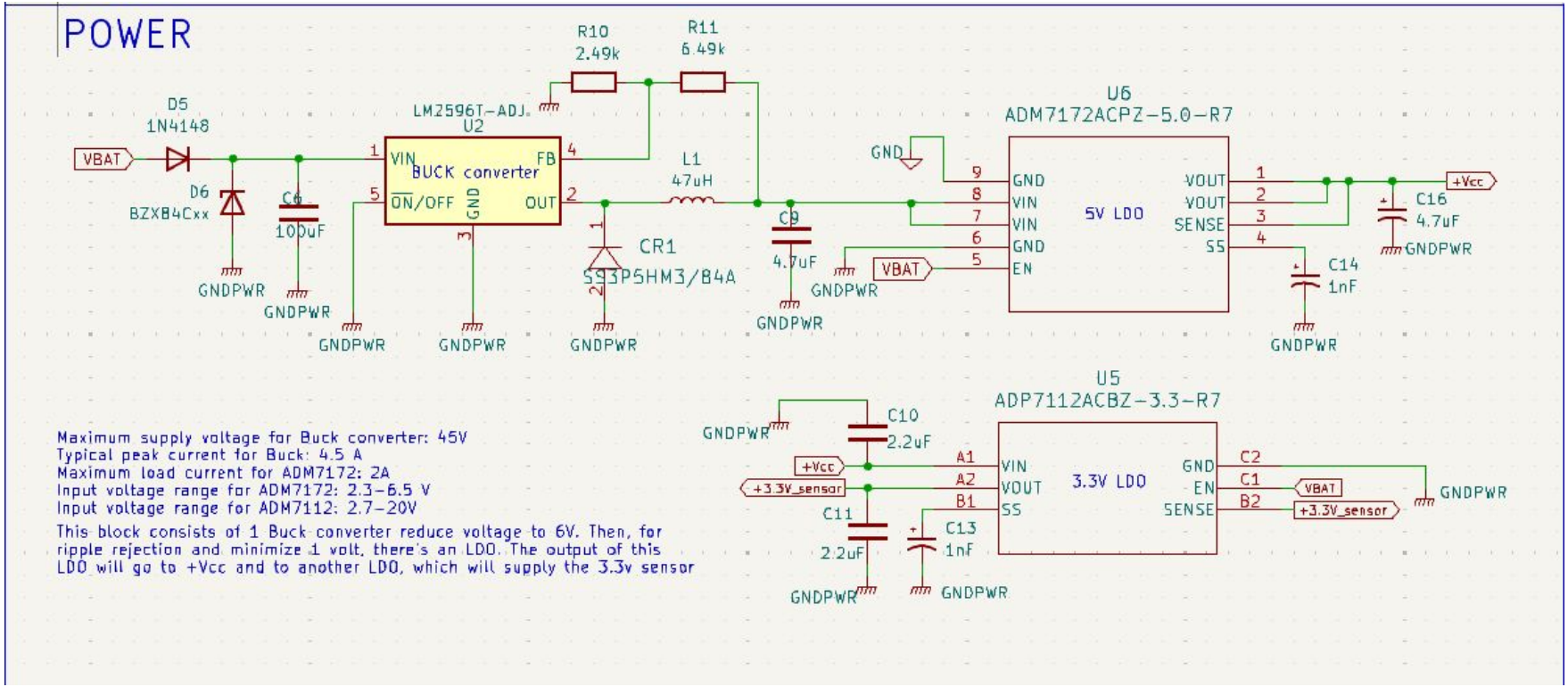
# Esquemàtic


INPUTS
POWER
OUTPUT
Light Sensor
DIGITAL
OUTPUT SELECT STAGE
SENSOR HALL
H-BRIDGE
CLOCK
Communication
Jordi Godàs i Max Pérez
Title: Projecte Eines de Disseny: Llums

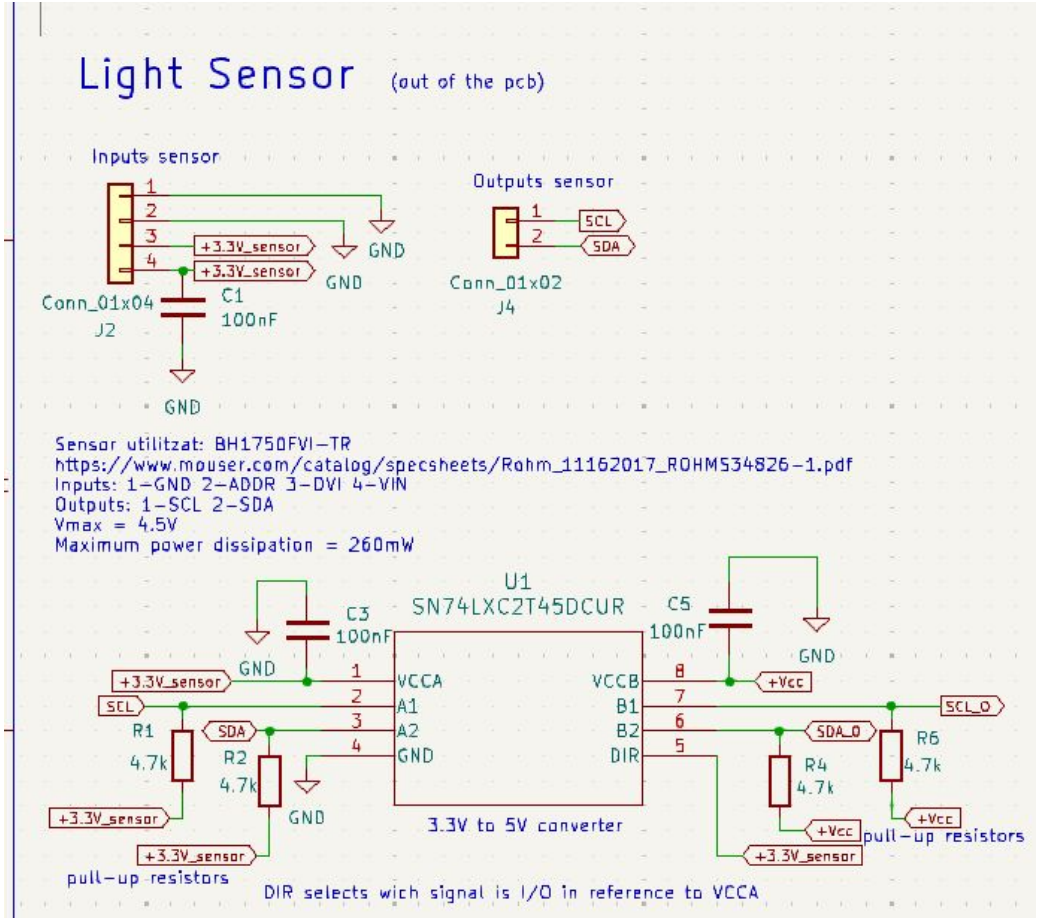
# Inputs


INPUTS
Batery connector
J10
Screw_Terminal_01x02
F1
Fuse
D1
D
2
1
GND
VBAT
D2
D_Zener
GND
Button connector
J1
Conn_01x05_Socket
5
4
3
2
1
RC0
RC1
RC2
RC6
RC7
Programable connector
J5
Conn_01x05
1
2
3
4
5
MCLR
+Vcc
PGD
PGC
GND

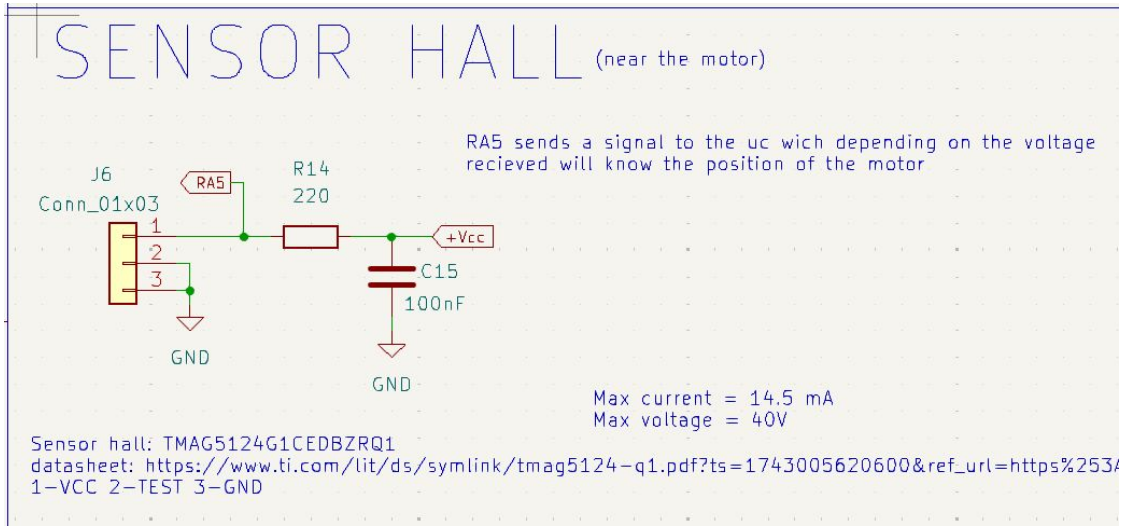
# Power

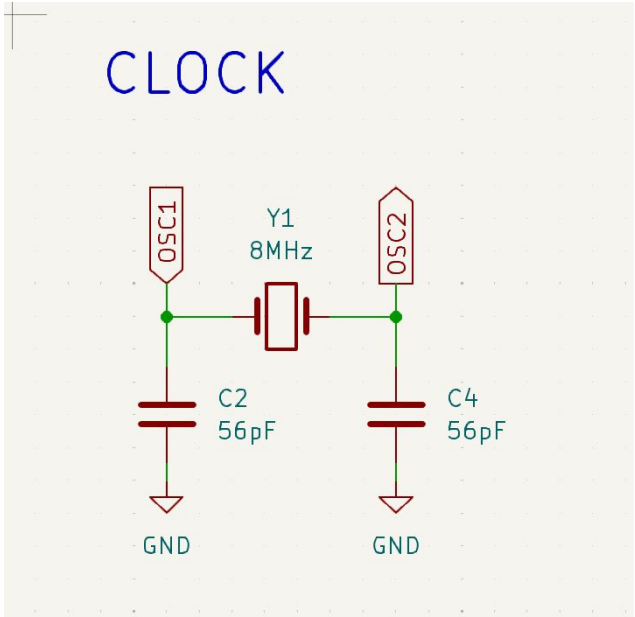

POWER
R10
2.49k
R11
6.49k
D5
1N4148
VBAT
D6
BZX84Cxx
C6
100uF
GNDPWR
LM2596T-ADJ
U2
VIN
BUCK converter
FB
ON/OFF
GND
OUT
L1
47uH
CR1
SS3P5HM3/84A
C9
4.7uF
U6
ADM7172ACPZ-5.0-R7
GND
VIN
VIN
GND
EN
5V LDO
VOUT
VOUT
SENSE
SS
+Vcc
C16
4.7uF
C14
1nF
U5
ADP7112ACBZ-3.3-R7
C10
2.2uF
+3.3V_sensor
C11
2.2uF
A1
A2
B1
VIN
VOUT
SS
3.3V LDO
GND
EN
SENSE
C2
C1
B2
C13
1nF
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

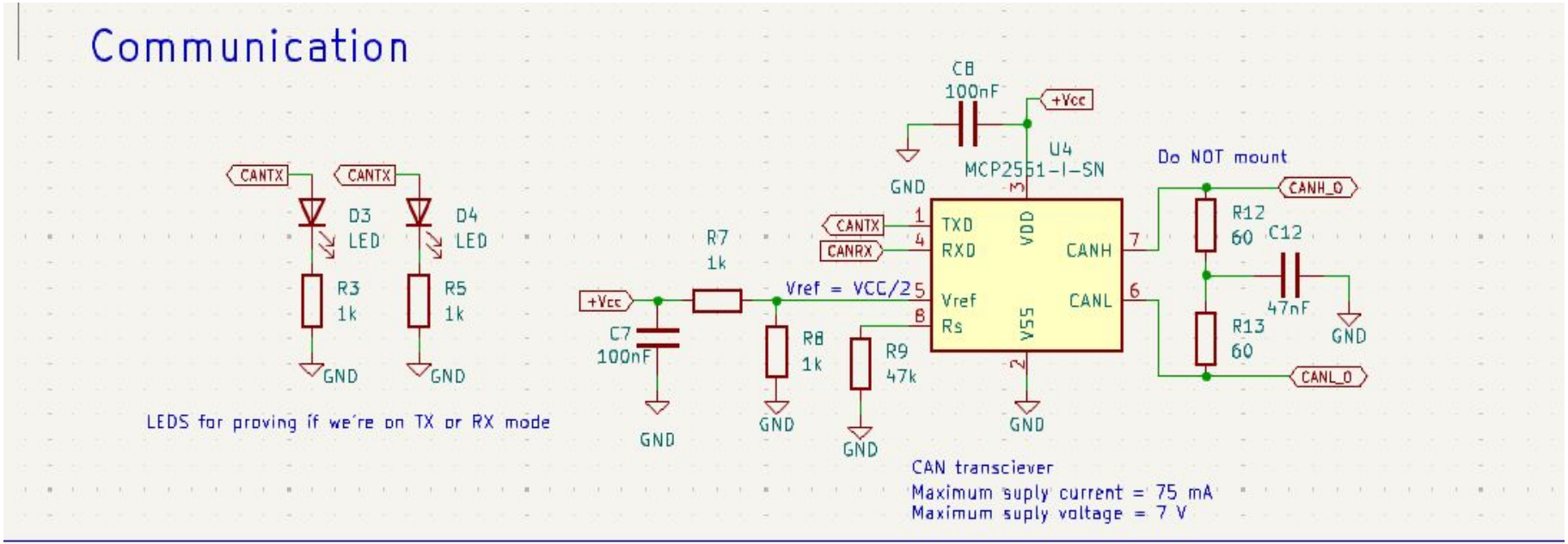


# Sensor Hall i Clock

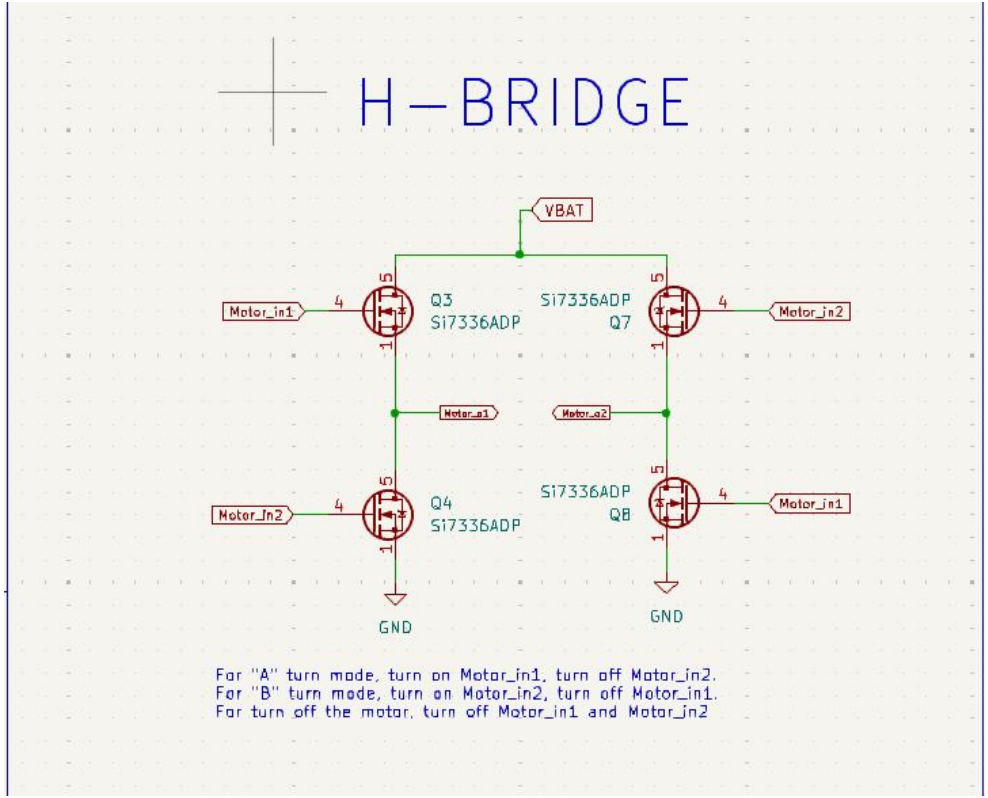


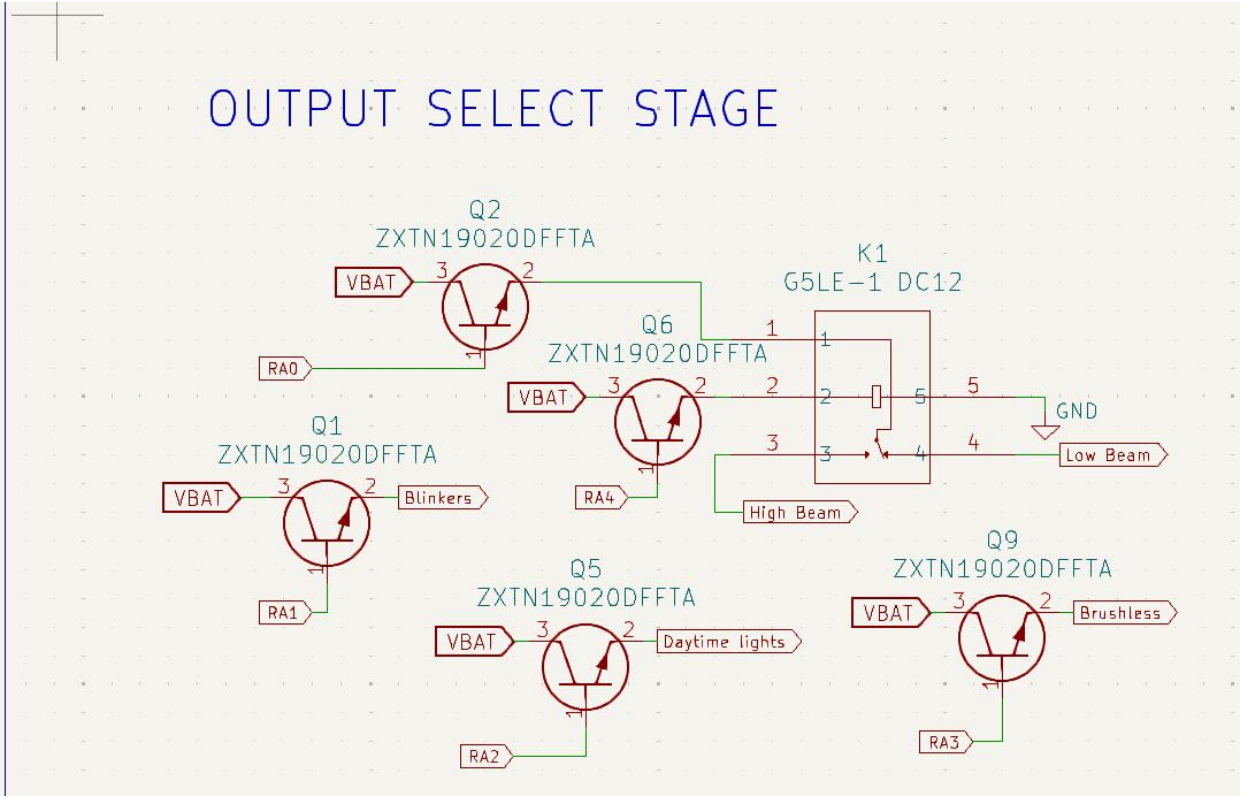
# Transceiver i leds



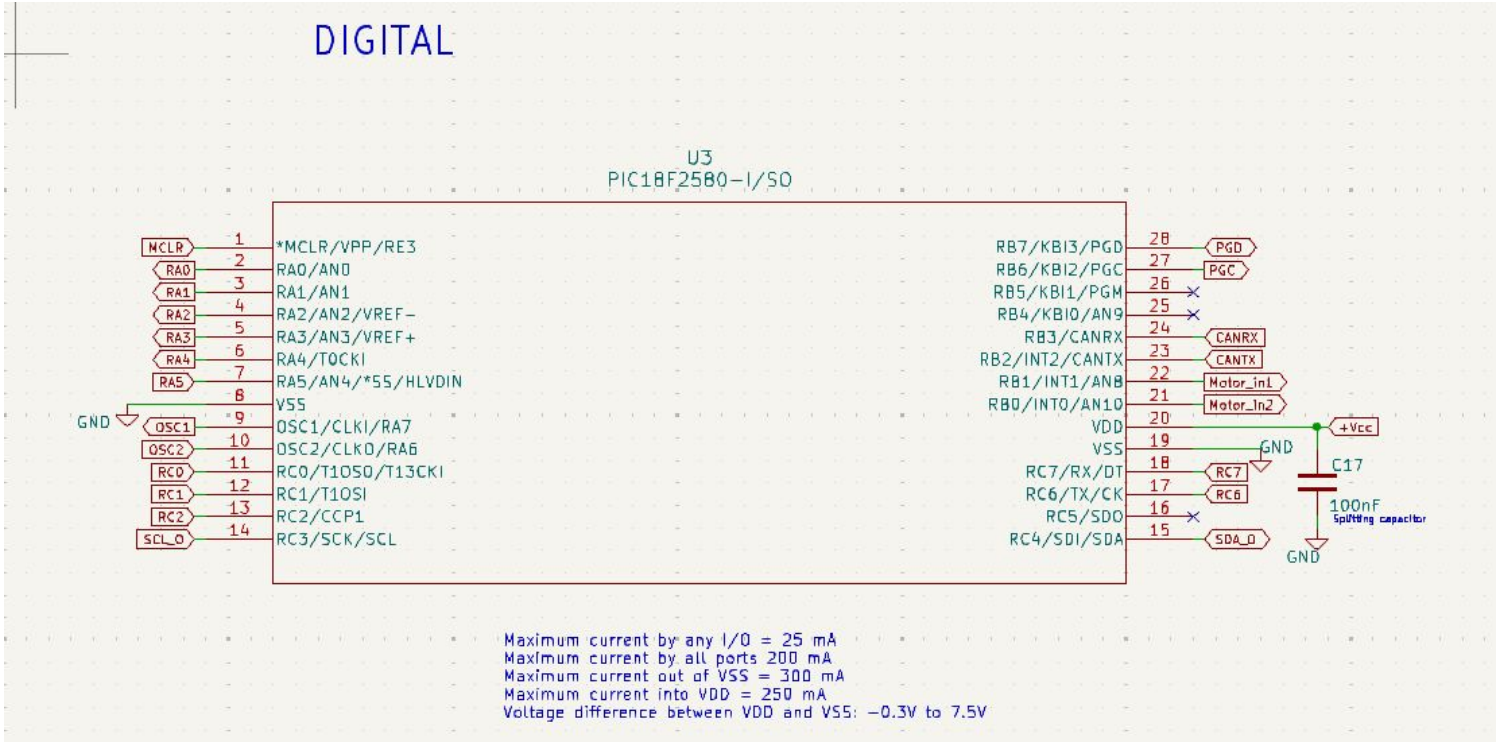
# H-bridge


H-BRIDGE
VBAT
Motor_in1
Q3
Si7336ADP
Si7336ADP
Q7
Motor_in2
Motor_a1
Motor_a2
Motor_in2
Q4
Si7336ADP
Si7336ADP
Q8
Motor_in1
GND
GND
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

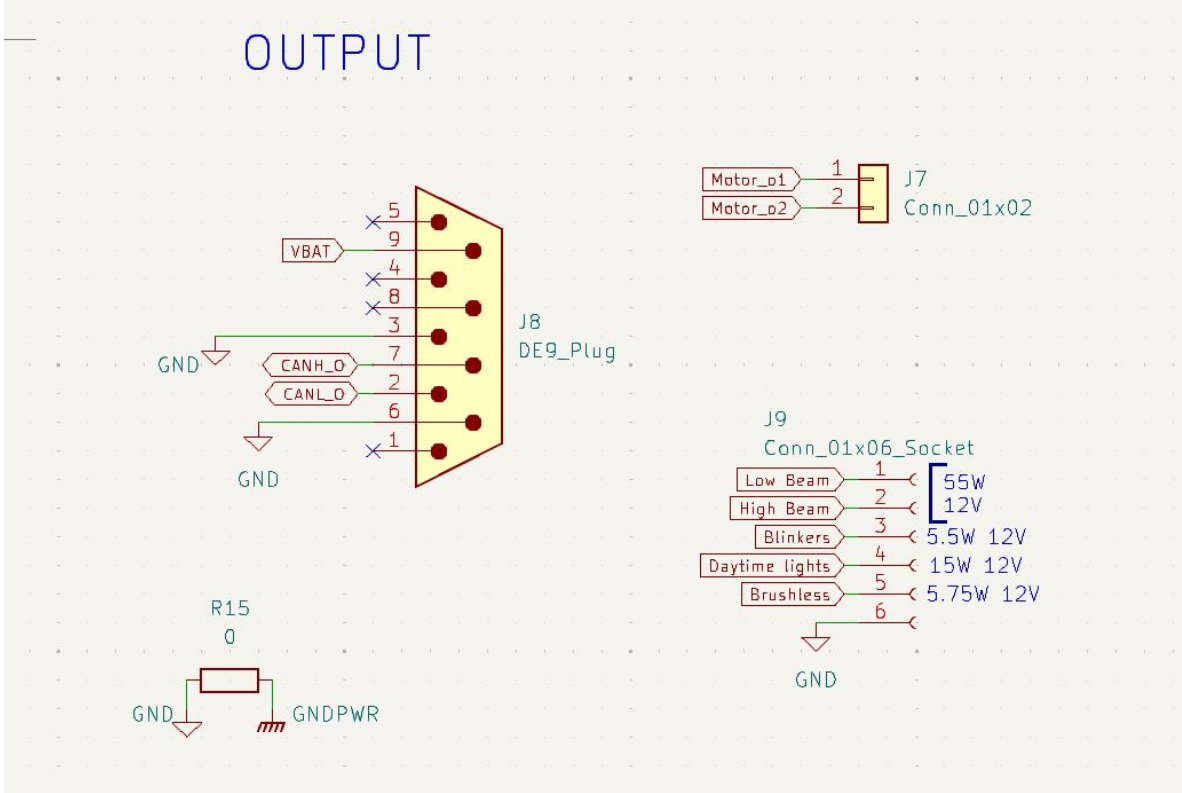
# Output select stage



# Microcontrolador



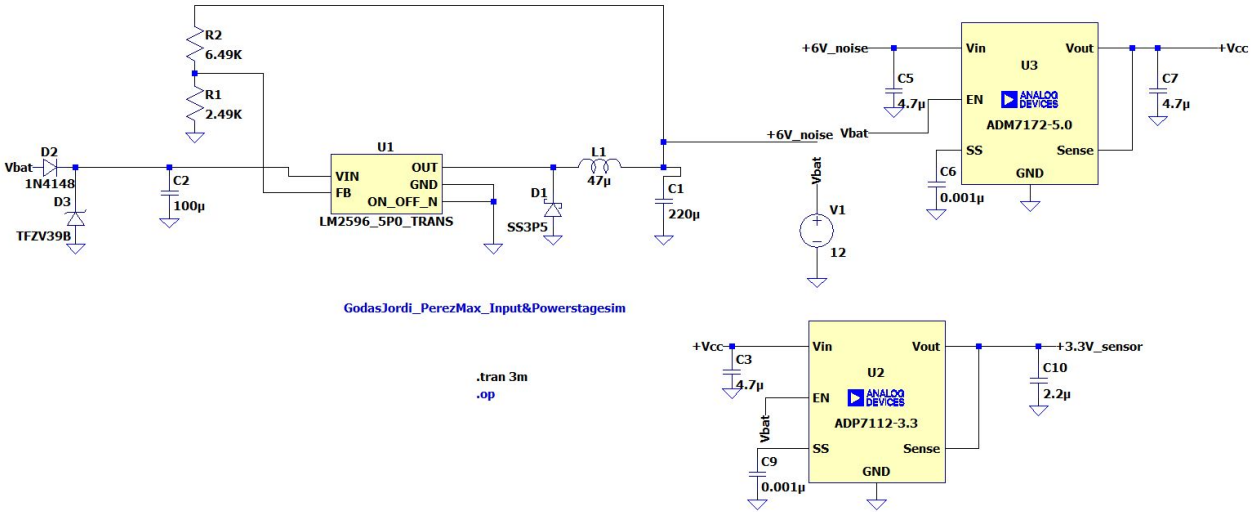
# Outputs


OUTPUT
J8
DE9_Plug
5
9
4
8
3
7
2
6
1
VBAT
GND
CANH_O
CANL_O
GND
Motor_o1
Motor_o2
1
2
J7
Conn_01x02
J9
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
GND
R15
0
GND
GNDPWR

# Simulacions

# Power stage

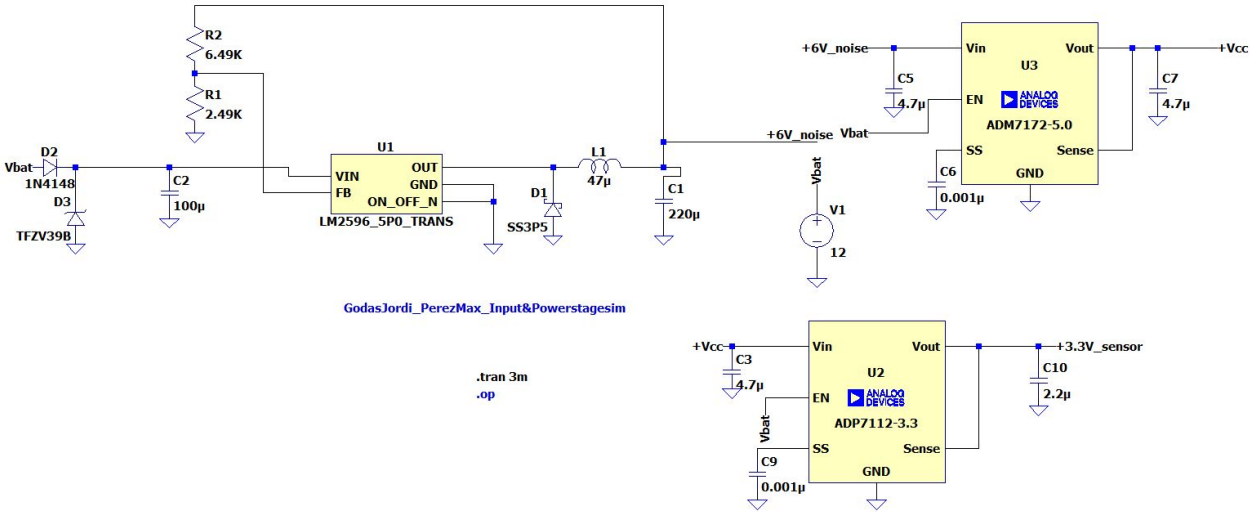
Ripple LM2596:




*Etapa de potència*

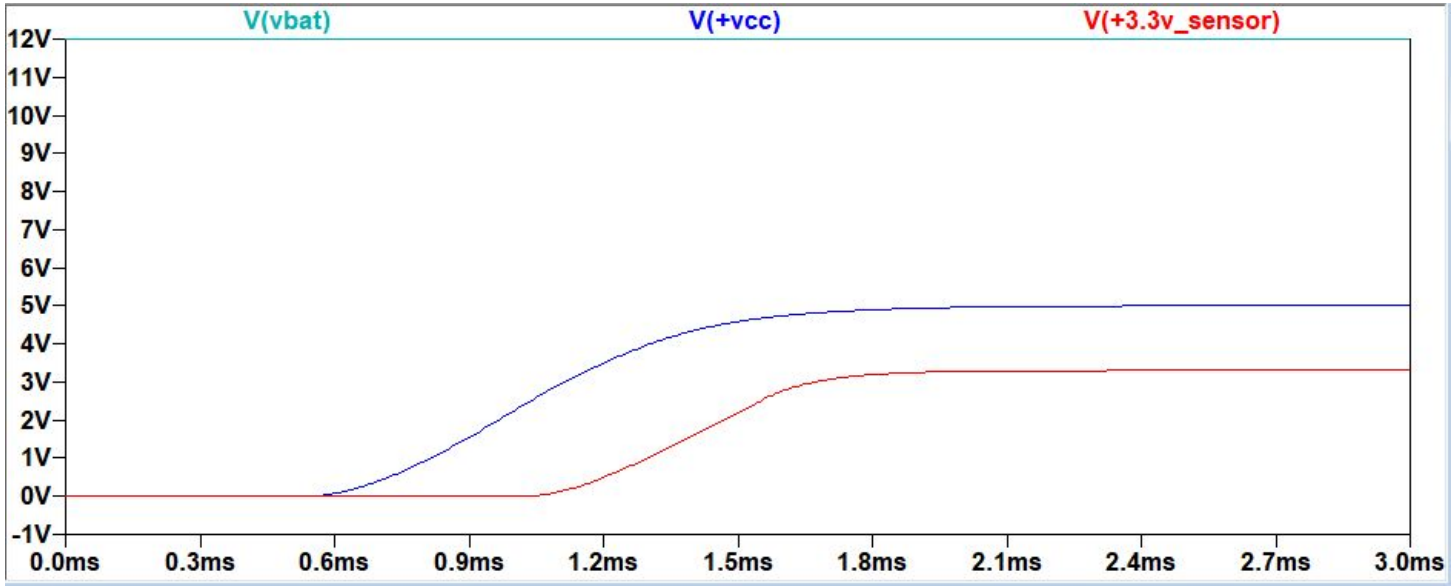
# Power stage

Ripple LM2596:



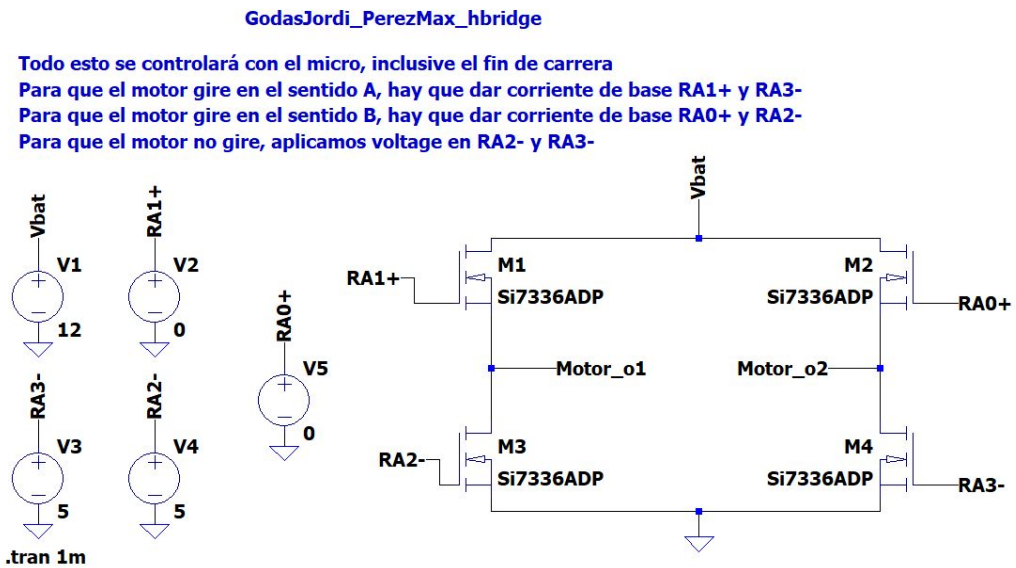

*Etapa de potència*

# Power stage



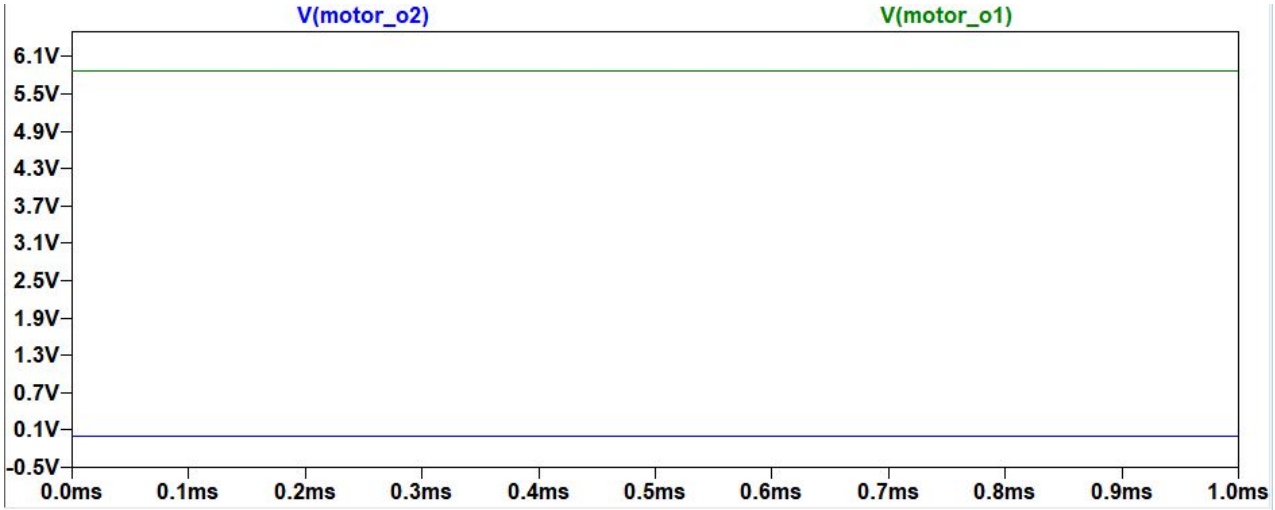

*Representació gràfica dels diferents voltatges de l'etapa de potència en funció del temps*

# H-Bridge



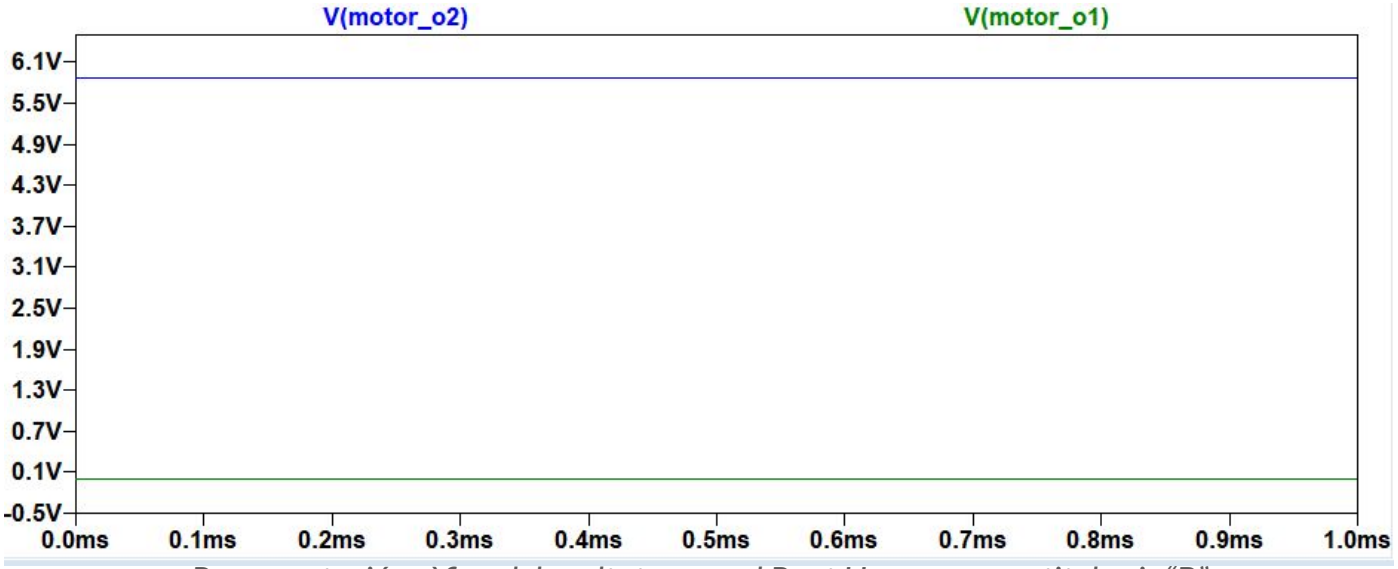

*Pont H per controlar el sentit de gir del motor i final de carrera*

# H-Bridge (sentit de gir A)



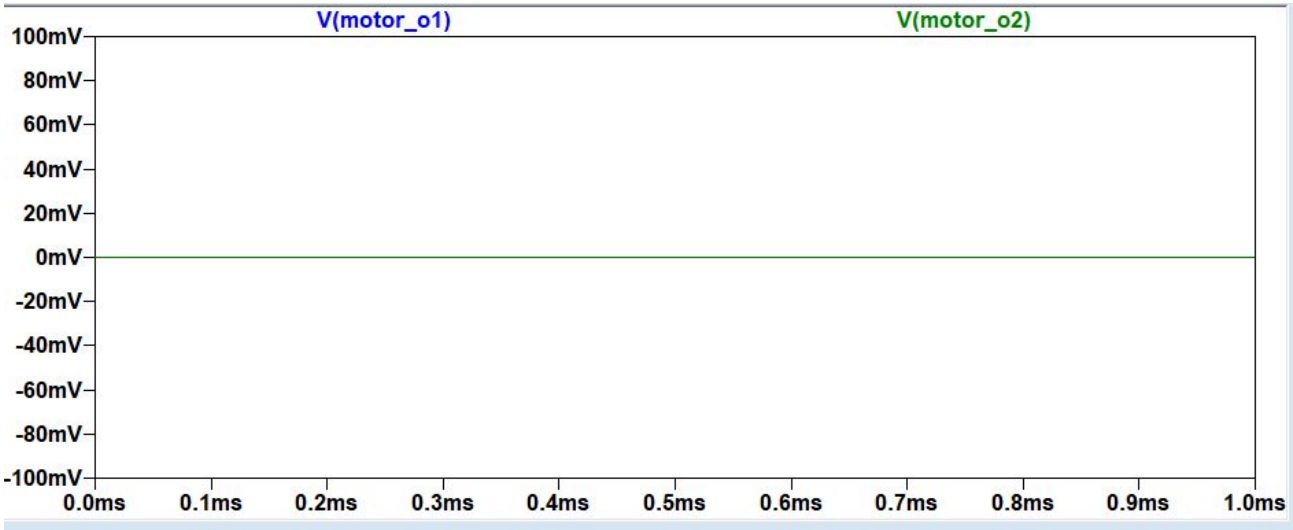

*Representació gràfica dels voltatges en el Pont H per a un sentit de gir "A"*

# H-Bridge (sentit de gir B)




*Representació gràfica dels voltatges en el Pont H per a un sentit de gir "B"*

# H-Bridge (motor apagat)




*Representació gràfica dels voltatges en el Pont H per al motor apagat*

# 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 |