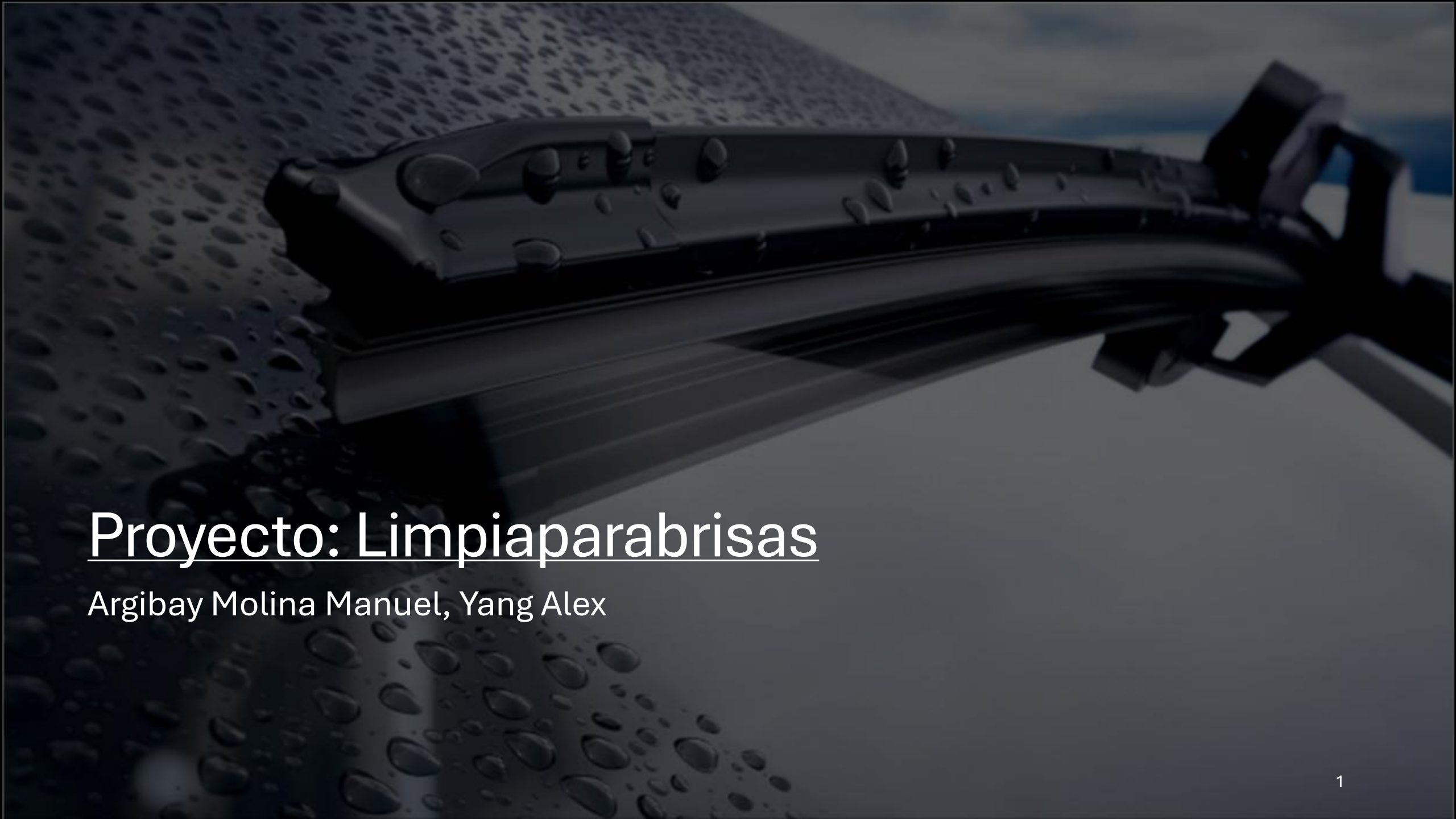


Proyecto: Limpiaparabrisas

Argibay Molina Manuel, Yang Alex

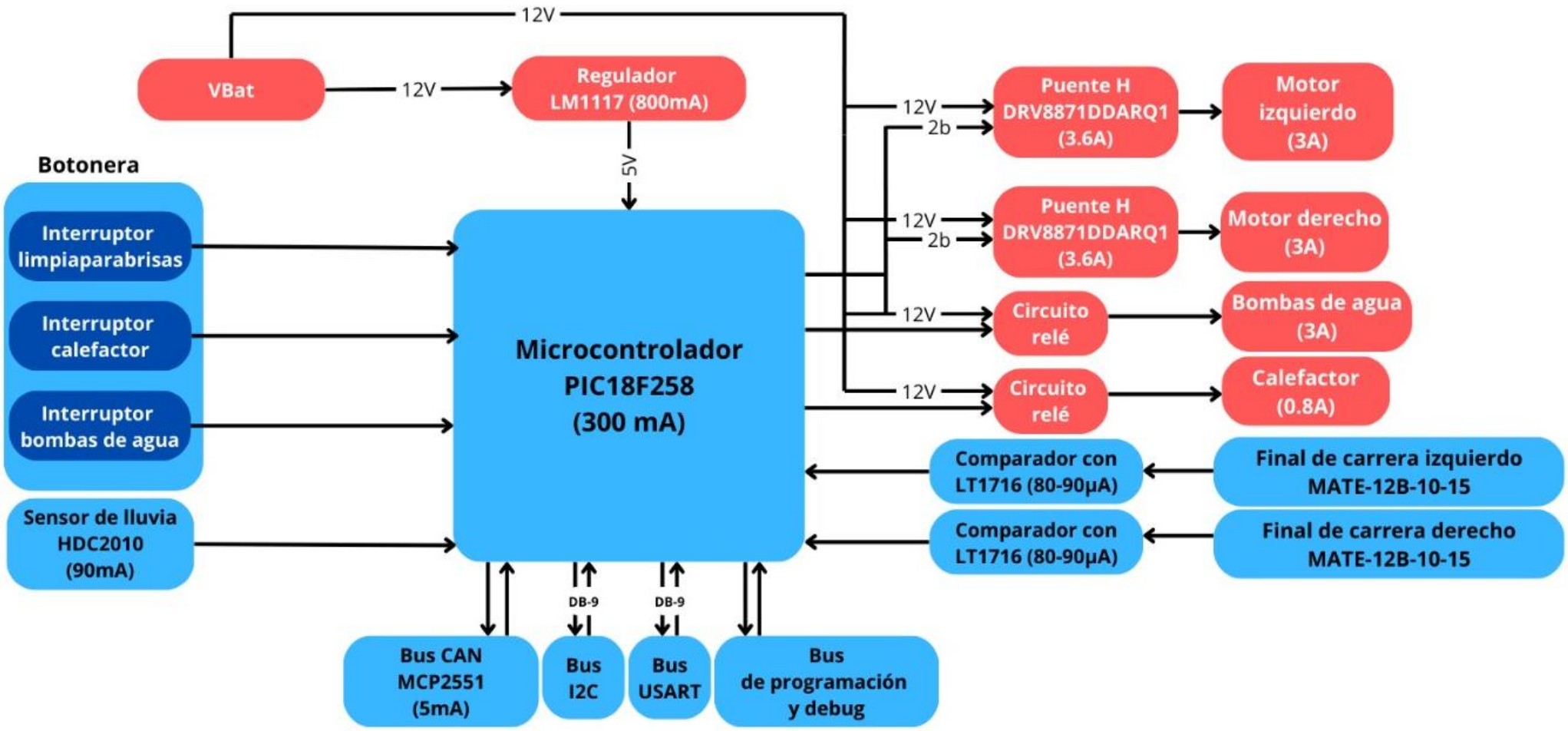
Funcionalidad y objetivos

- Mantener el parabrisas limpio y libre de elementos que obstruyan la visión
    - Escobillas limpiaparabrisas controladas por motores.
    - Bombas de líquido limpia parabrisas.
    - Calefactor que evita el empañamiento del parabrisas.
    - Interfaz manual mediante botonera
- Diseñar e implementar este sistema en una PCB.
    - Garantizar funcionamiento y fiabilidad en el producto.
    - Optimización de energía.
    - Optimización de costos.

Componentes

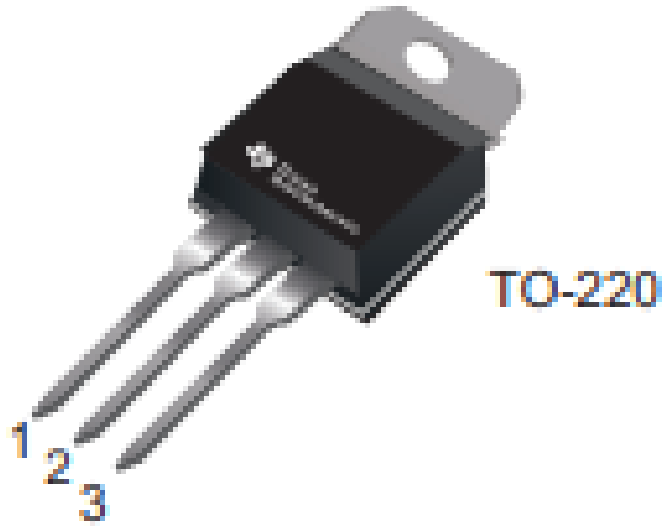
- Microcontrolador PIC18FXX8
- Transceptor MCP2551
- Bus de programación y debug
- Bus CAN
- Bus I^2C
- Botonera
- Fuente de 12V
- Regulador de tensión
- 2 motores DC
- 2 bombas de líquido limpiaparabrisas
- Sensor digital de lluvia
- Calefactor del vidrio
- 2 puentes “H”
- 2 relés electromagnéticos
- 2 finales de carreras magnéticos

Diagrama de Bloques



Regulador de tensión

LM1117



V_{OUT}	Output voltage	LM1117-1.8 I_{OUT} = 10 mA, V_{IN} = 3.8 V, T_J = 25°C		1.782	1.8	1.818	V
		LM1117-1.8 0 ≤ I_{OUT} ≤ 800 mA, 3.2 V ≤ V_{IN} ≤ 10 V	T_J = 25°C		1.8		
			over the junction temperature range 0°C to 125°C	1.746		1.854	
		LM1117-2.5 I_{OUT} = 10 mA, V_{IN} = 4.5 V, T_J = 25°C		2.475	2.5	2.525	V
		LM1117-2.5 0 ≤ I_{OUT} ≤ 800 mA, 3.9 V ≤ V_{IN} ≤ 10 V	T_J = 25°C		2.5		
			over the junction temperature range 0°C to 125°C	2.45		2.55	
		LM1117-3.3 I_{OUT} = 10 mA, V_{IN} = 5 V T_J = 25°C		3.267	3.3	3.333	V
		LM1117-3.3 0 ≤ I_{OUT} ≤ 800 mA, 4.75 V ≤ V_{IN} ≤ 10 V	T_J = 25°C		3.3		
			over the junction temperature range 0°C to 125°C	3.235		3.365	
		LM1117-5.0 I_{OUT} = 10 mA, V_{IN} = 7 V, T_J = 25°C		4.95	5	5.05	V
		LM1117-5.0 0 ≤ I_{OUT} ≤ 800 mA, 6.5 V ≤ V_{IN} ≤ 12 V	T_J = 25°C		5		
			over the junction temperature range 0°C to 125°C	4.9		5.1	

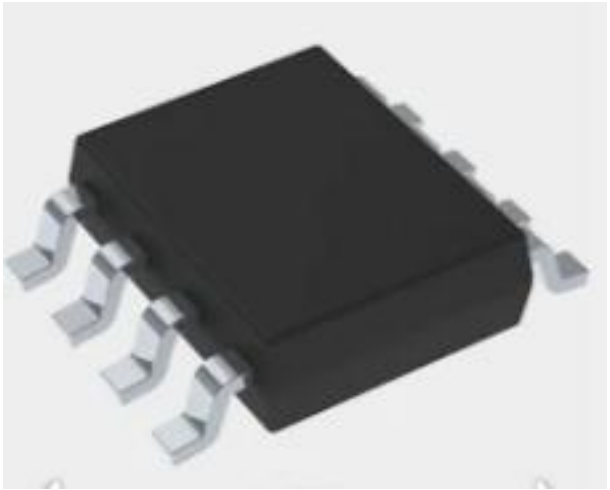
I_{OUT}	PARAMETER	LM1117	TLV1117	UNIT
800 mA	Input voltage range (max)	15	15	V
	Load regulation accuracy	1.6	1.6	%
	PSRR (120 Hz)	75	75	dB
	Recommended operating temperature	0 – 125	-40 – 125	°C
	SOT-223 T_{JA}	61.6	104.3	°C/W
	TO-220 T_{JA}	23.8	30.1	°C/W
	TO-252 T_{JA}	45.1	50.9	°C/W
	TO-263 T_{JA}	41.3	27.5	°C/W
	WSON-8 T_{JA}	39.3	38.3	°C/W

Detector de lluvia

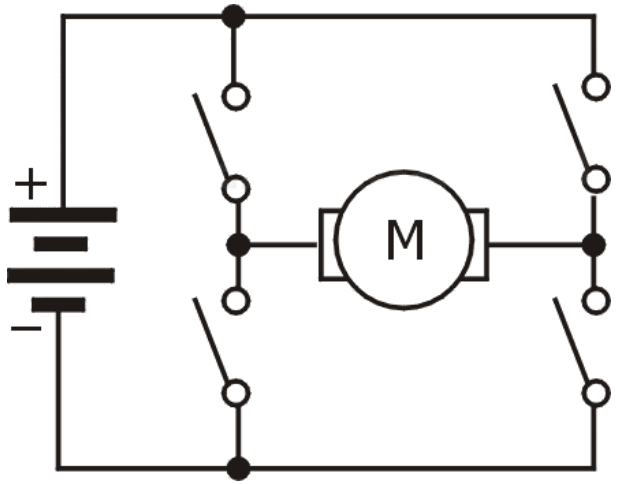
HDC2010

Puente H

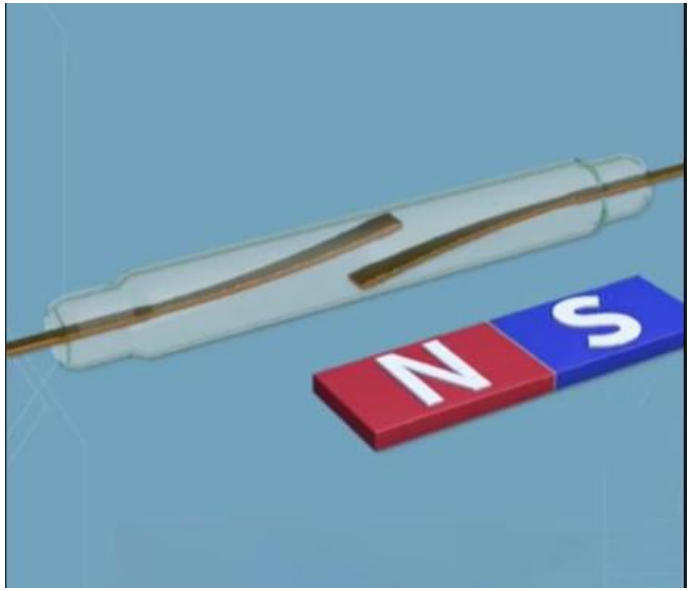
IN1	IN2	OUT1	OUT2	DESCRIPTION
0	0	High-Z	High-Z	Coast; H-bridge disabled to High-Z (sleep entered after 1 ms)
0	1	L	H	Reverse (Current OUT2 → OUT1)
1	0	H	L	Forward (Current OUT1 → OUT2)
1	1	L	L	Brake; low-side slow decay

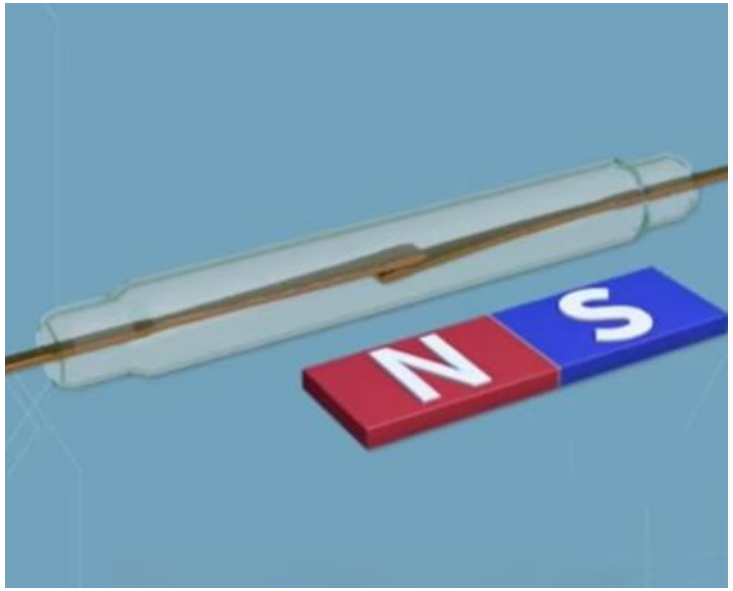


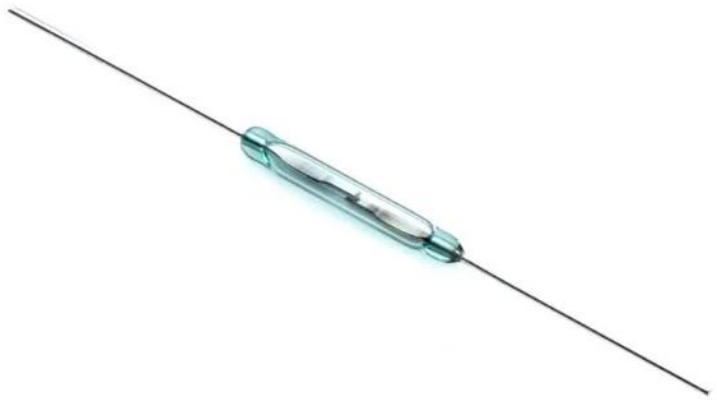
DRV8871DDARQ1



Final de Carrera magnético (Reed Switch)

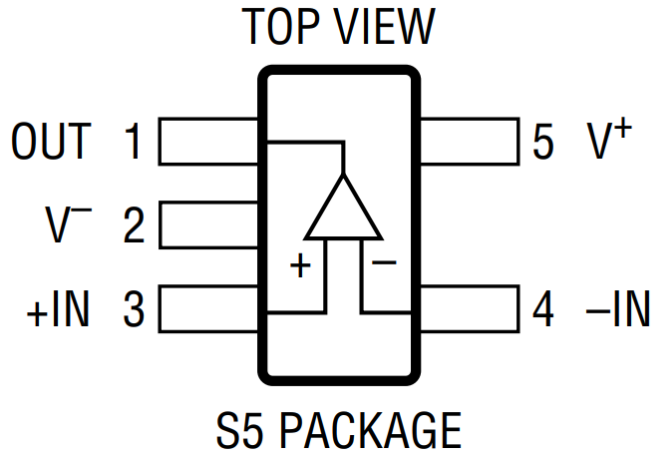






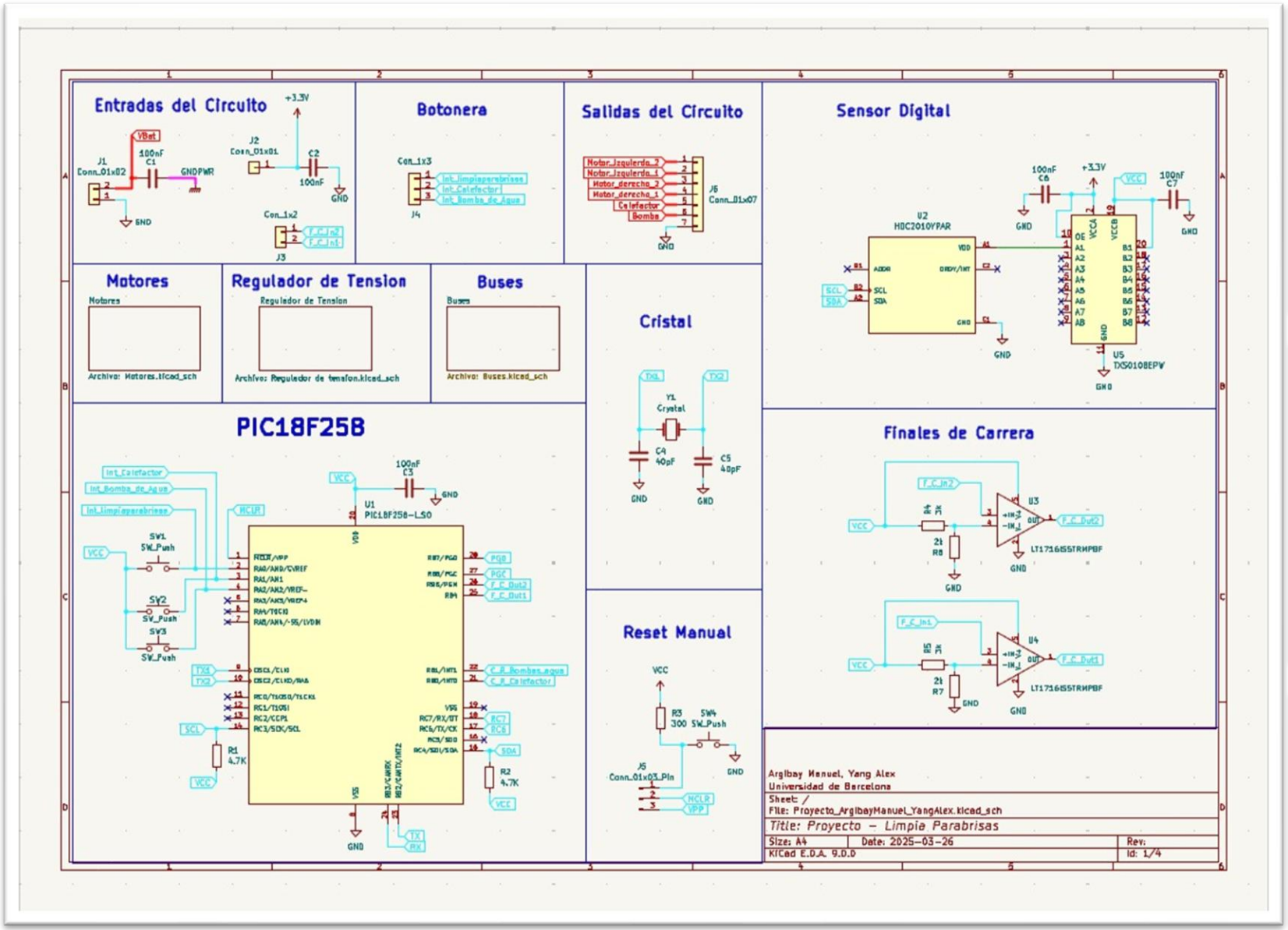
MATE-12B-10-15

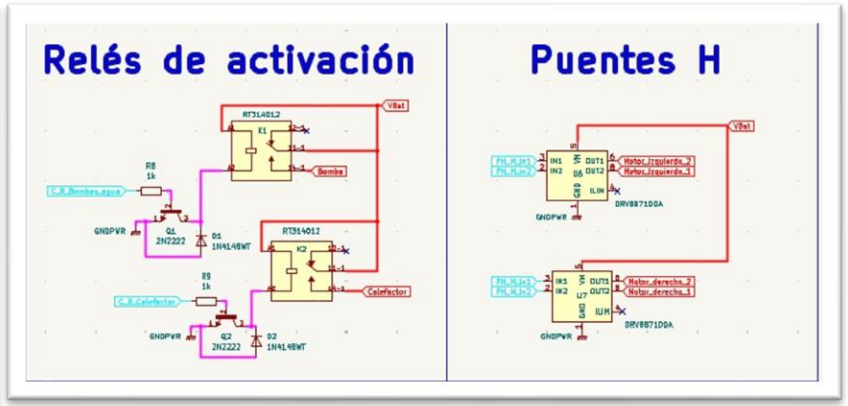
Amplificador Operacional

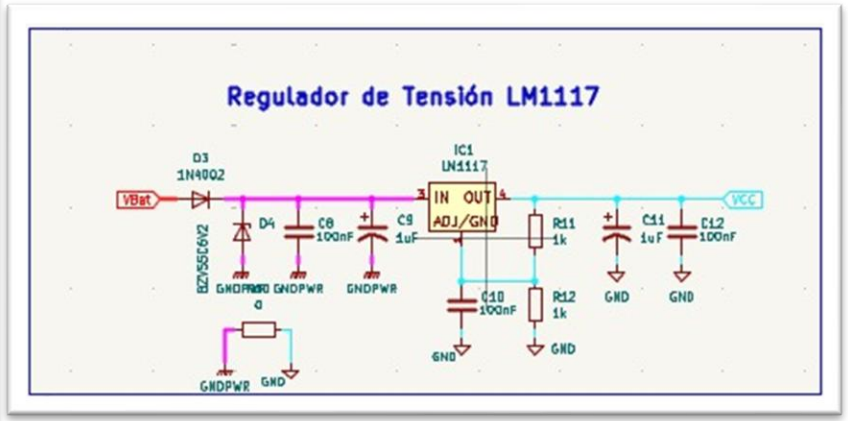


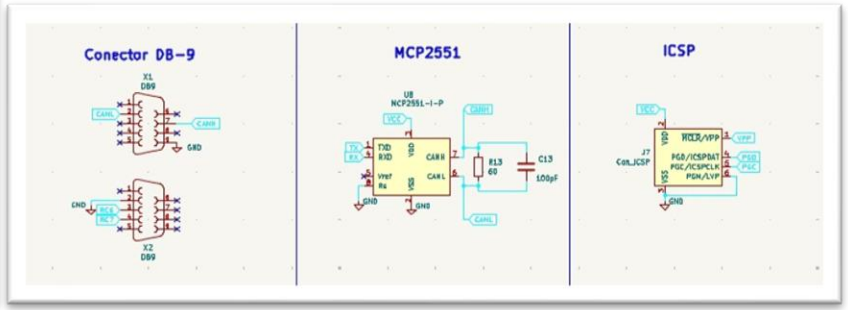
LT1716

Esquemático del circuito

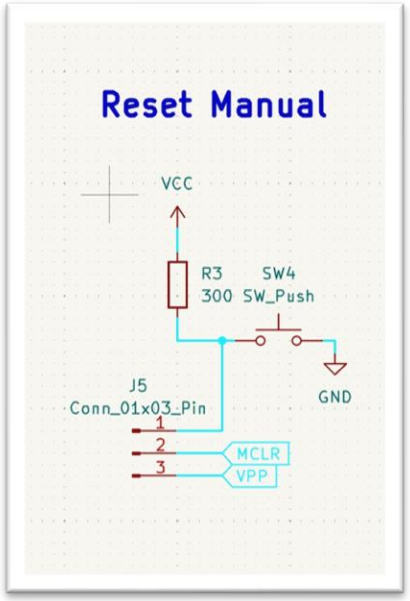


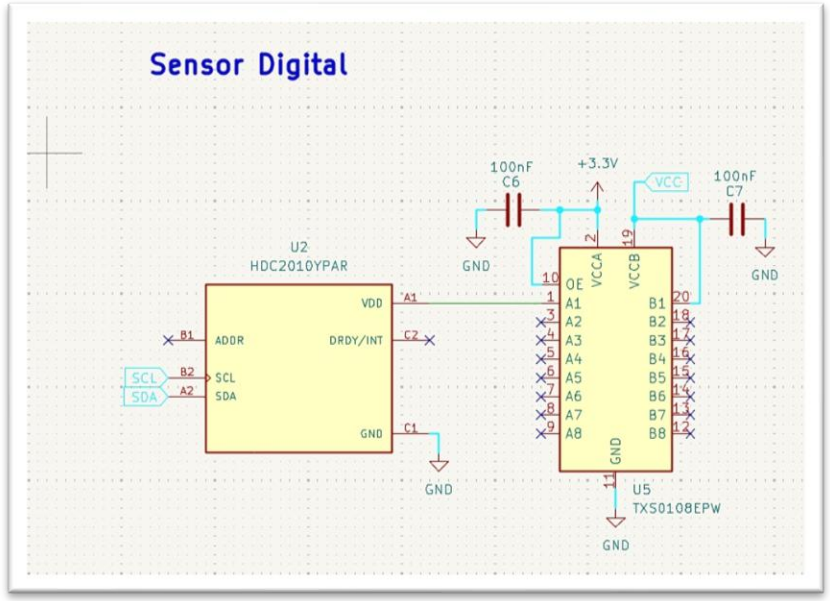


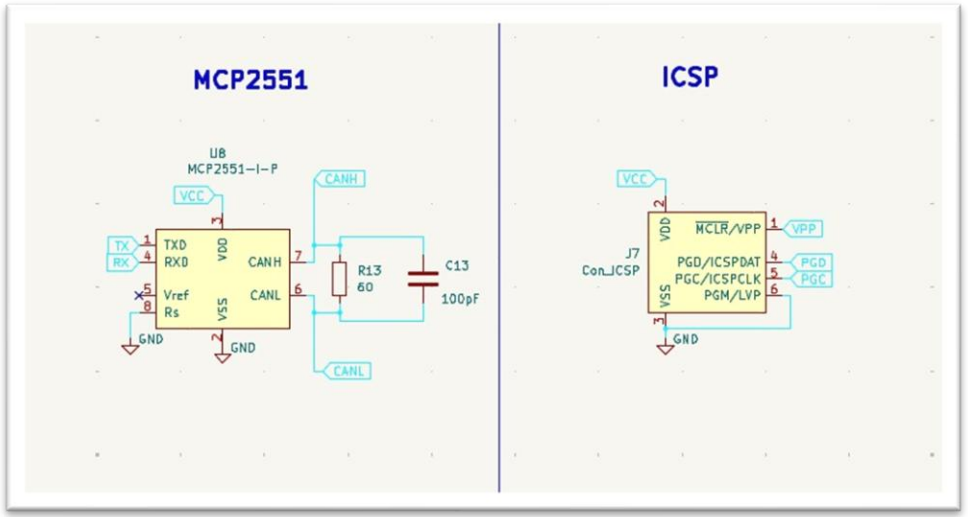


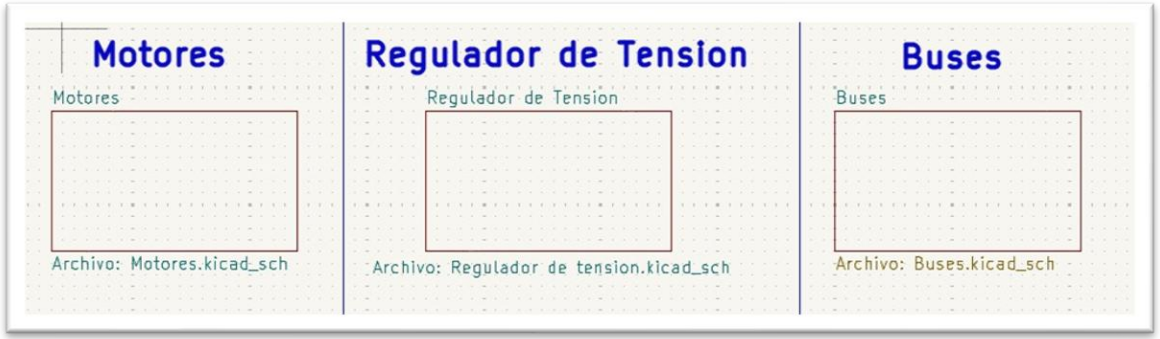


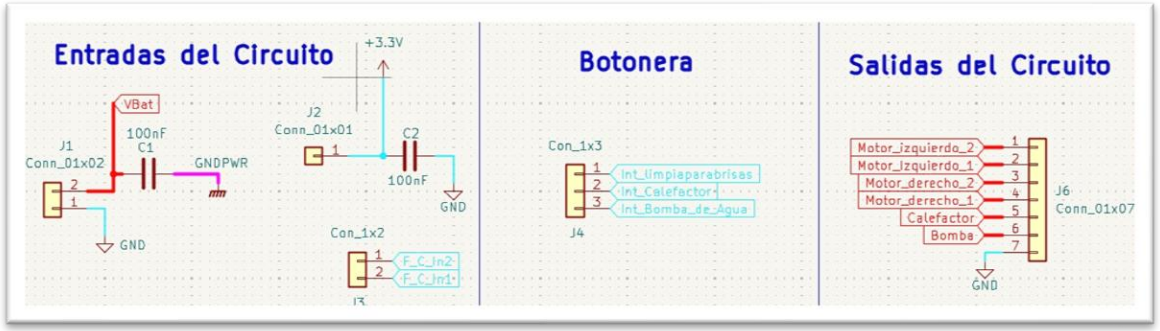
Cambios


Reset Manual
VCC
R3
300
SW4
SW_Push
GND
J5
Conn_01x03_Pin
MCLR
VPP

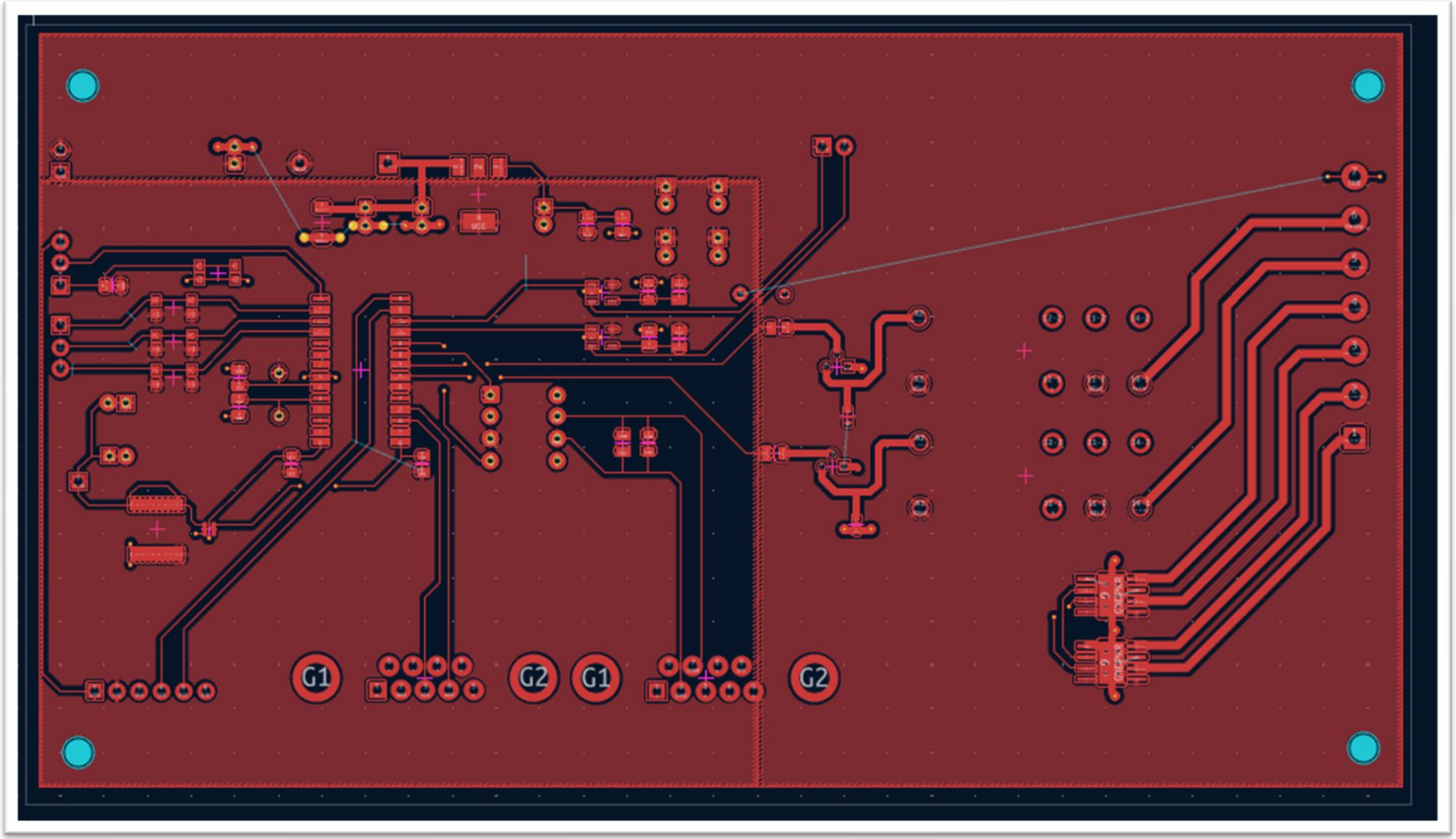

Sensor Digital
100nF
C6
+3.3V
VCC
100nF
C7
GND
U2
HDC2010YPAR
VDD
ADDR
DRDY/INT
SCL
SDA
GND
OE
VCCA
VCCB
GND
U5
TXS0108EPW


MCP2551
U8
MCP2551-I-P
VCC
TXD
RXD
Vref
Rs
VDD
VSS
CANH
CANL
R13
60
C13
100pF
GND
ICSP
J7
Conn_ICSP
MCLR/VPP
PGD/ICSPDAT
PGC/ICSPCLK
PGM/LVP
VPP
PGD
PGC

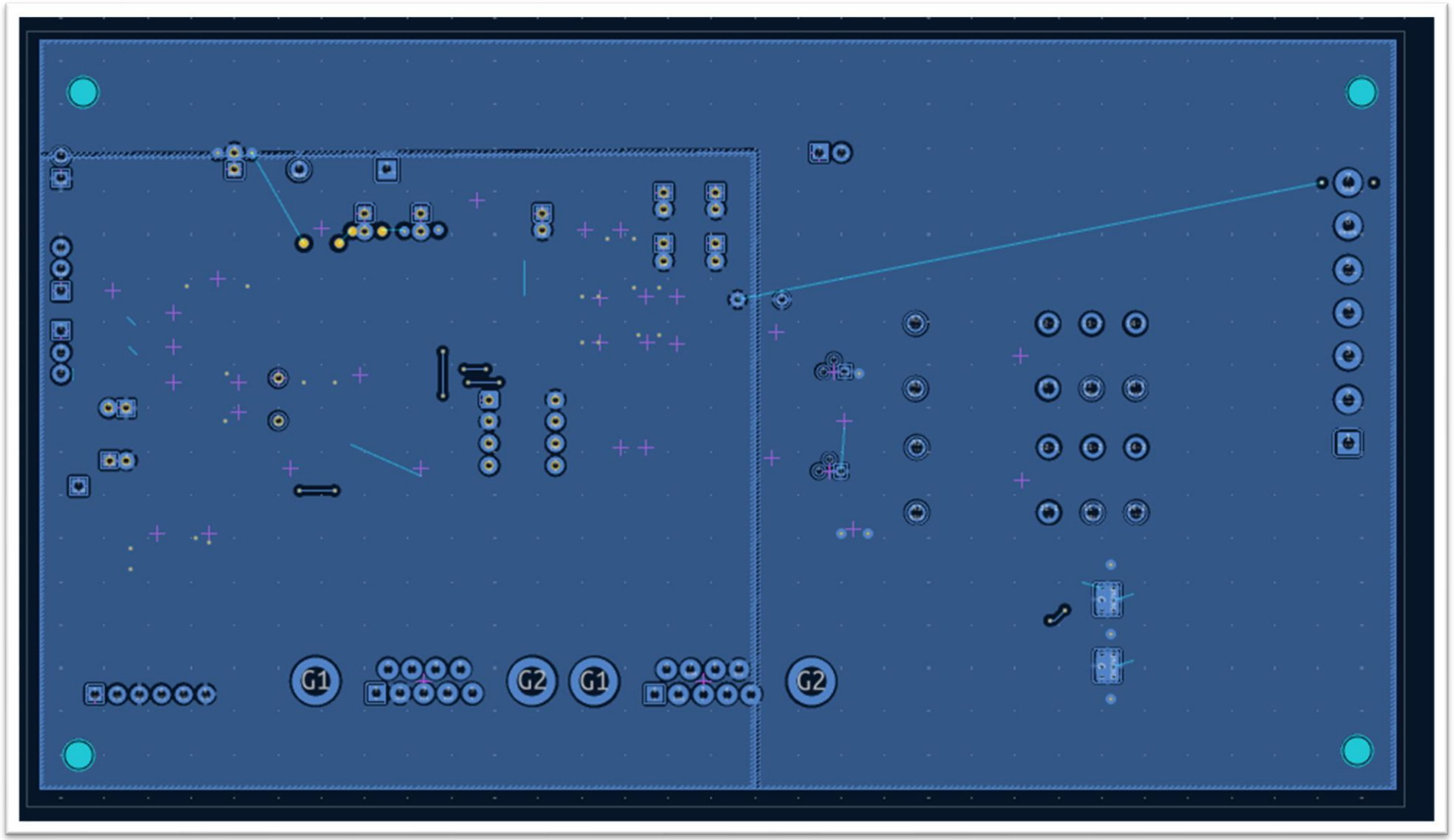

Motores
Motores
Archivo: Motores.kicad_sch
Regulador de Tension
Regulador de Tension
Archivo: Regulador de tension.kicad_sch
Buses
Buses
Archivo: Buses.kicad_sch


Entradas del Circuito
VBat
J1
Conn_01x02
100nF
C1
GNDPWR
GND
+3.3V
J2
Conn_01x01
C2
100nF
Con_1x2
Botonera
Con_1x3
Int_limpiaparabrisas
Int_Calefactor
Int_Bomba_de_Agua
J4
Salidas del Circuito
Motor_izquierdo_2
Motor_izquierdo_1
Motor_derecho_2
Motor_derecho_1
Calefactor
Bomba
J6
Conn_01x07

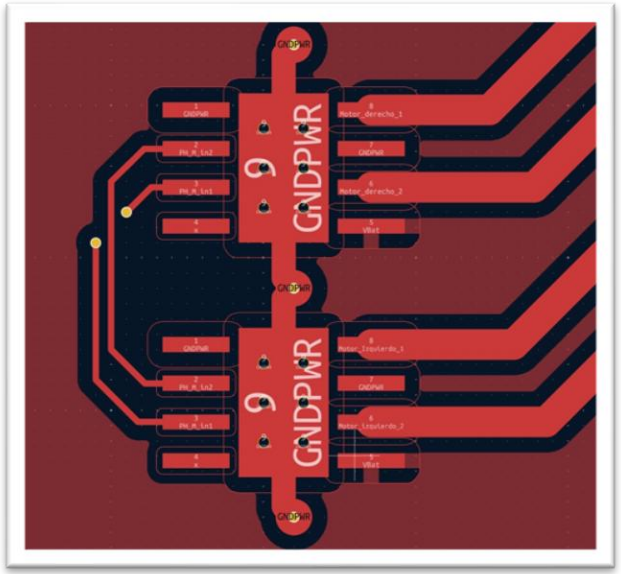
Layout (TOP)

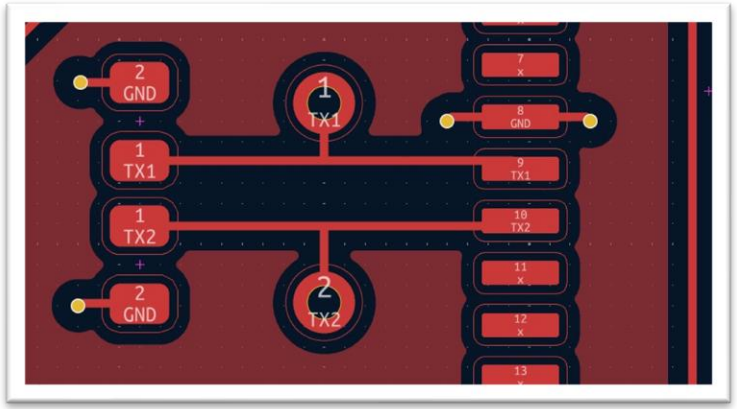


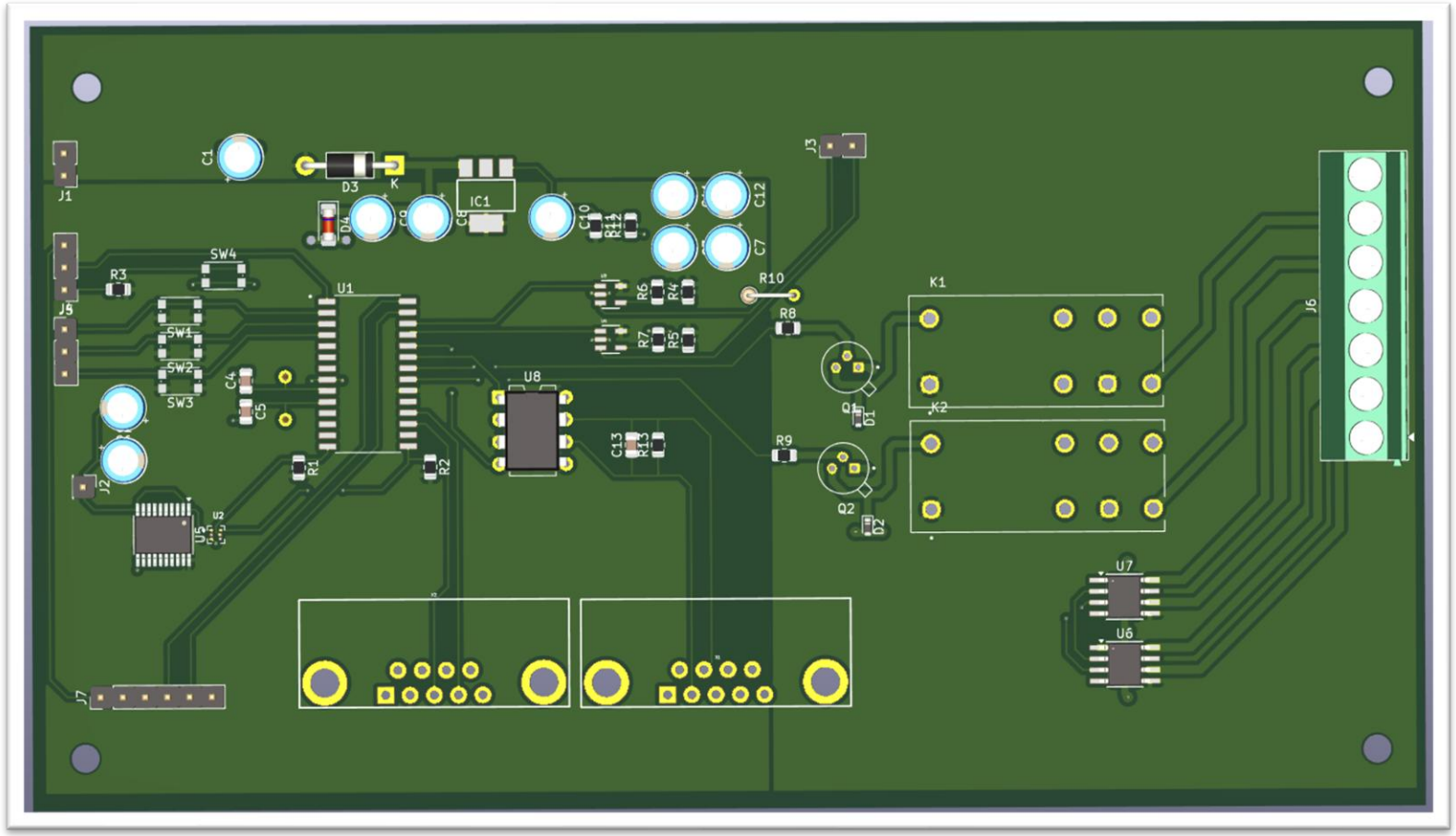
Bottom



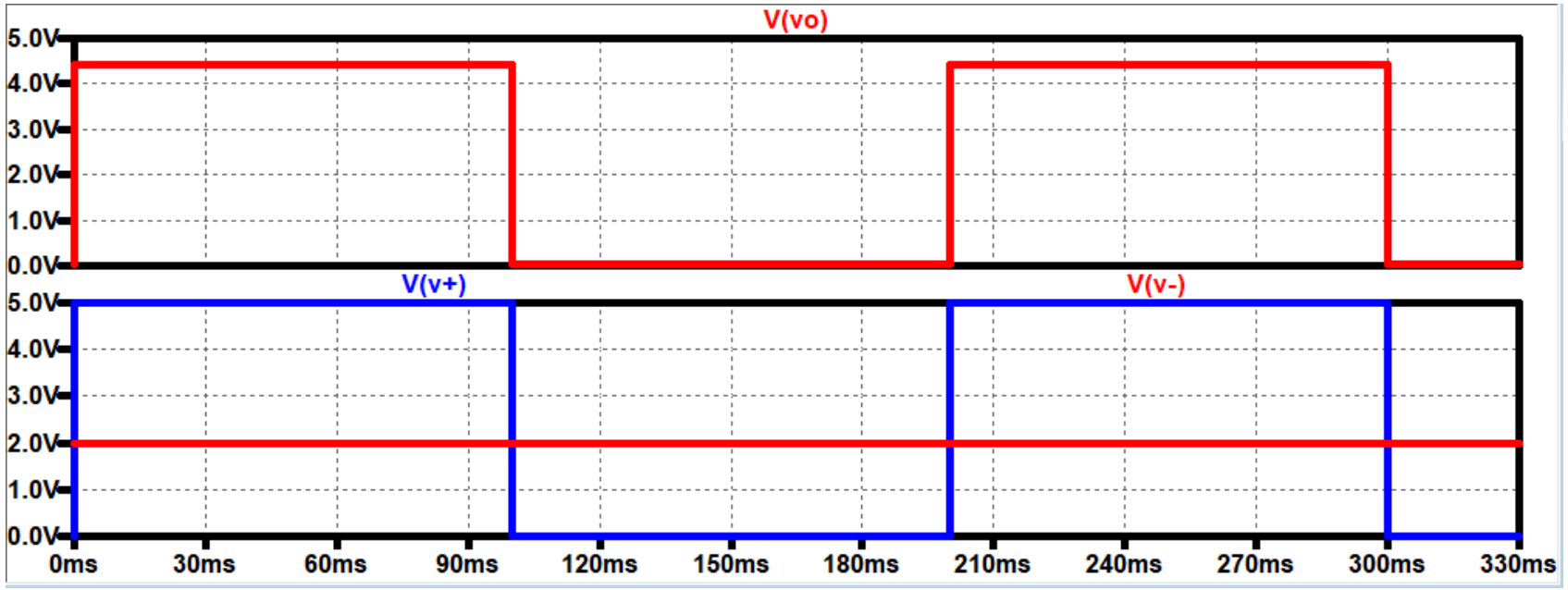
Cosas a destacar del Layout

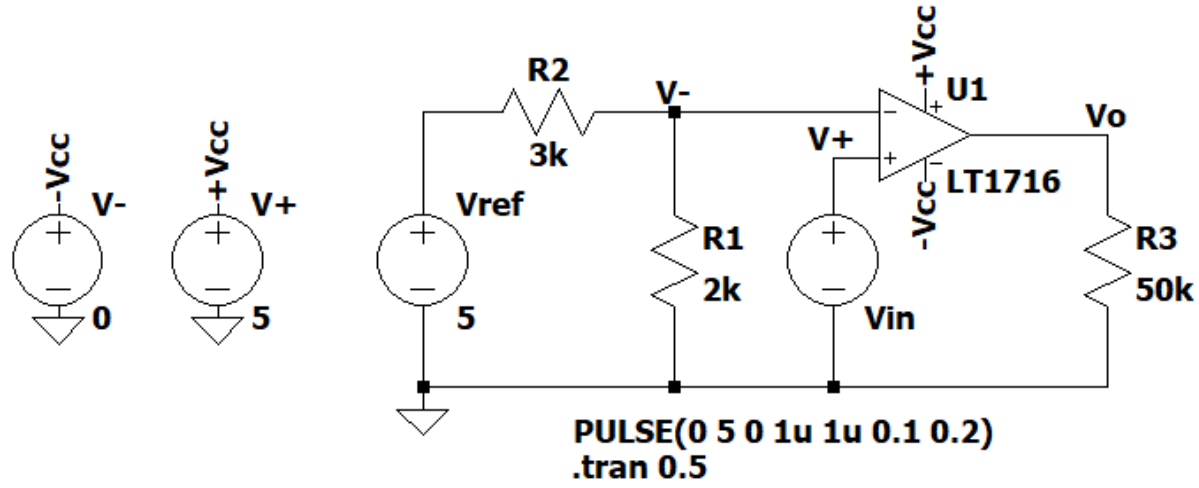




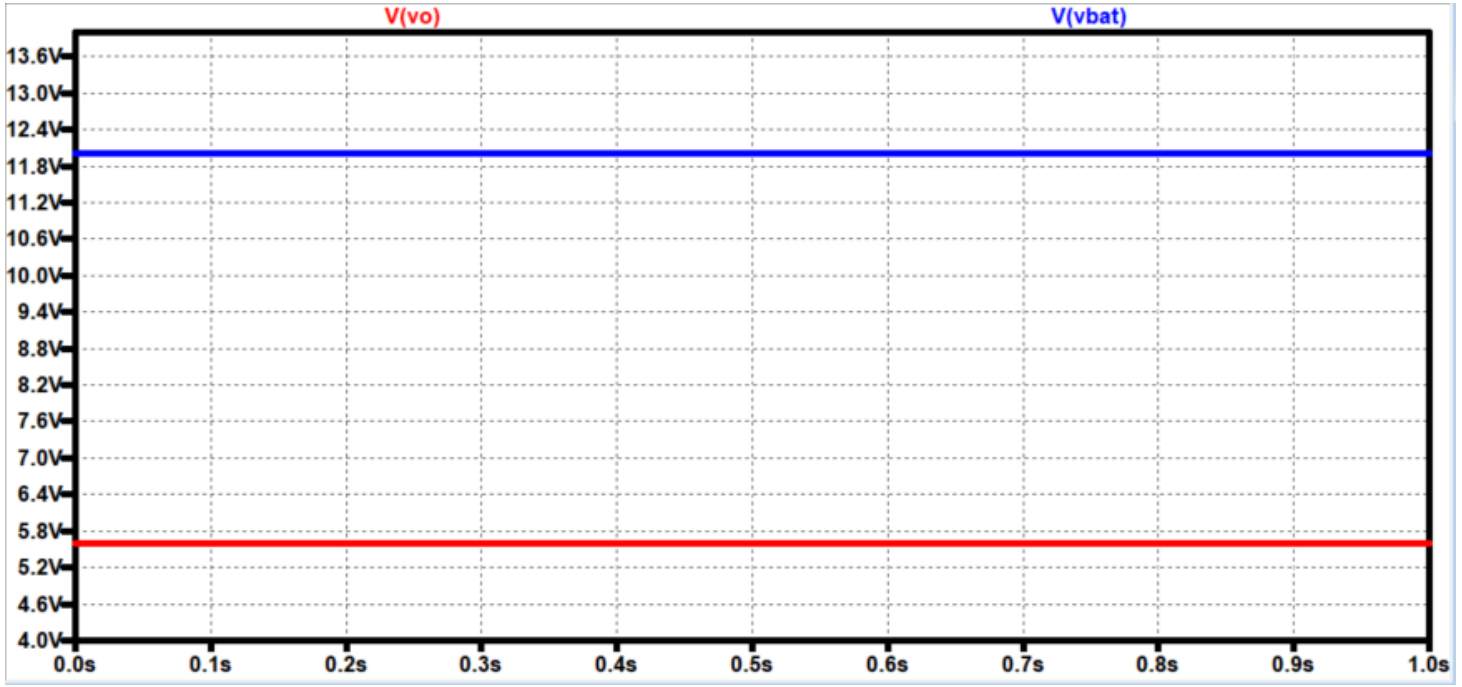


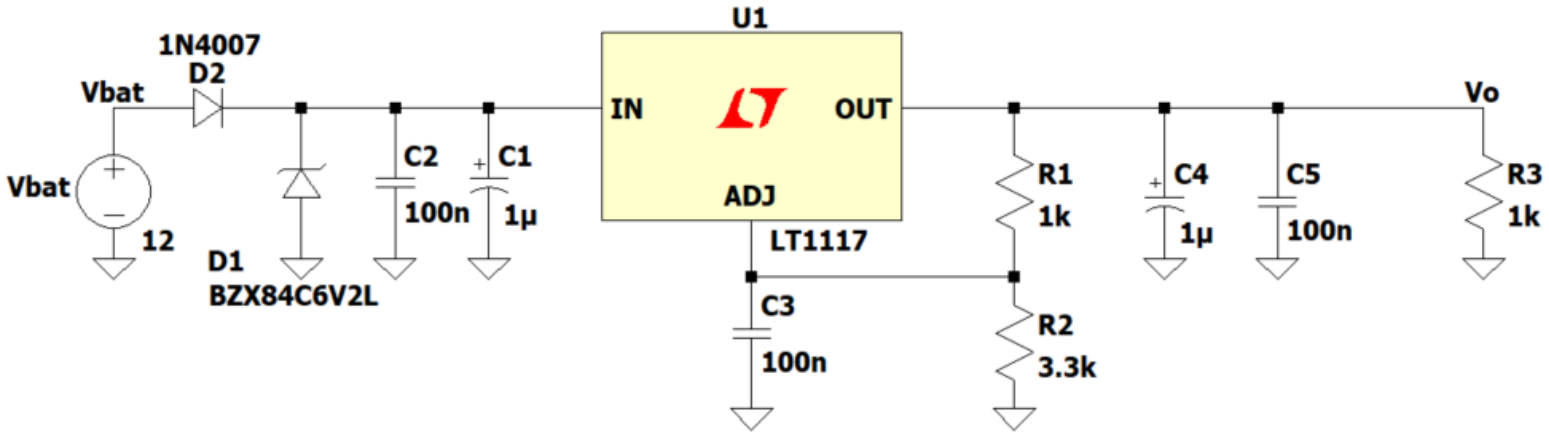
Simulación del comparador





Simulación del regulador





Bibliografía

- Puente H: https://www.mouser.es/ProductDetail/Texas-Instruments/DRV8871DDARQ1?qs=AQlKX63v8RstMGgN6CYN5Q%3D%3D
- Final de carrera: https://www.mouser.es/ProductDetail/Littelfuse/MATE-12B-10-15?qs=VJzv269c%252BPbO1tueKz5qUA%3D%3D
- Sensor HIH6130: https://prod-edam.honeywell.com/content/dam/honeywell-edam/sps/siot/en-ca/products/sensors/humidity-with-temperature-sensors/honeywell-humidicon-hih6100-series/documents/sps-siot-hih6130-6131-install-50061154-3-en-ciid-142166.pdf
- Regulador LM1117: https://www.ti.com/lit/ds/symlink/lm1117.pdf?ts=1743271923242&ref_url=https%253A%252F%252Fwww.ti.com%252Fproduct%252Fes-mx%252FLM1117
- Calefactor: https://www.digikey.com/es/products/detail/riedon-products-by-bourns/PTCA-40/10271325
- Funcionamiento de Reed Switch: https://www.youtube.com/shorts/parNm9pB5Yw
- Opamp: https://www.mouser.es/ProductDetail/Analog-Devices/LT1716HS5WTRMPBF?qs=wnTfsH77Xs7Skv7hhFl%2Fog%3D%3D
- Relé: https://www.mouser.es/ProductDetail/Omron-Electronics/G5LE-1-DC12?qs=Rh%252BaoYk36r4VGdet26ofGg%3D%3D&srsltid=AfmBOooAyKs2Mql2XdE5AiwUxQem_03q25LeT7B3V_xfZvShMnbi9I-o
- BJT: https://www.mouser.es/ProductDetail/Central-Semiconductor/2N2222-PBFREE?qs=u16ybLDytRZWJogOmjHVFA%3D%3D