



# Proyecto: Limpiaparabrisas

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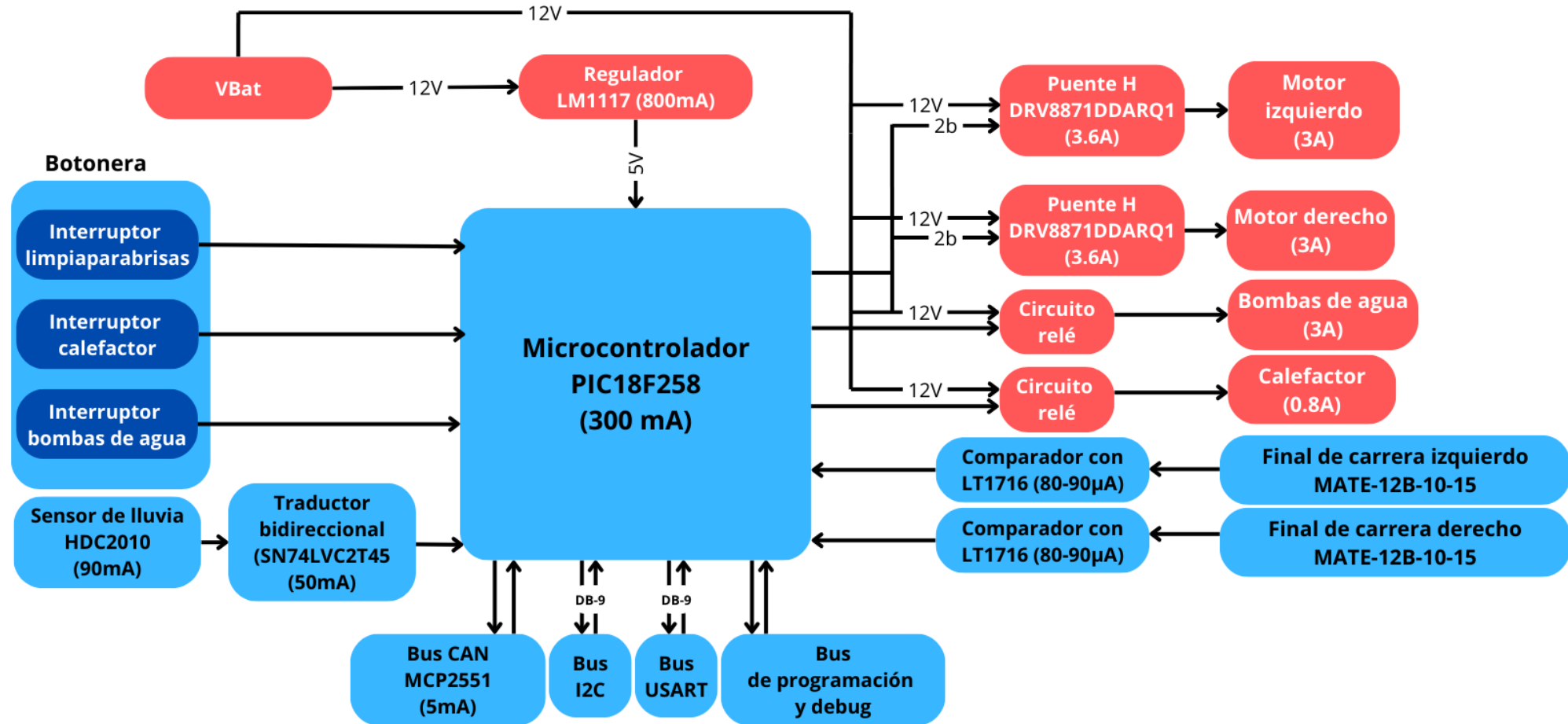
# Funcionalidad y objetivos

- 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

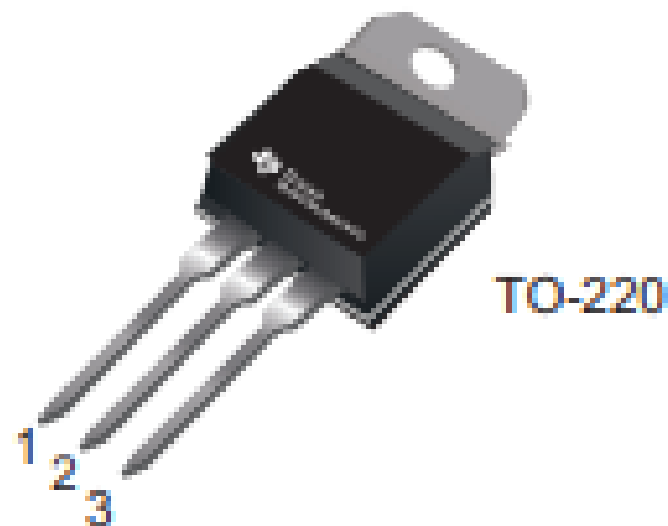
- Microcontrolador PIC18FXX8
- Transceptor MCP2551
- Bus de programación y debug
- Bus CAN
- Bus  $I^2C$
- Botonera
- Fuente de 12V
- Regulador de tensión
- 2 motores DC
- 2 bombas de líquido limpiaparabrisas
- Sensor digital de lluvia
- Calefactor del vidrio
- 2 puentes “H”
- 2 relés electromagnéticos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

# Diagrama de Bloques



# Regulador de tensión

LM1117



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

I <sub>OUT</sub>	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 <sub>JA</sub>	61.6	104.3	°C/W
	TO-220 T <sub>JA</sub>	23.8	30.1	°C/W
	TO-252 T <sub>JA</sub>	45.1	50.9	°C/W
	TO-263 T <sub>JA</sub>	41.3	27.5	°C/W
	WSO-8 T <sub>JA</sub>	39.3	38.3	°C/W

# Detector de lluvia

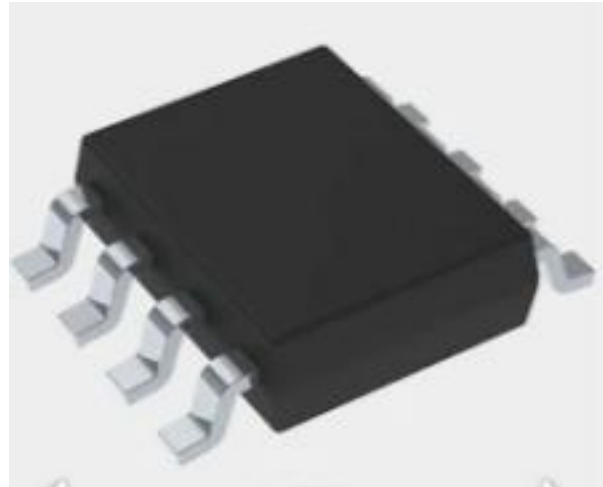
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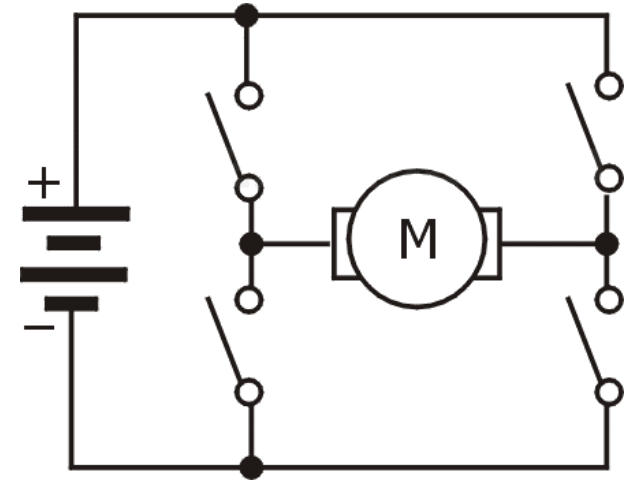
HDC2010

# 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

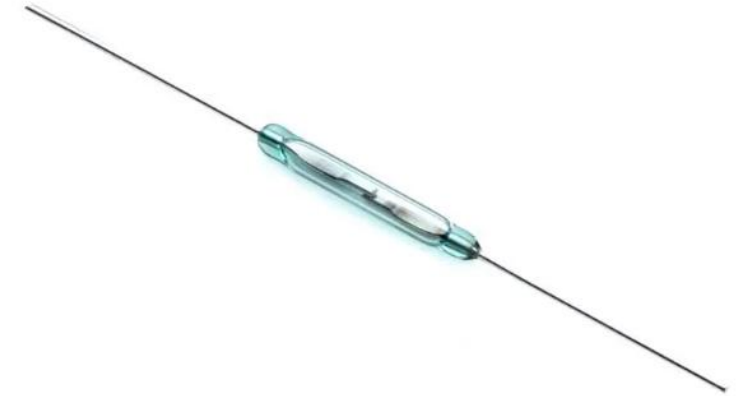
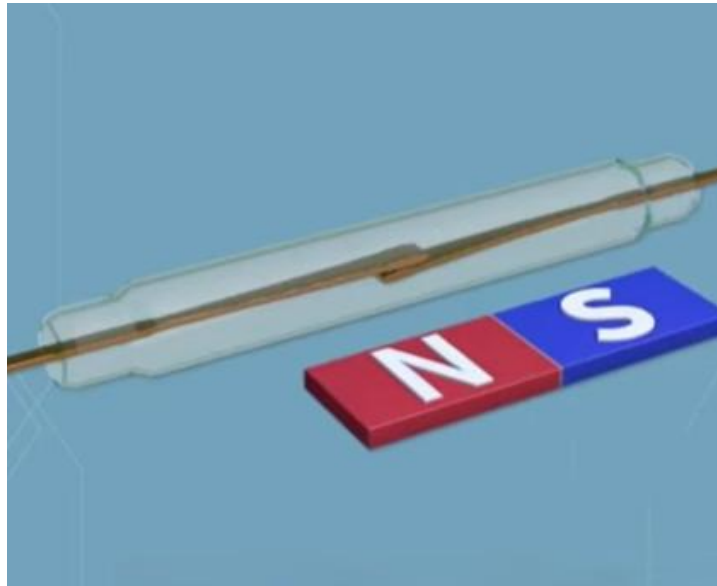
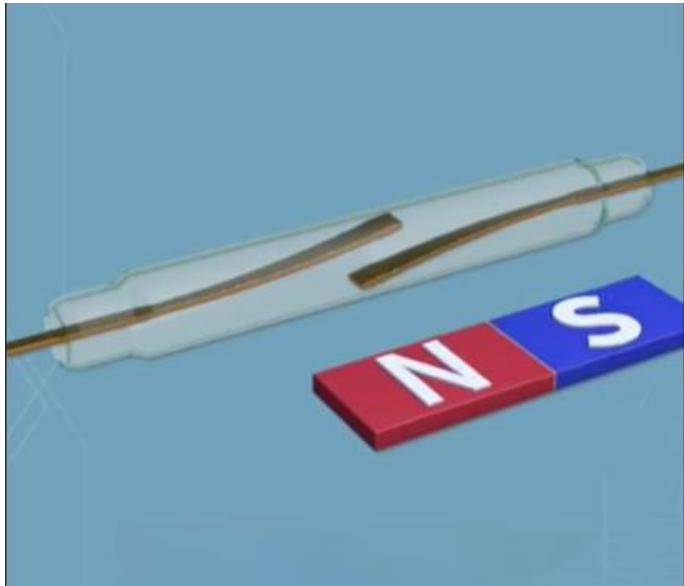


DRV8871DDARQ1



# Final de Carrera magnético (Reed Switch)

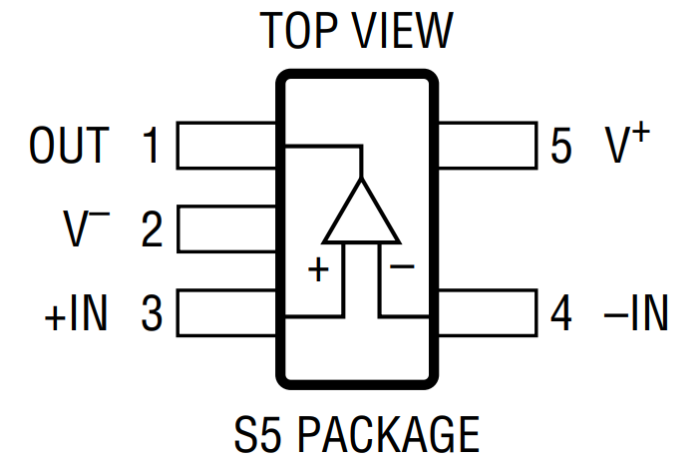
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MATE-12B-10-15

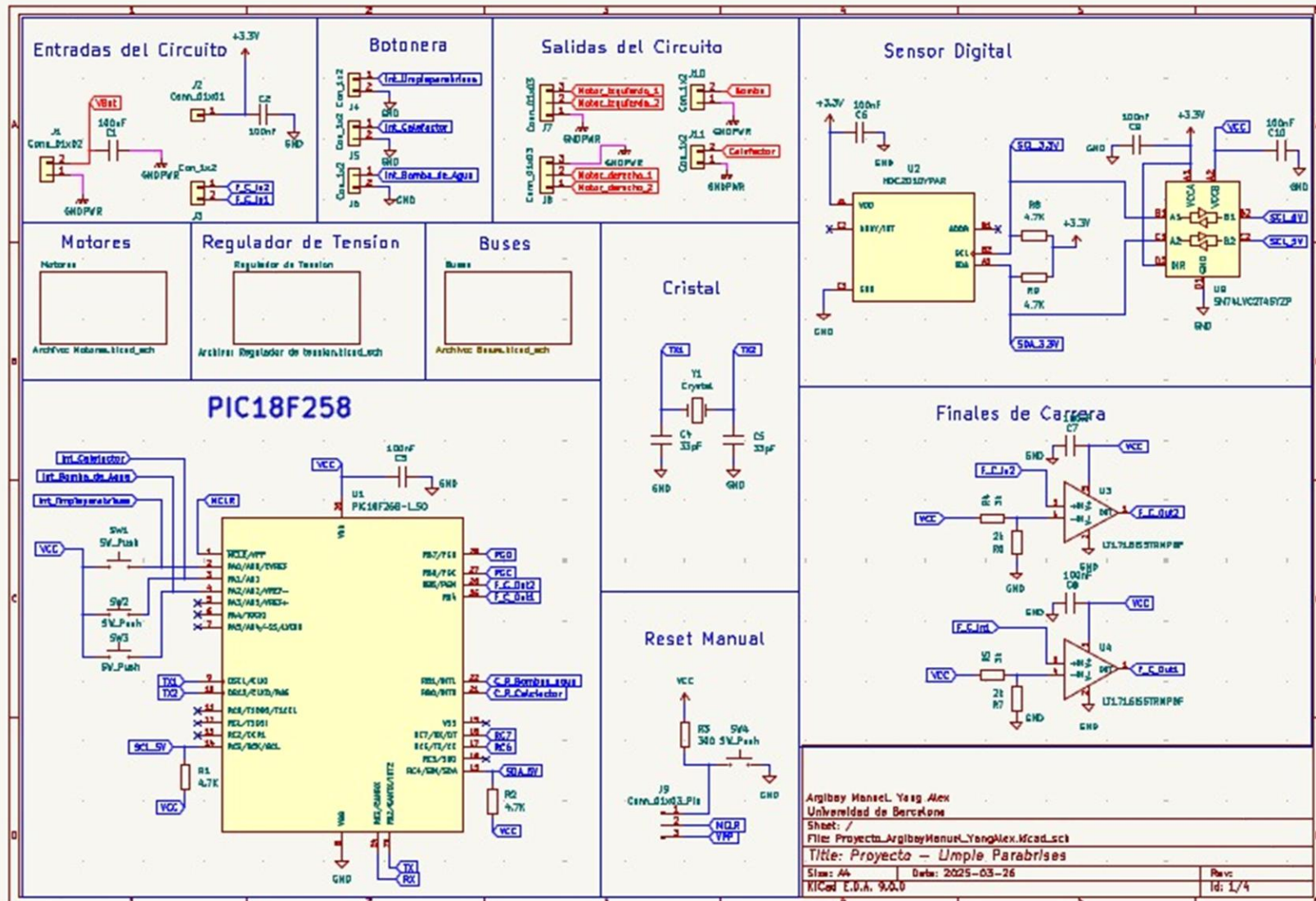


# Amplificador Operacional

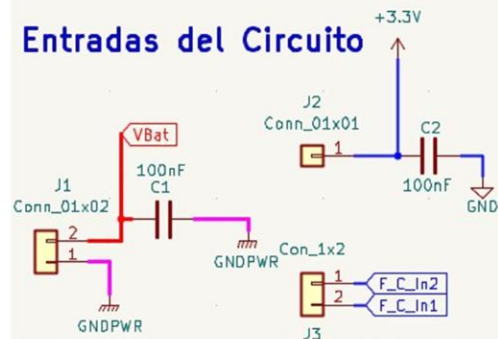


LT1716

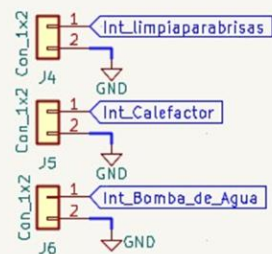
# Esquemático del circuito



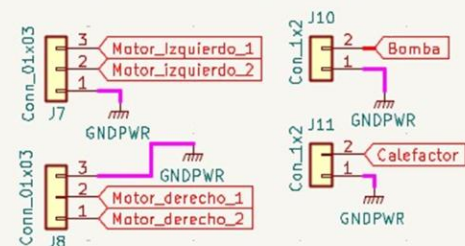
## Entradas del Circuito



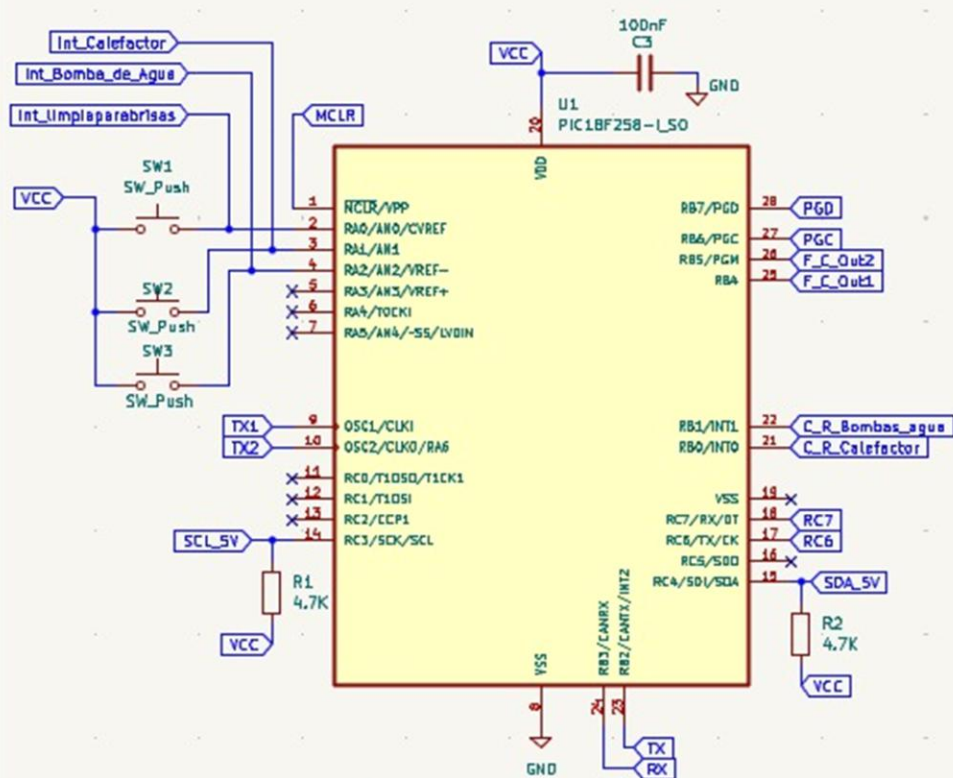
## Botonera



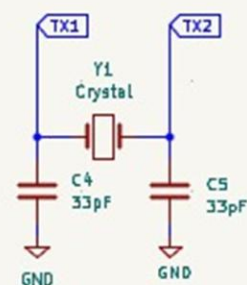
## Salidas del Circuito



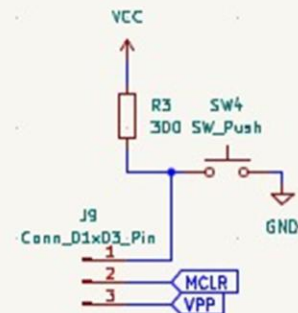
## PIC18F258

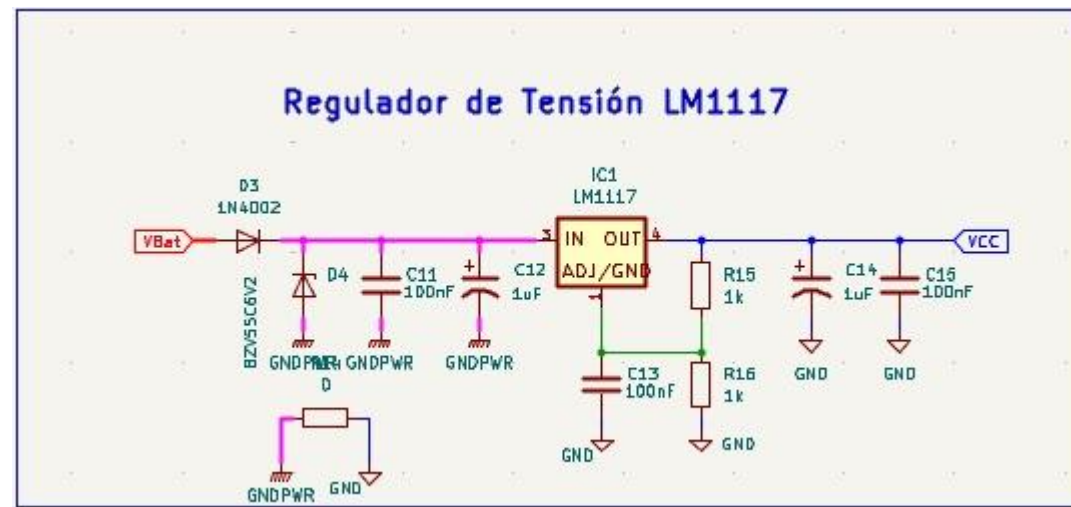
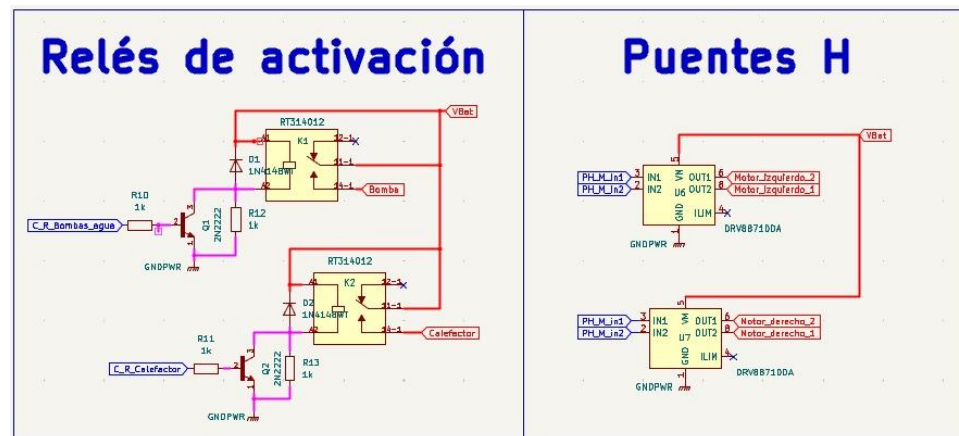
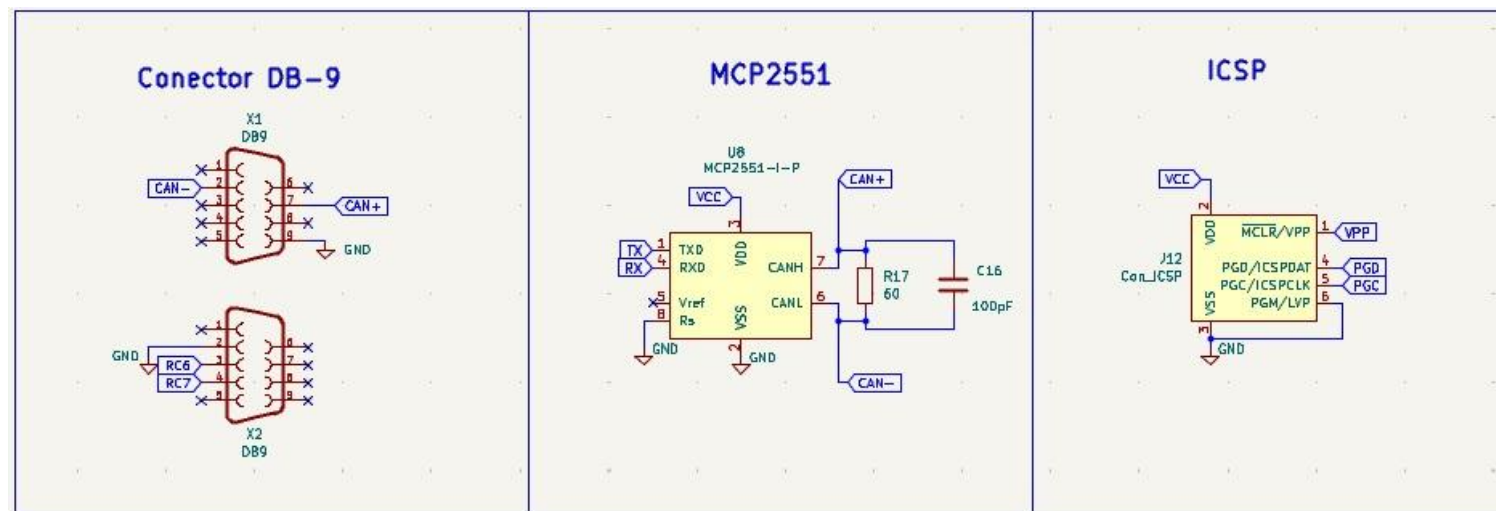


## Cristal



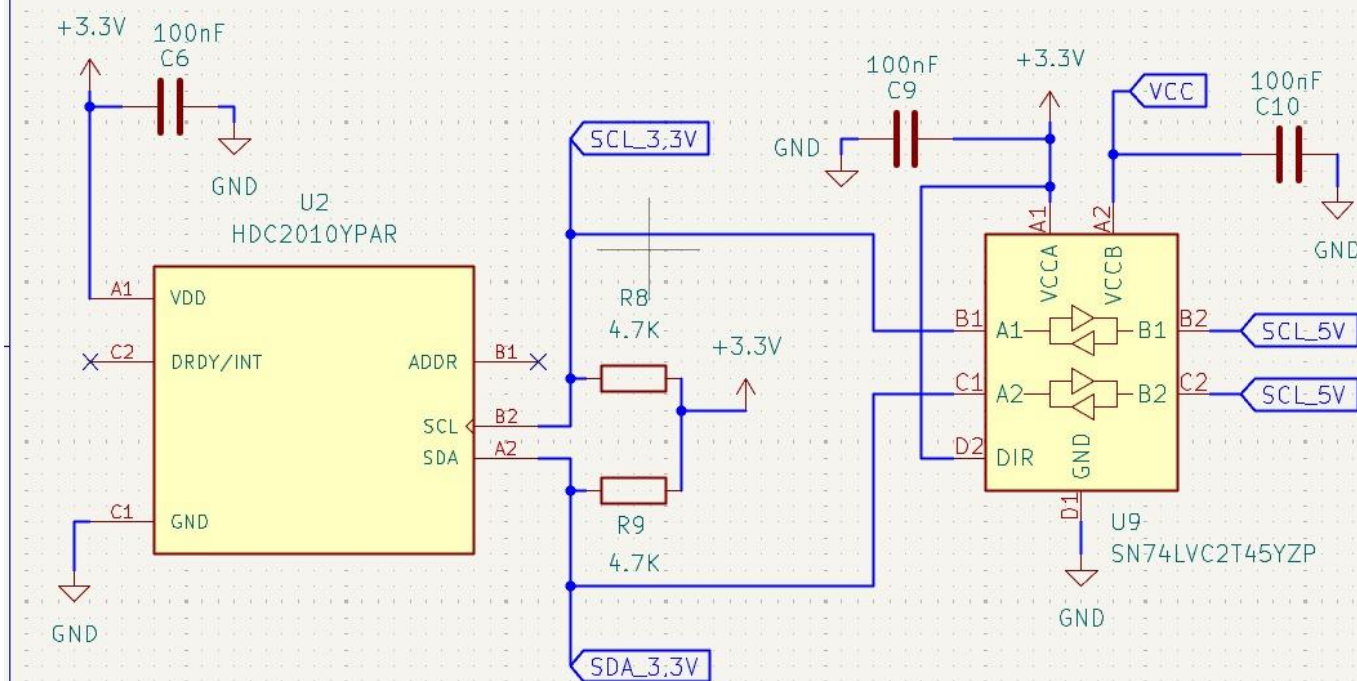
## Reset Manual



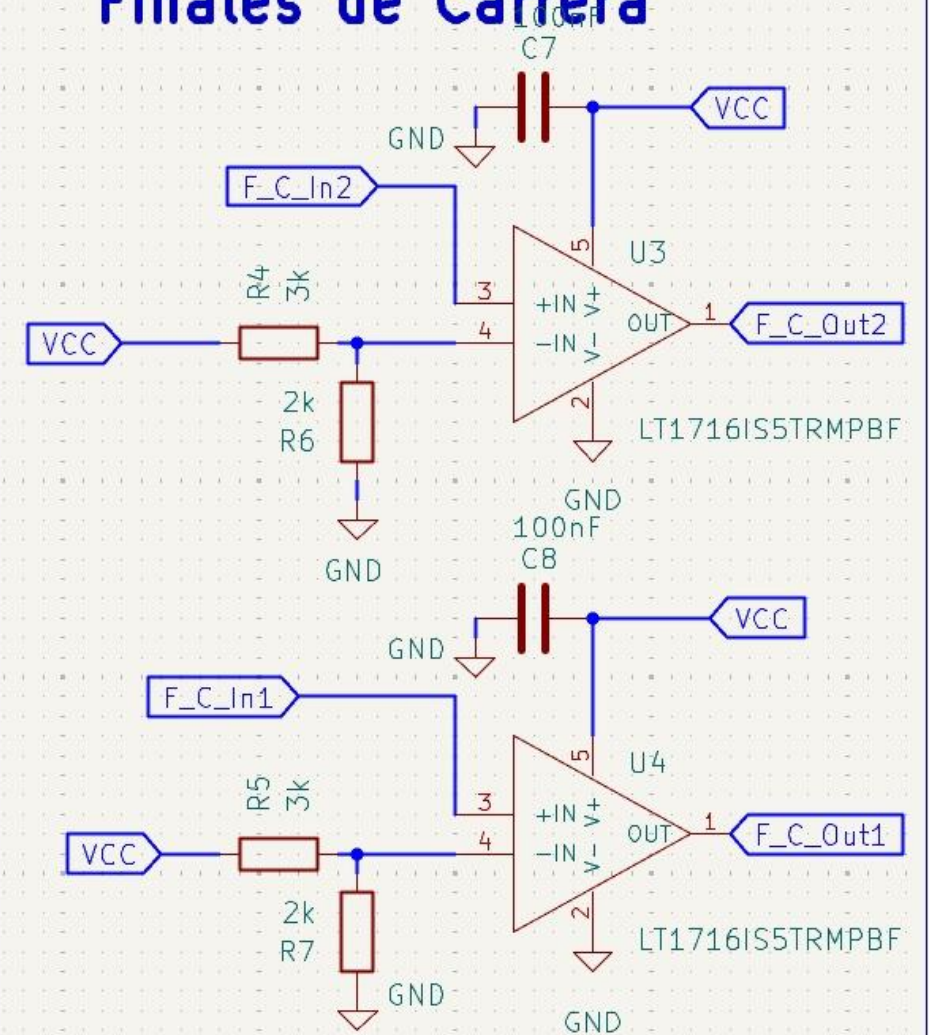




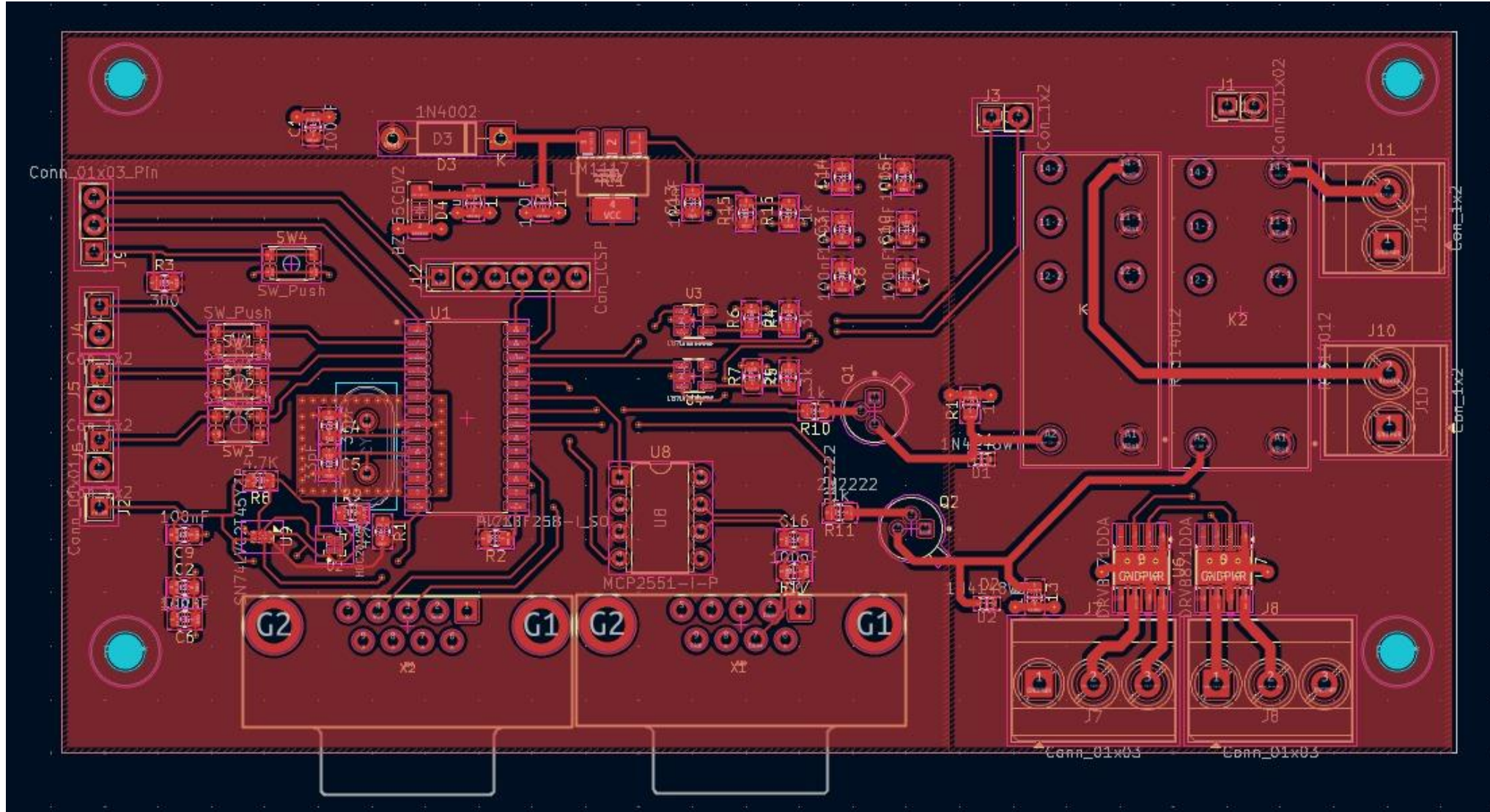
## Sensor Digital



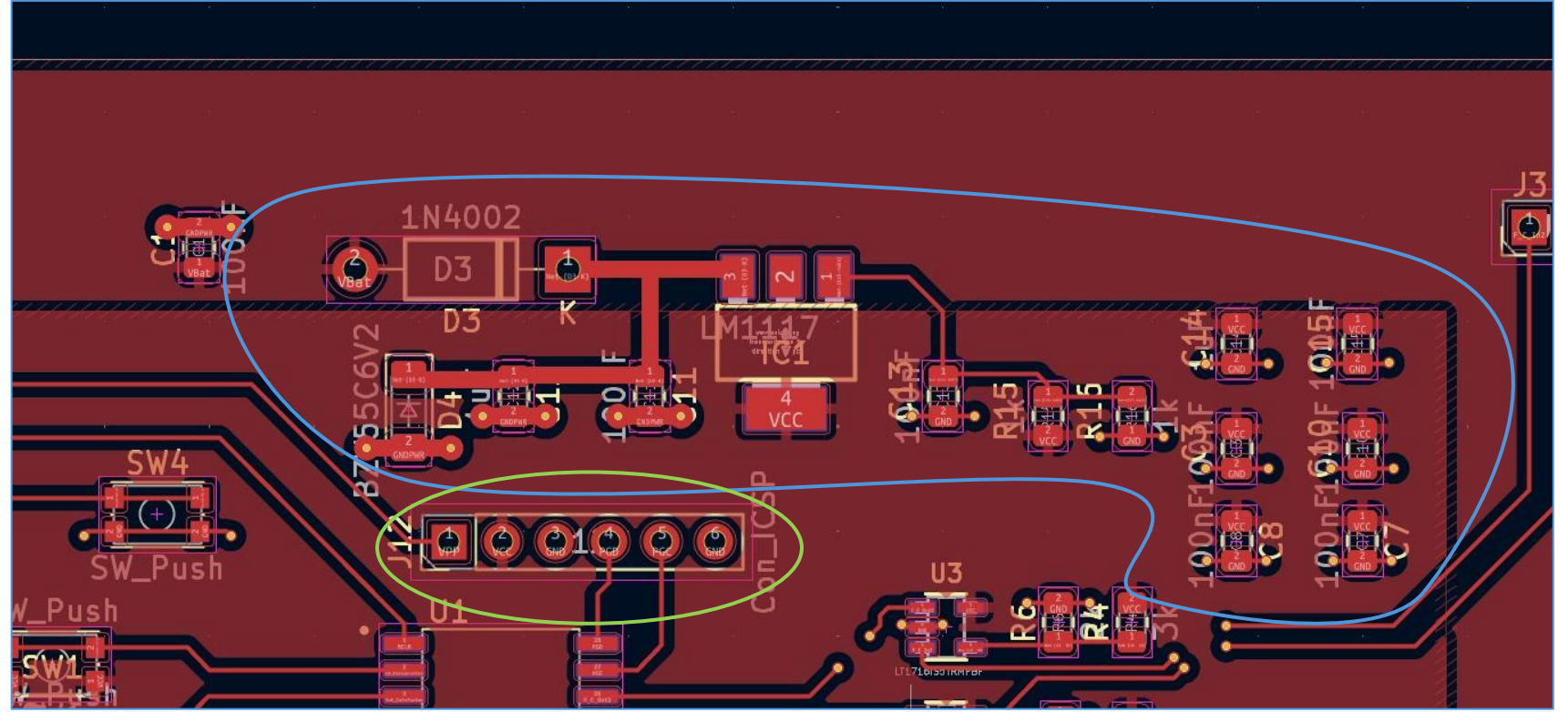
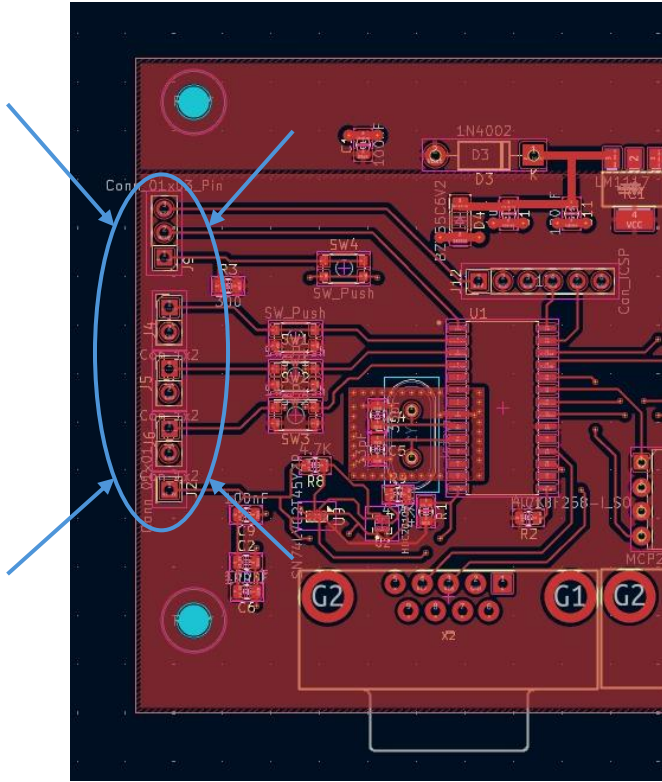
## Finales de Carrera

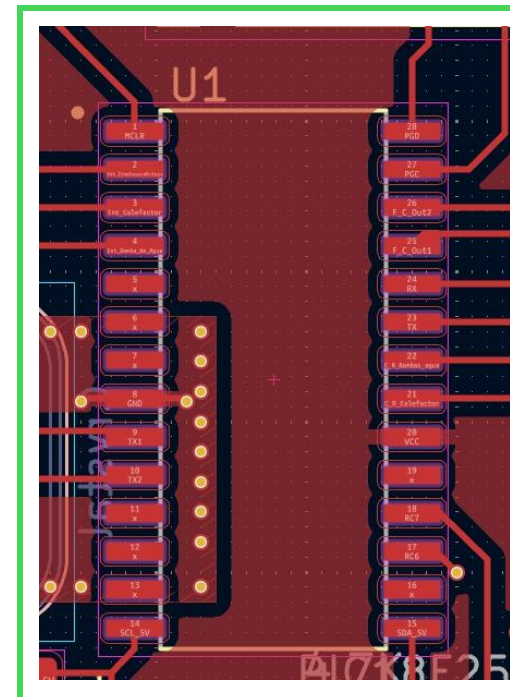
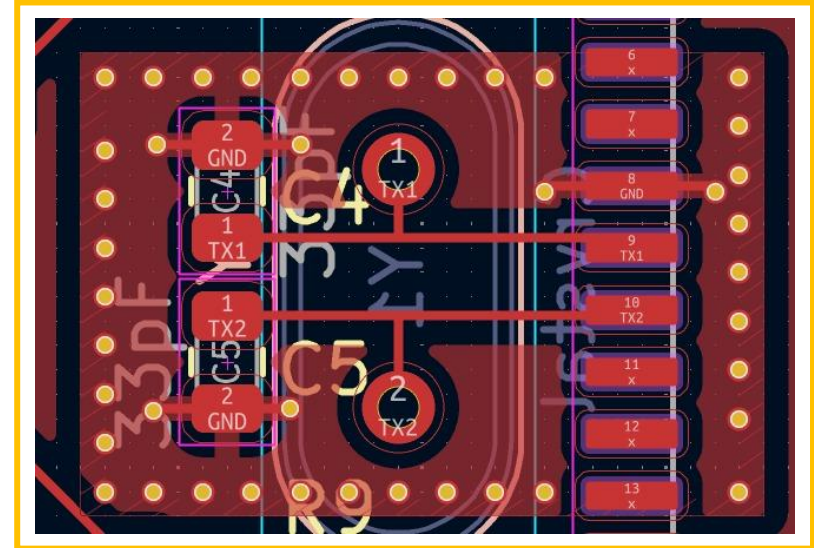
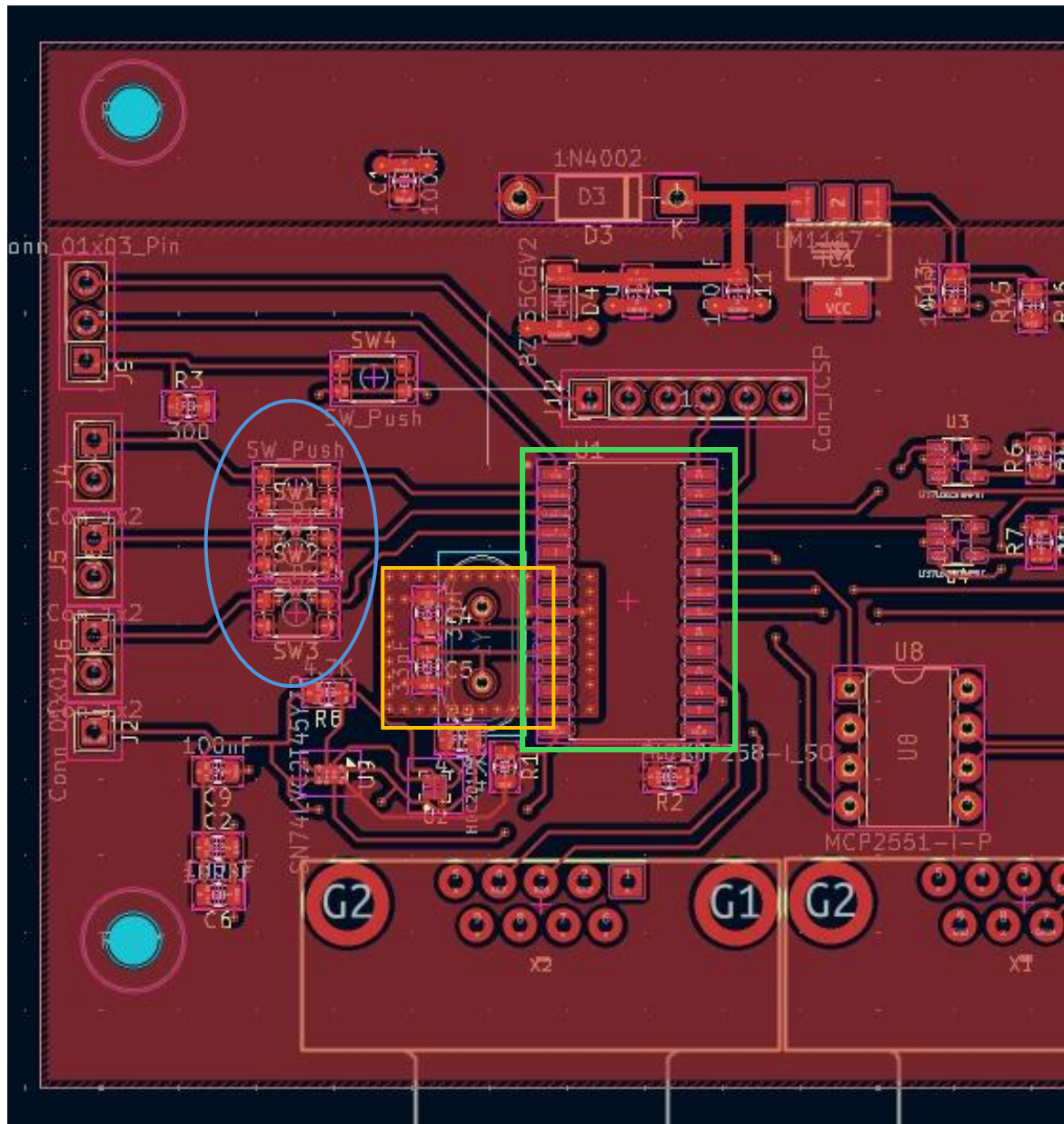


# Layout (TOP)

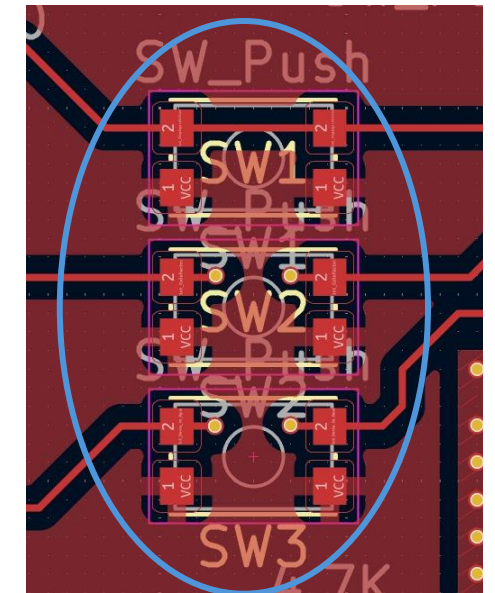








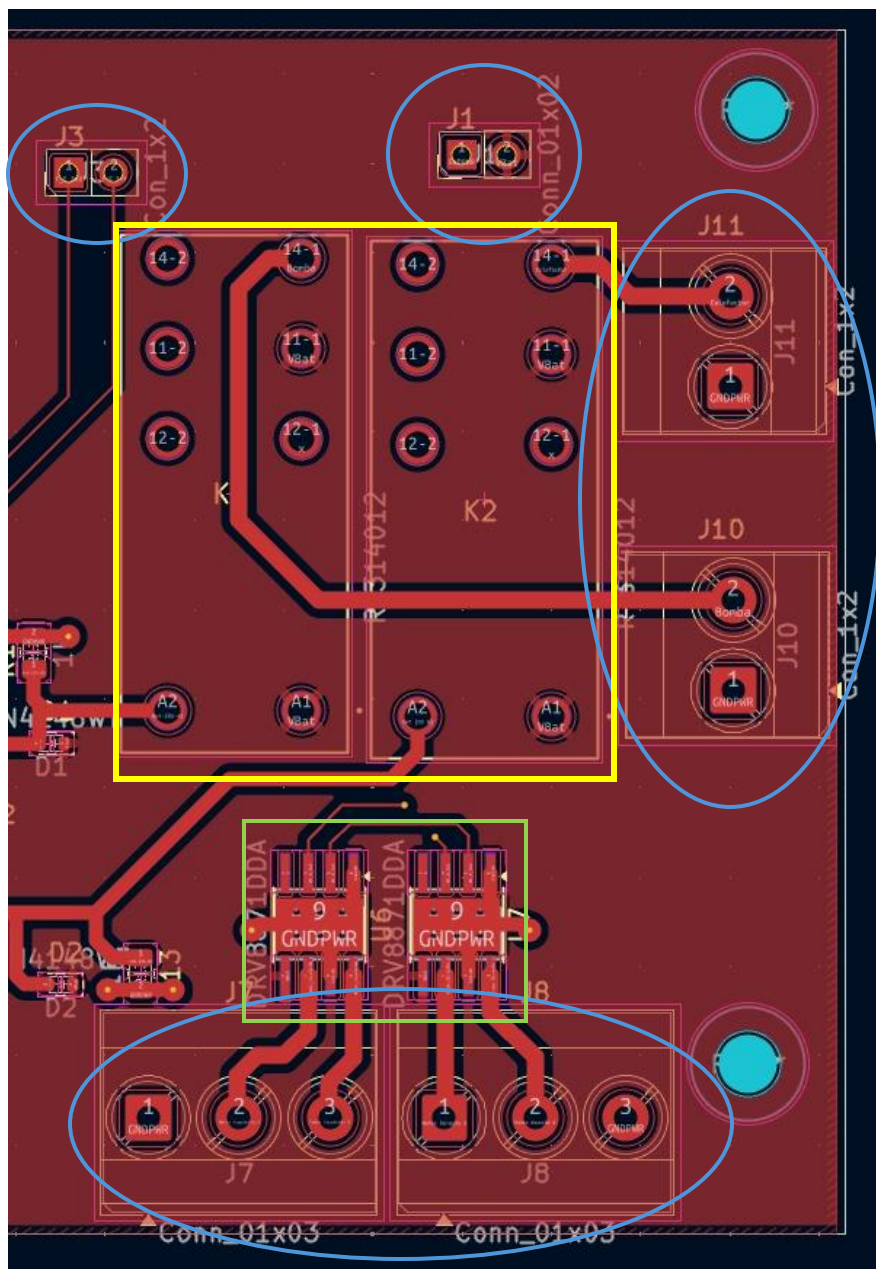
Microcontrolador



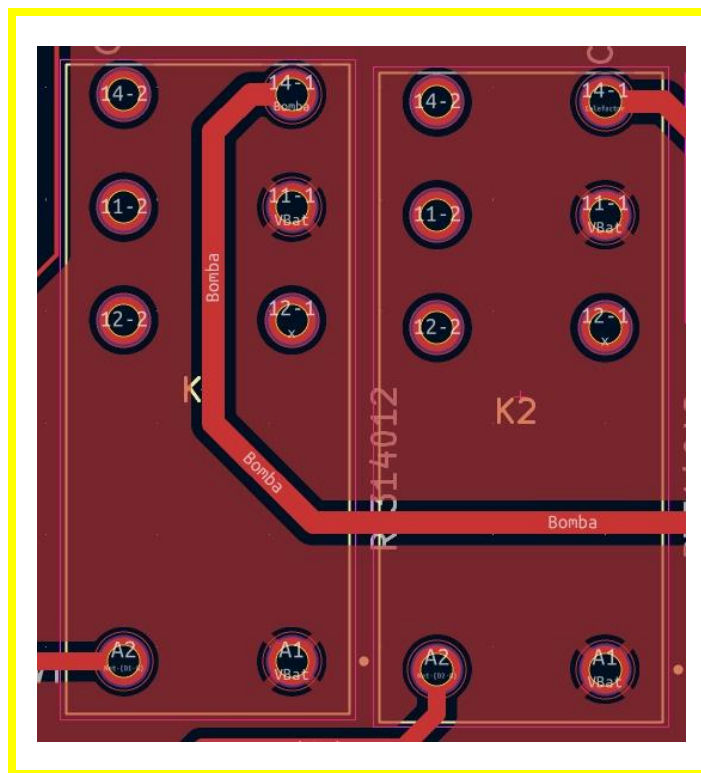
Botonera



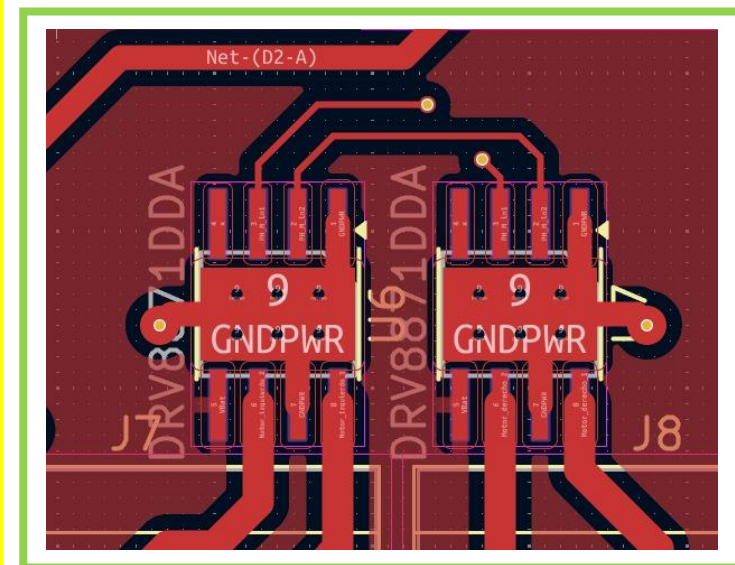




Relés de activación

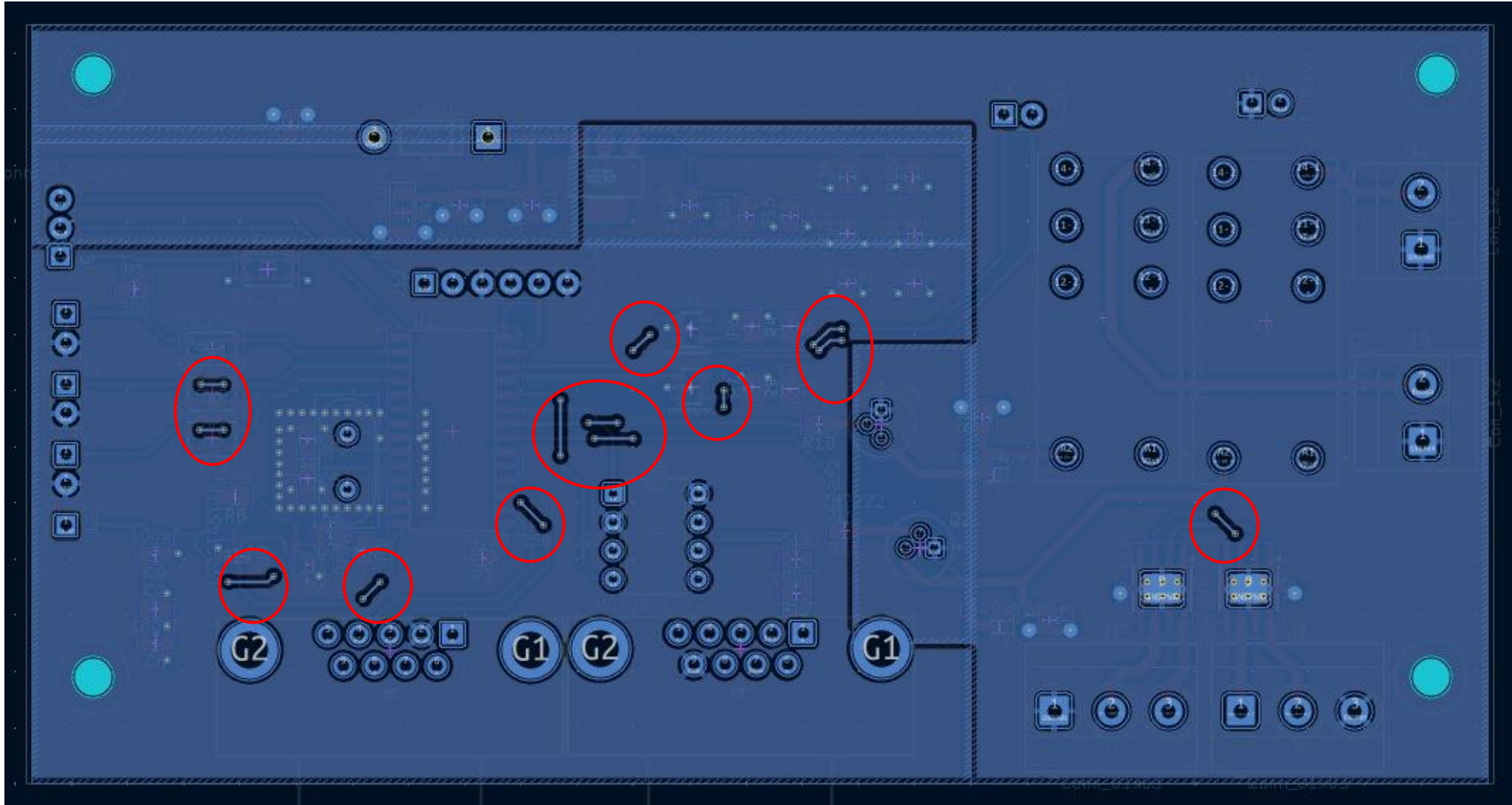


Puentes H

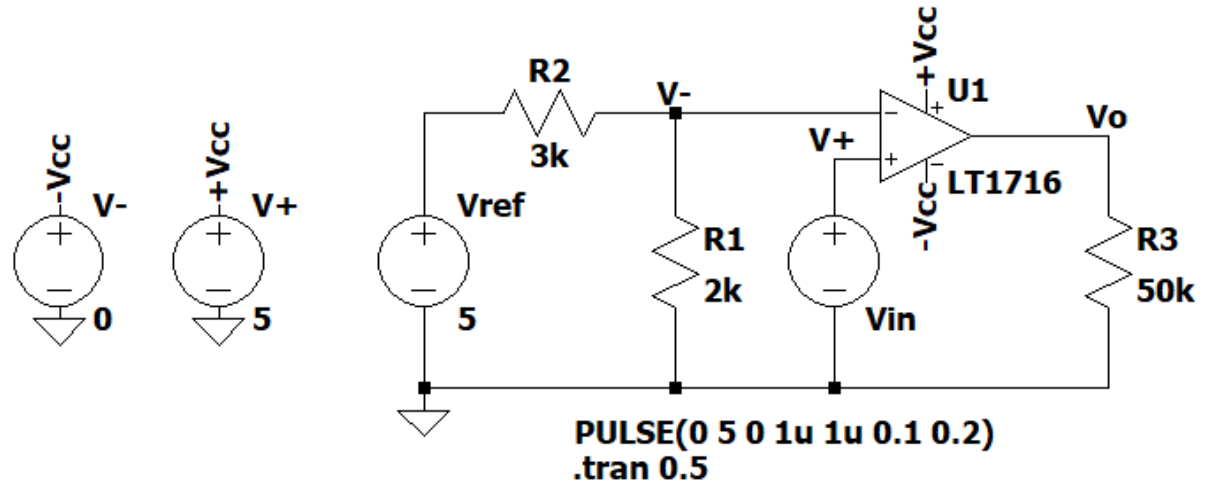
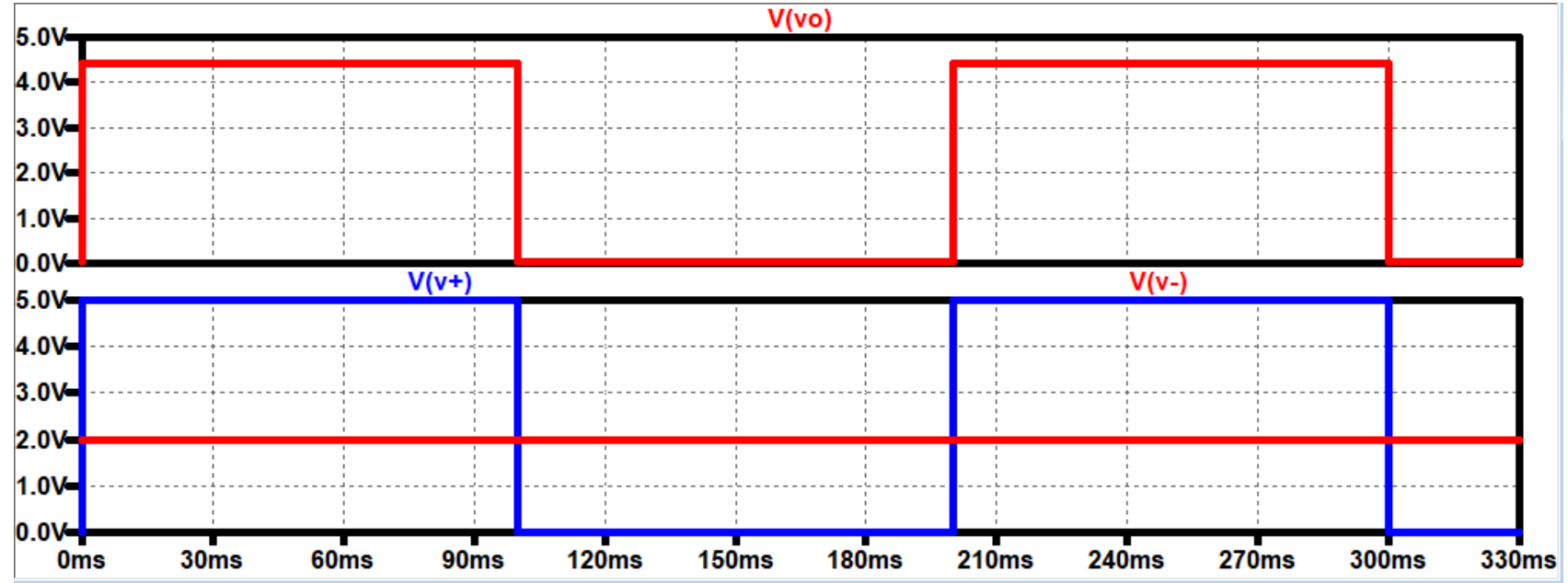




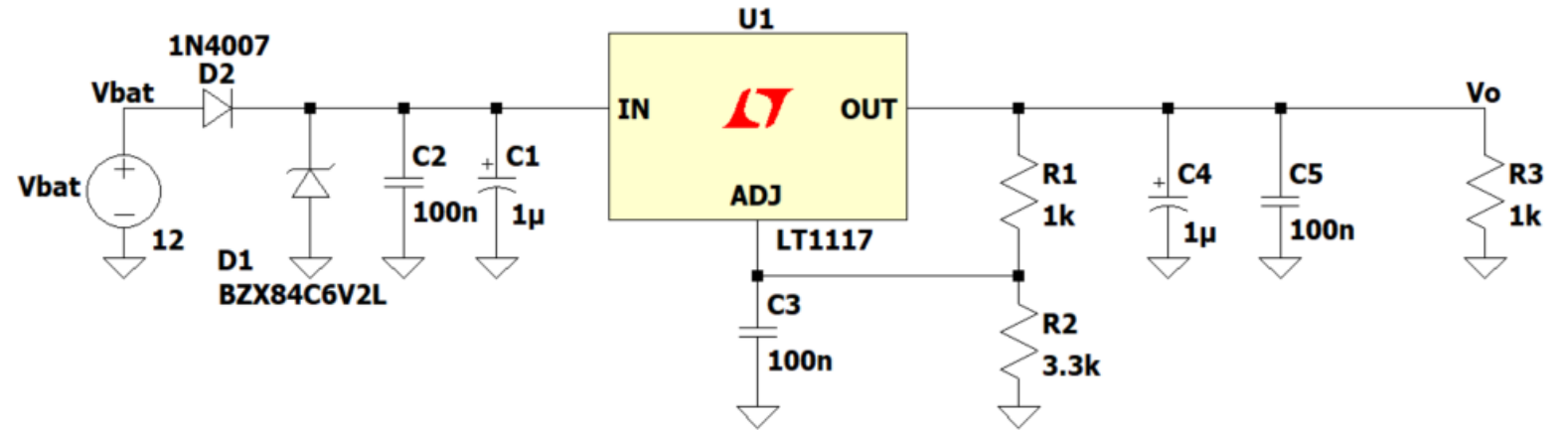
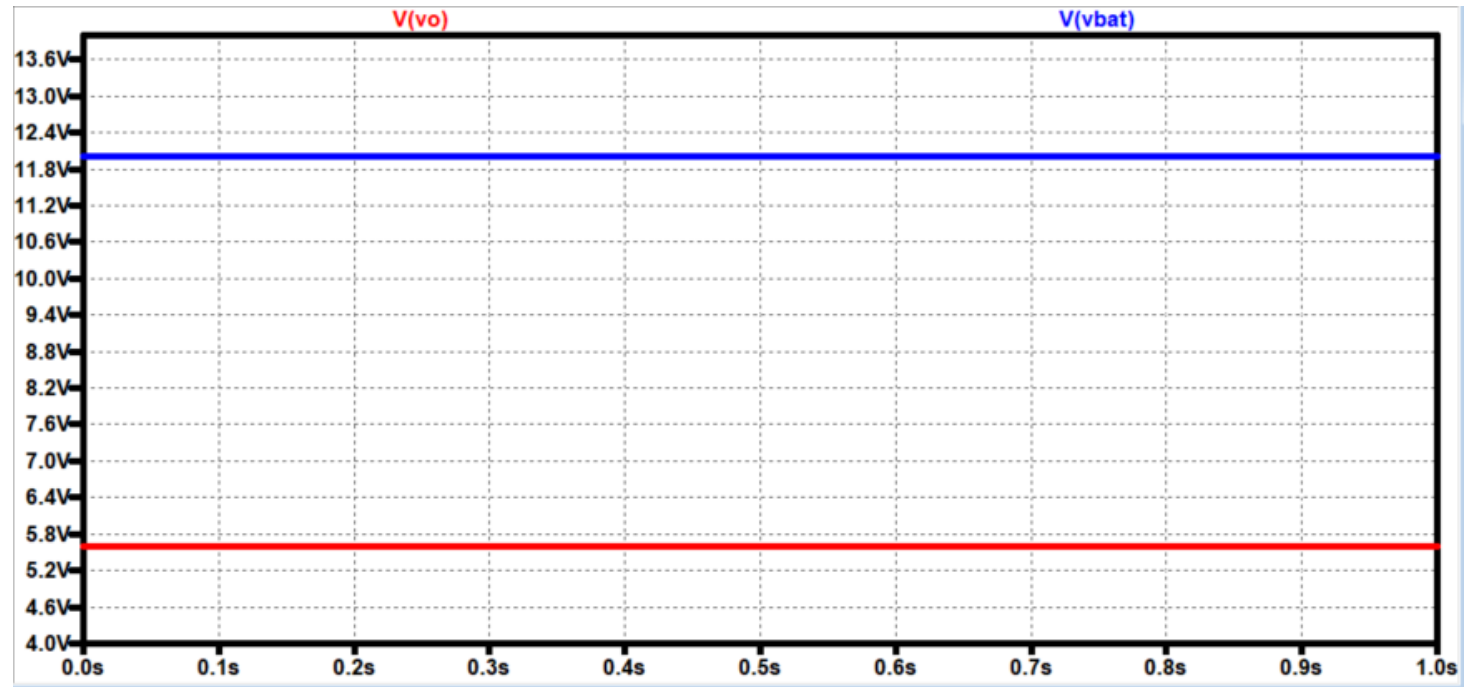
# Layout (Bottom)



# 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](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&srsId=AfmBOooAyKs2Mql2XdE5AiwUxQem\\_03q25LeT7B3V\\_xfZvShMnbi9I-o](https://www.mouser.es/ProductDetail/Omron-Electronics/G5LE-1-DC12?qs=Rh%252BaoYk36r4VGdet26ofGg%3D%3D&srsId=AfmBOooAyKs2Mql2XdE5AiwUxQem_03q25LeT7B3V_xfZvShMnbi9I-o)
- BJT: <https://www.mouser.es/ProductDetail/Central-Semiconductor/2N2222-PBFREE?qs=u16ybLDytRZWJogOmjHVFA%3D%3D>