

A close-up, low-angle shot of a car windshield wiper blade. The blade is dark and curved, with several water droplets of varying sizes resting on its surface. The background is a blurred view of the sky and the car's body, suggesting a rainy day. The overall tone is cool and slightly desaturated.

# Proyecto: Limpiaparabrisas

Argibay Molina Manuel, Yang Alex

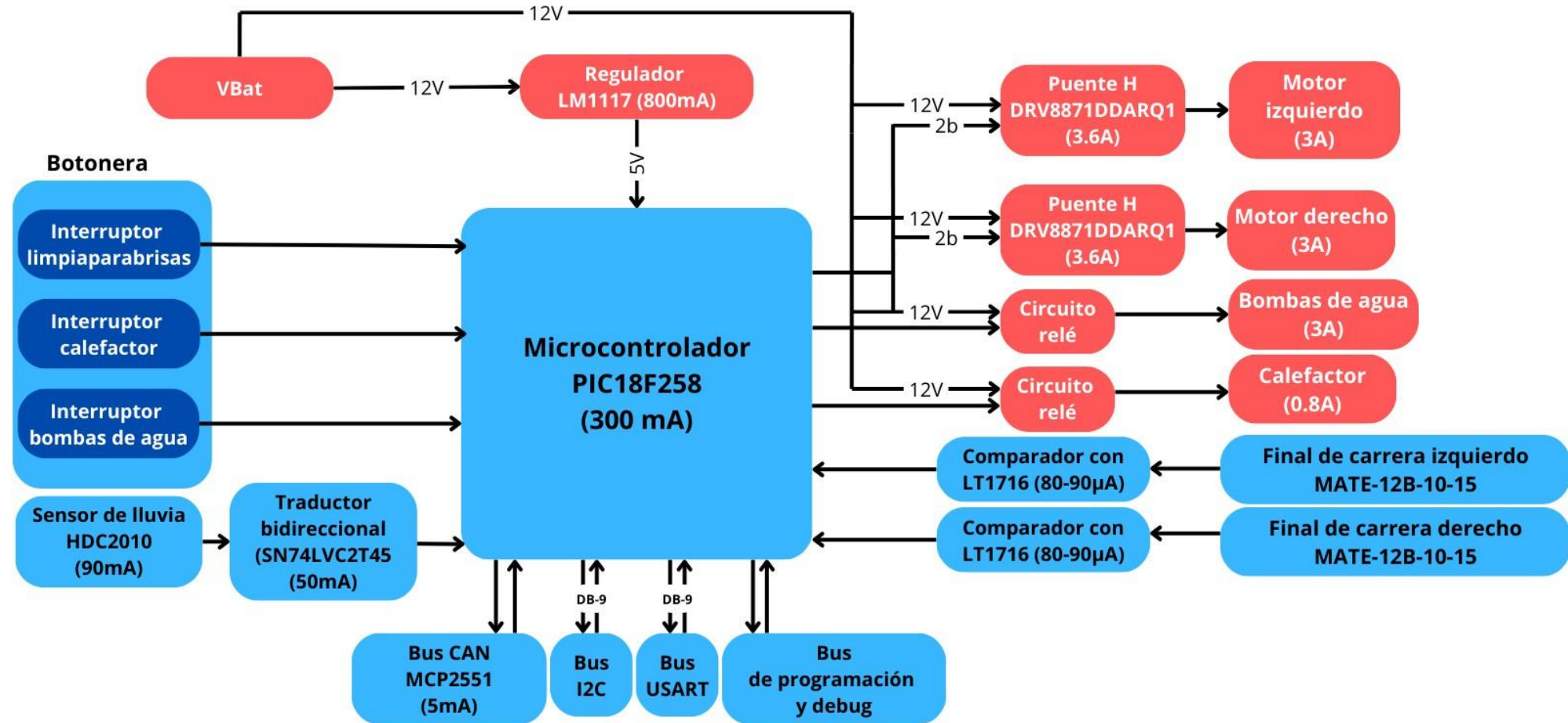
# Funcionalidad y objetivos

- 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 <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

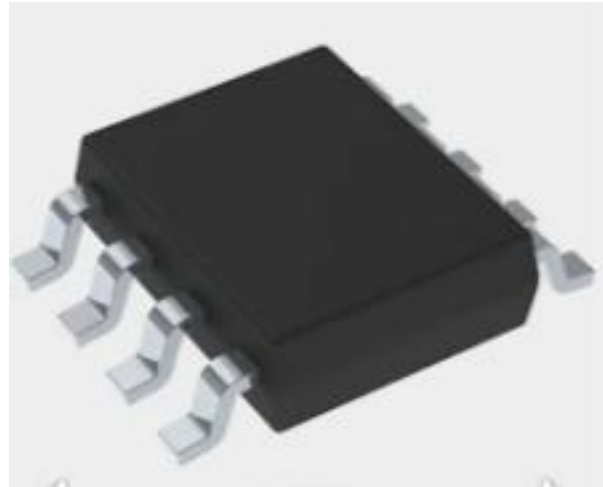
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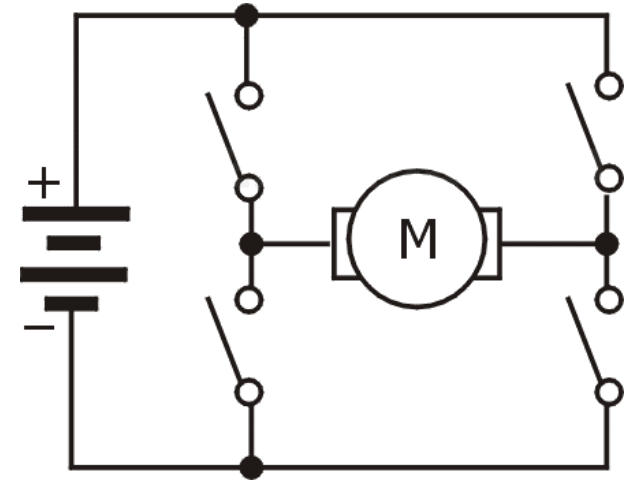
HDC2010

# 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

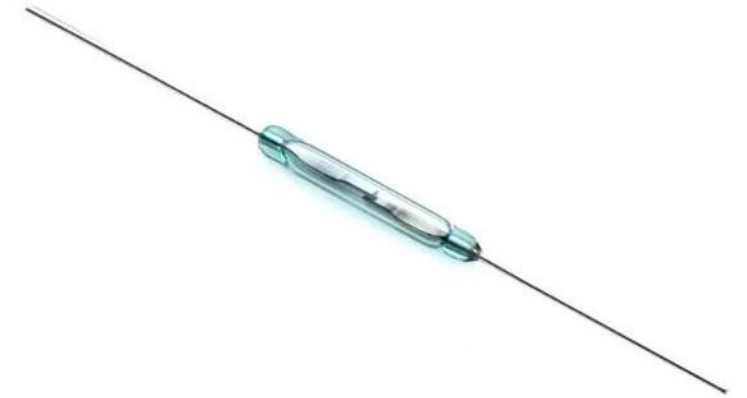
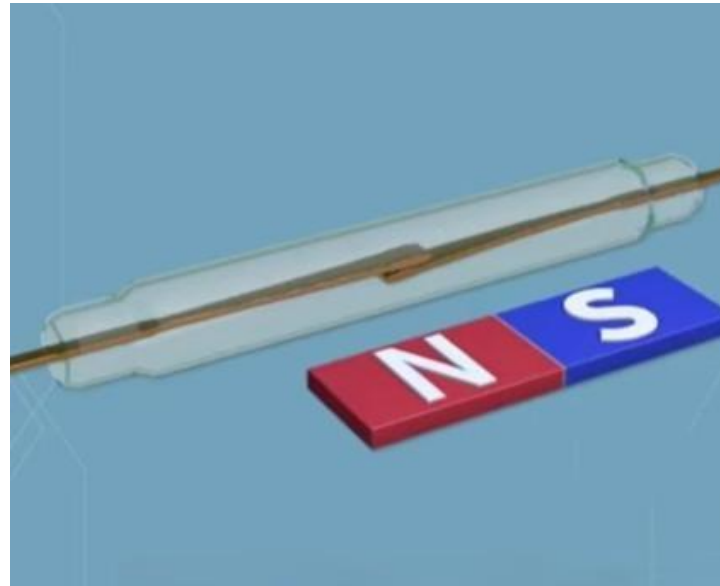
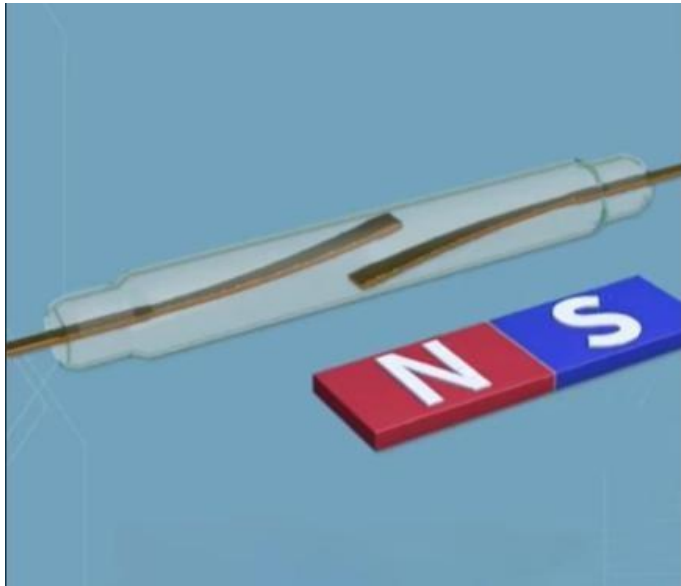


DRV8871DDARQ1



# Final de Carrera magnético (Reed Switch)

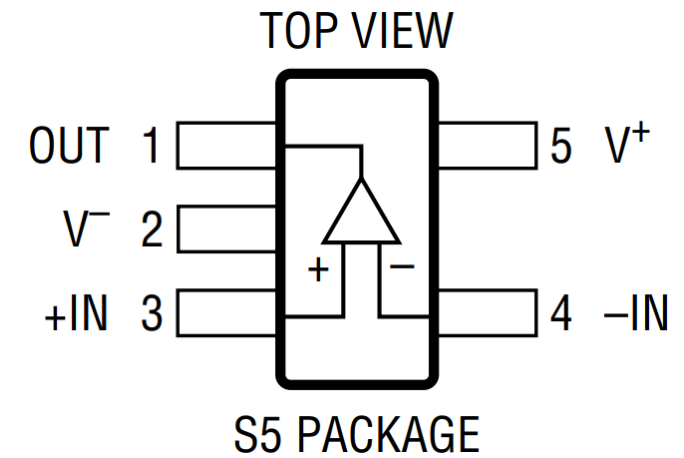
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MATE-12B-10-15

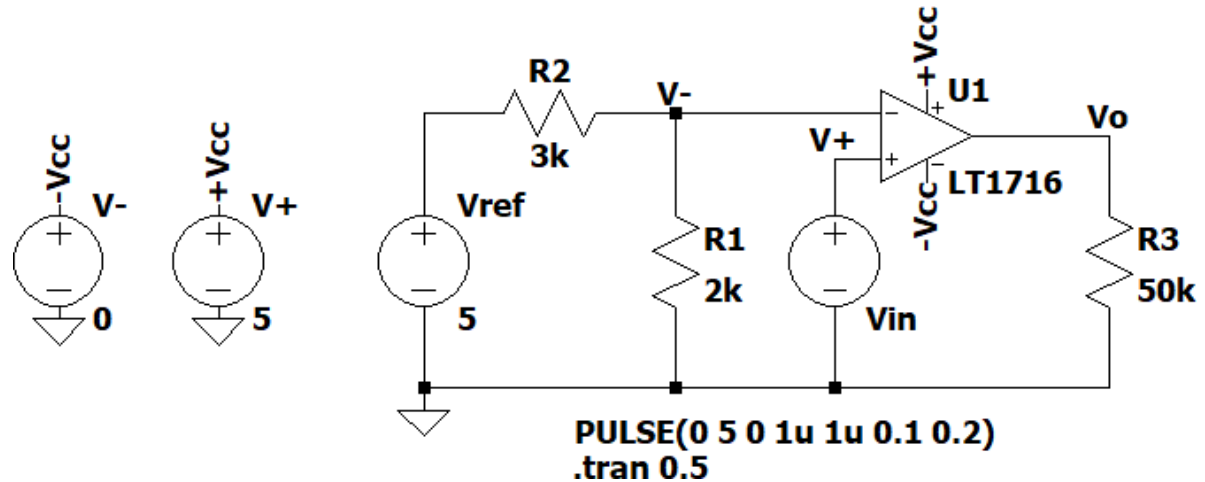
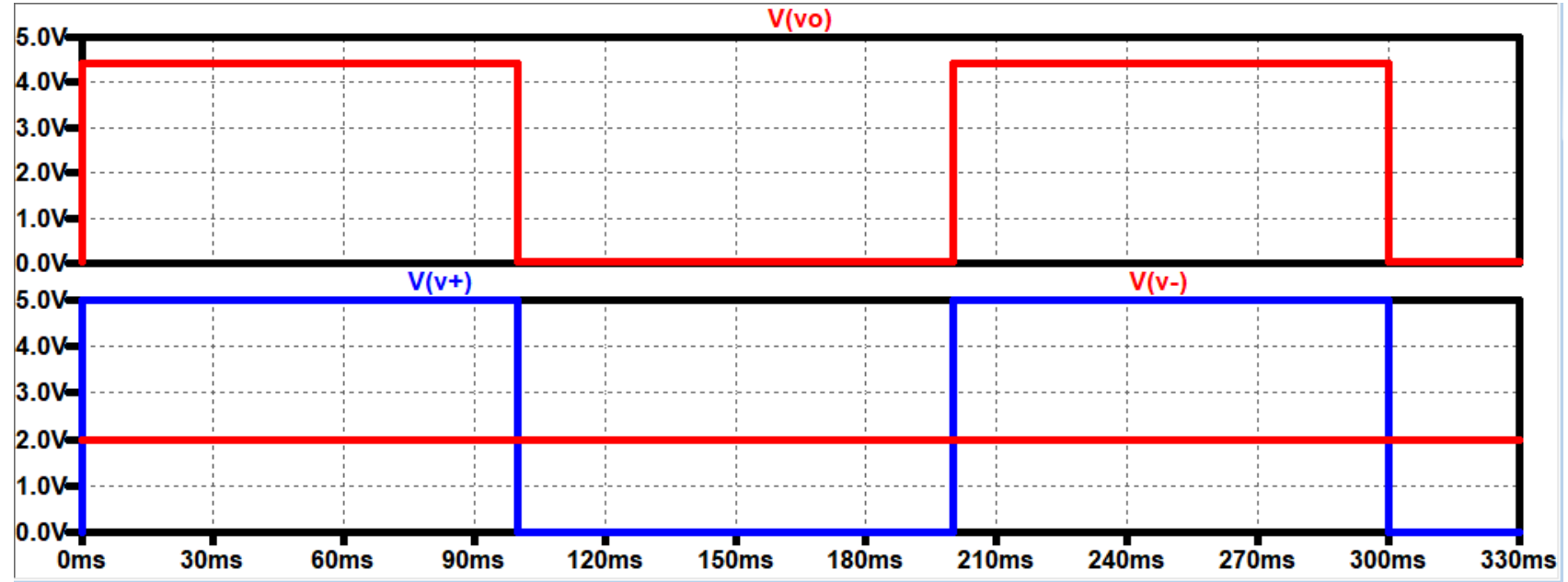


# Amplificador Operacional

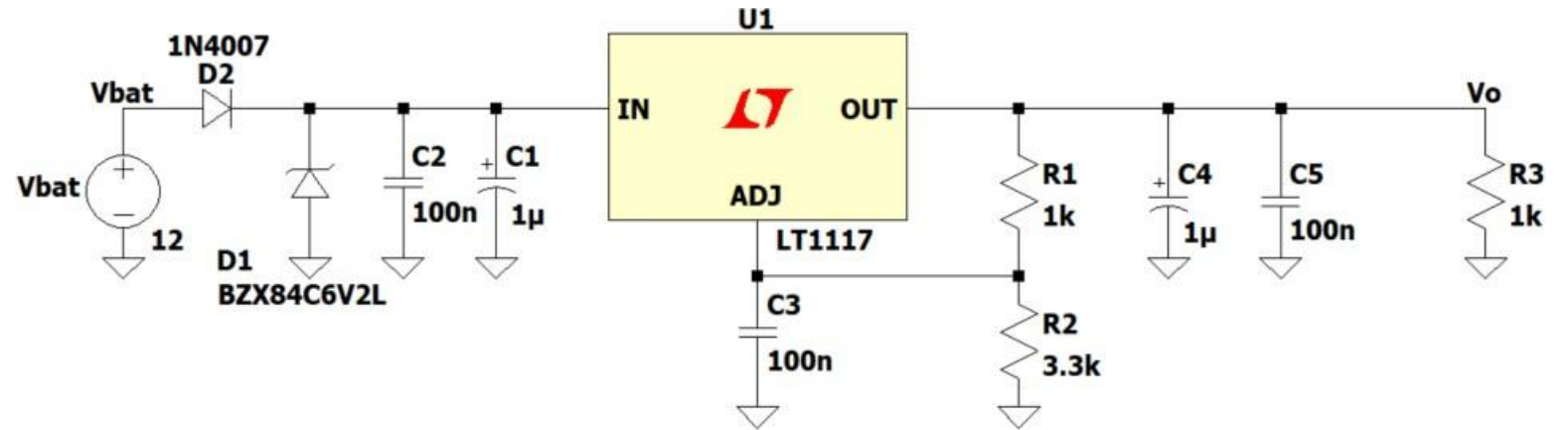
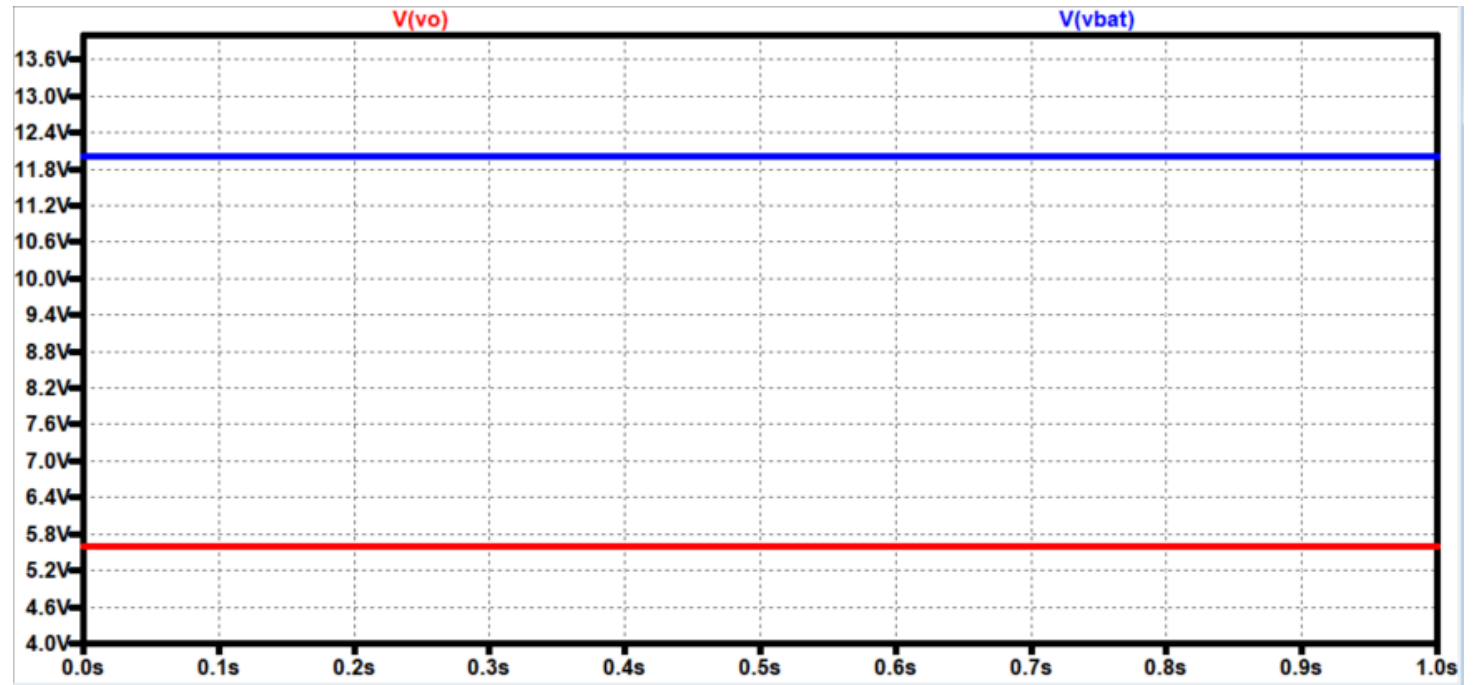


LT1716

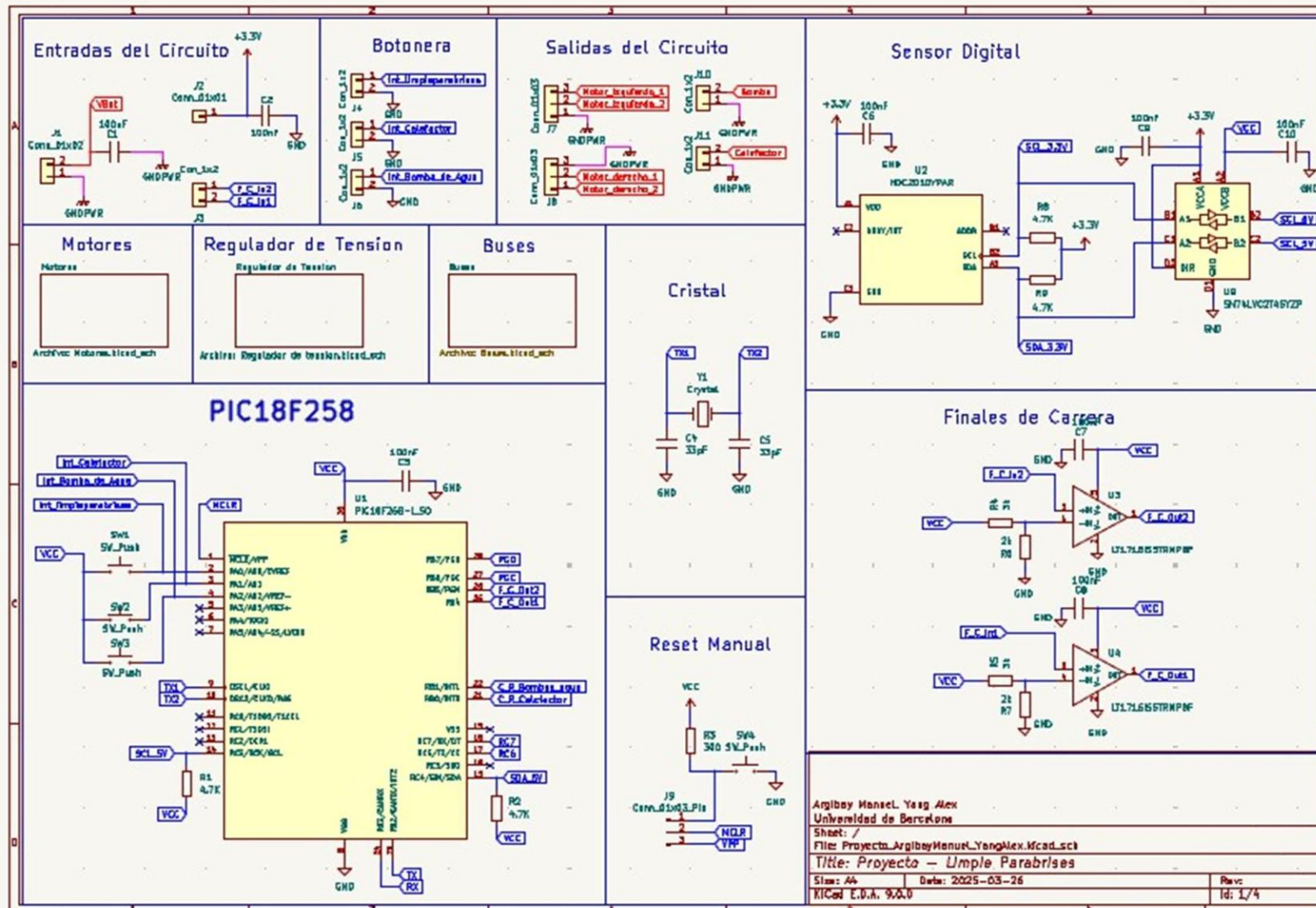
# Simulación del comparador



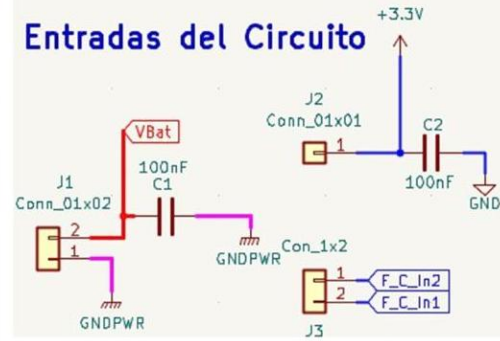
# Simulación del regulador



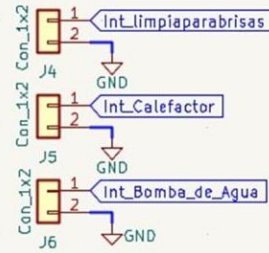
## Esquemático del circuito



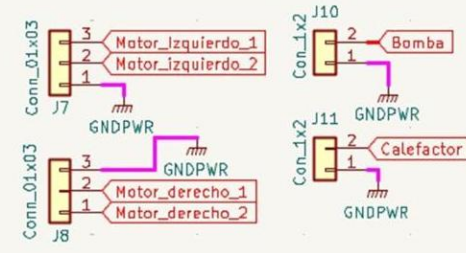
## Entradas del Circuito



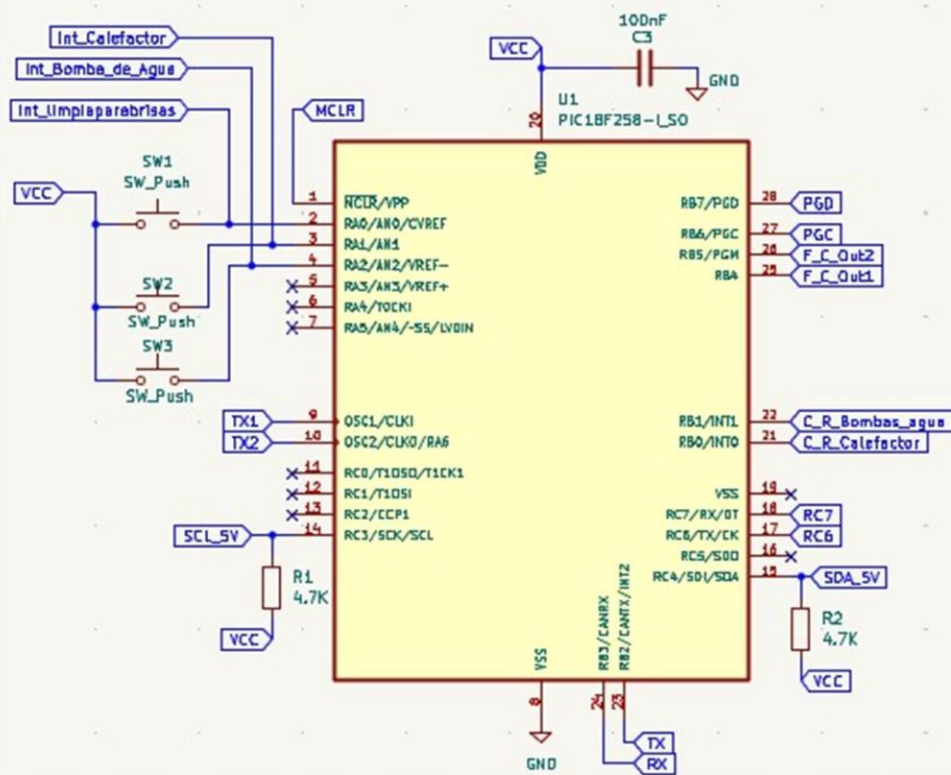
## Botonera



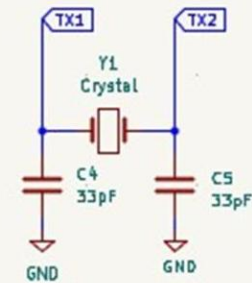
## Salidas del Circuito



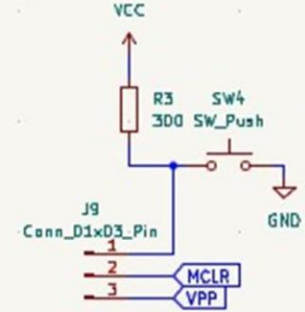
## PIC18F258



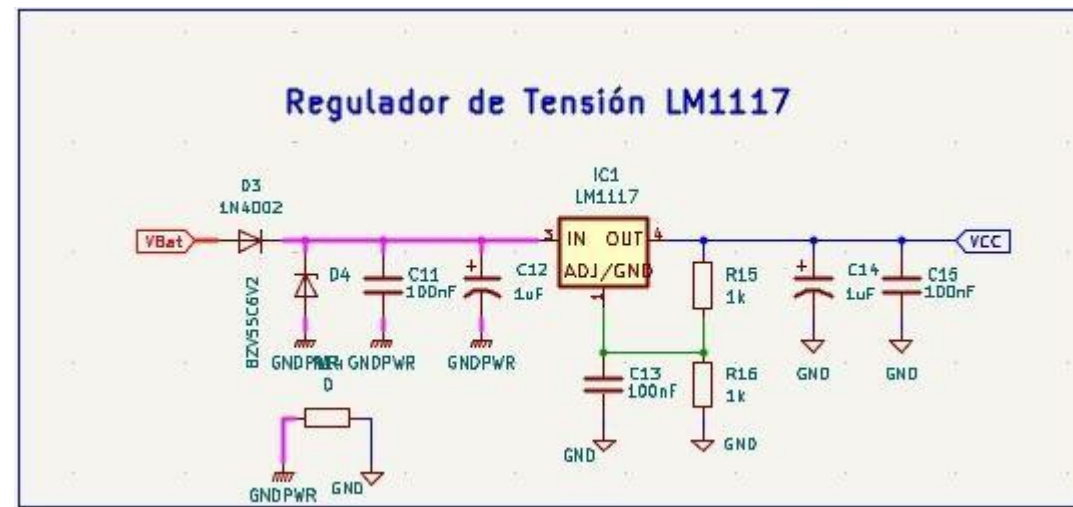
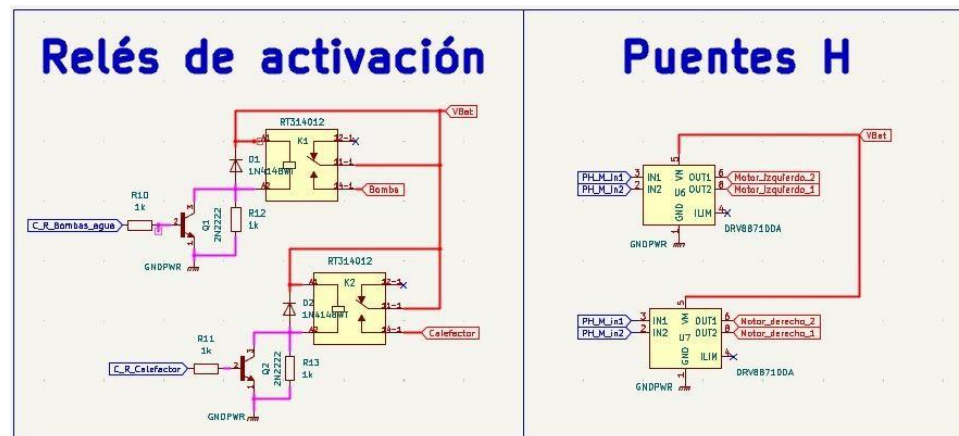
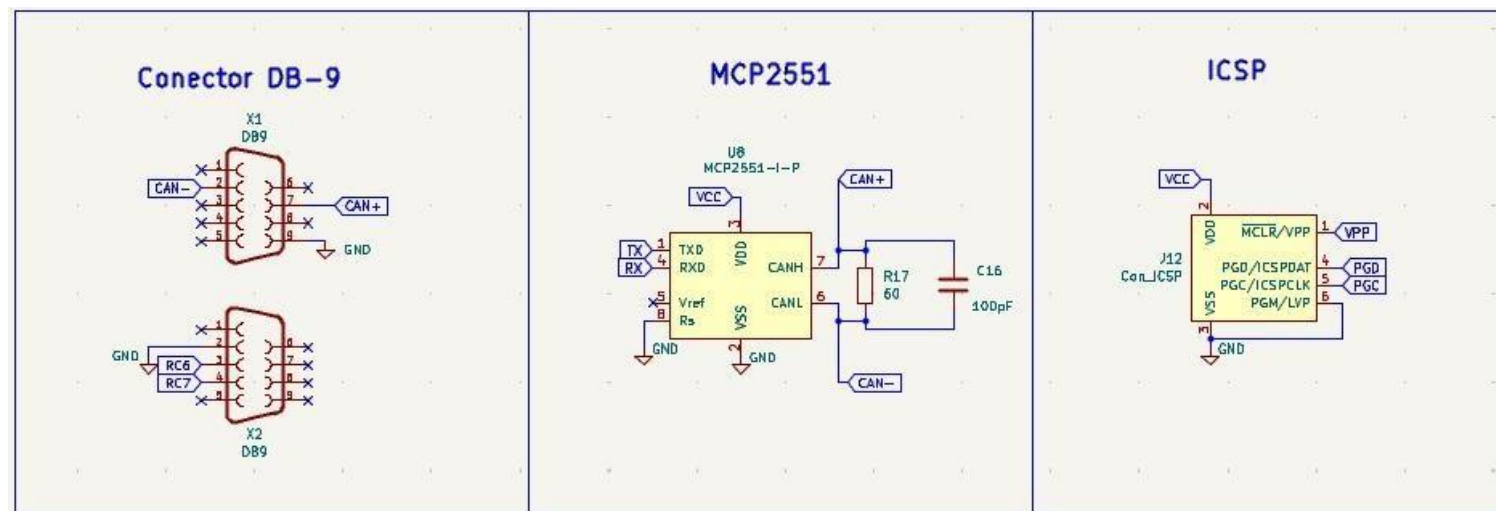
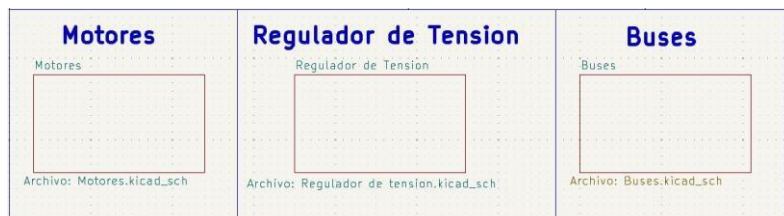
## Cristal



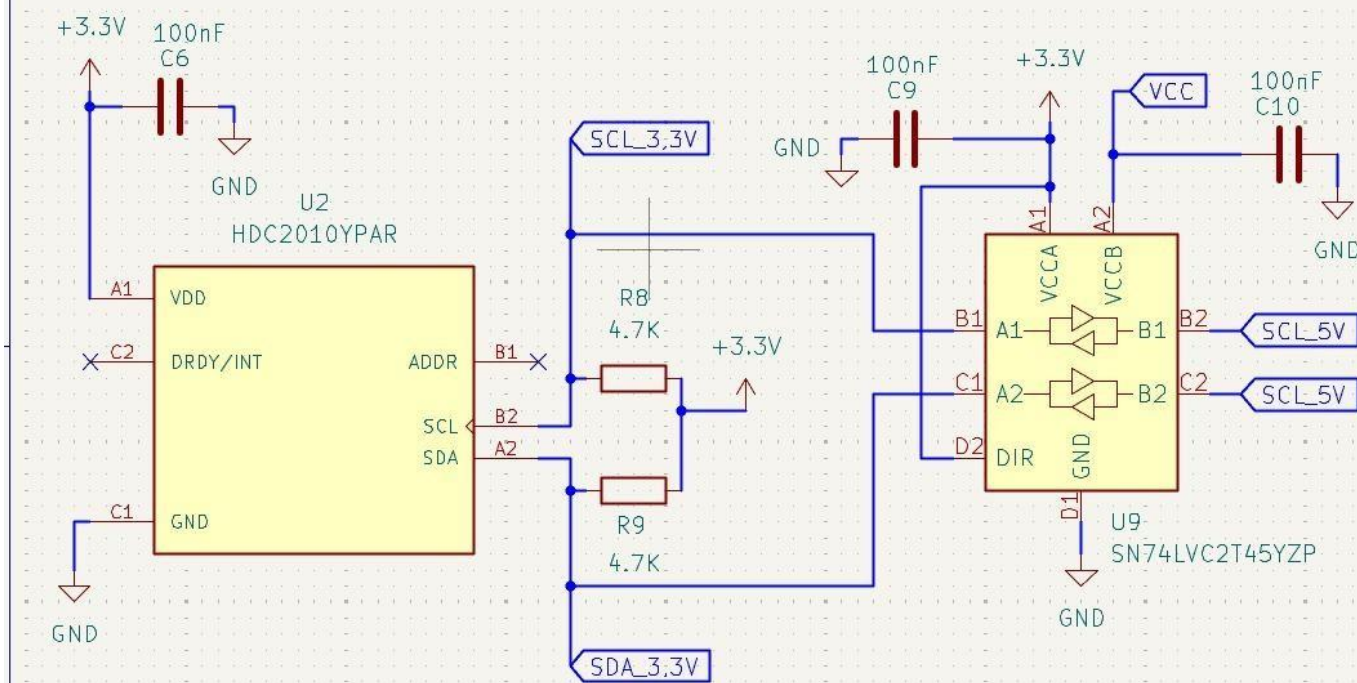
## Reset Manual



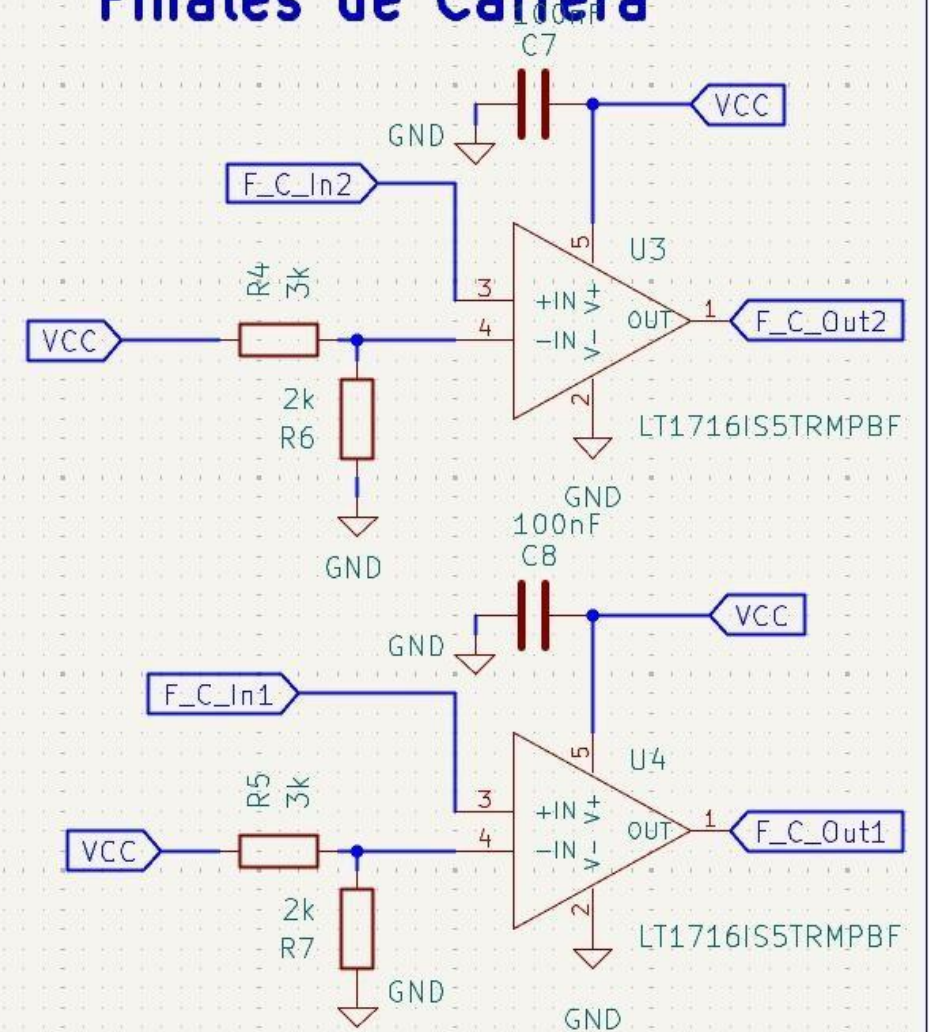




## Sensor Digital

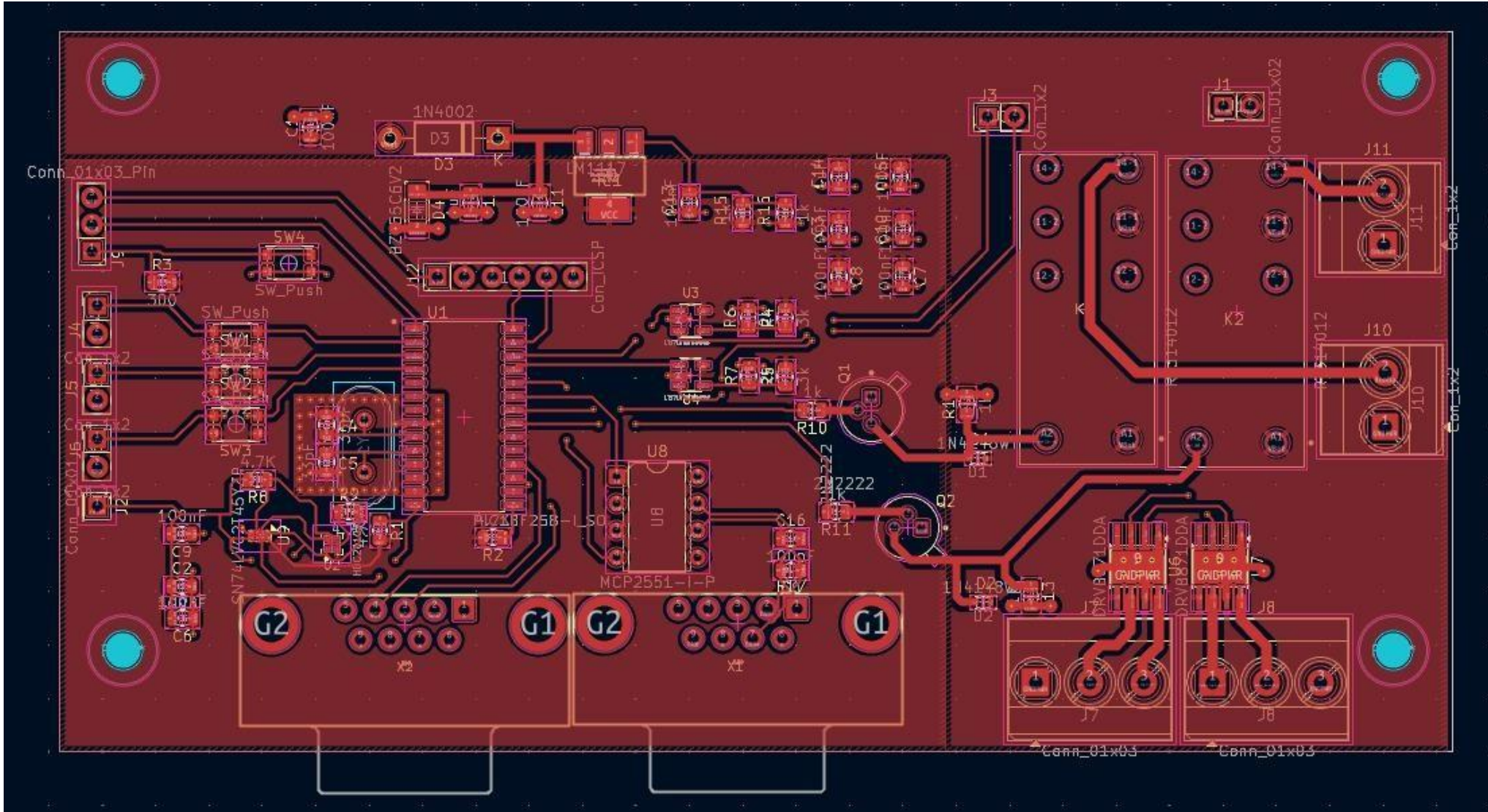


## Finales de Carrera

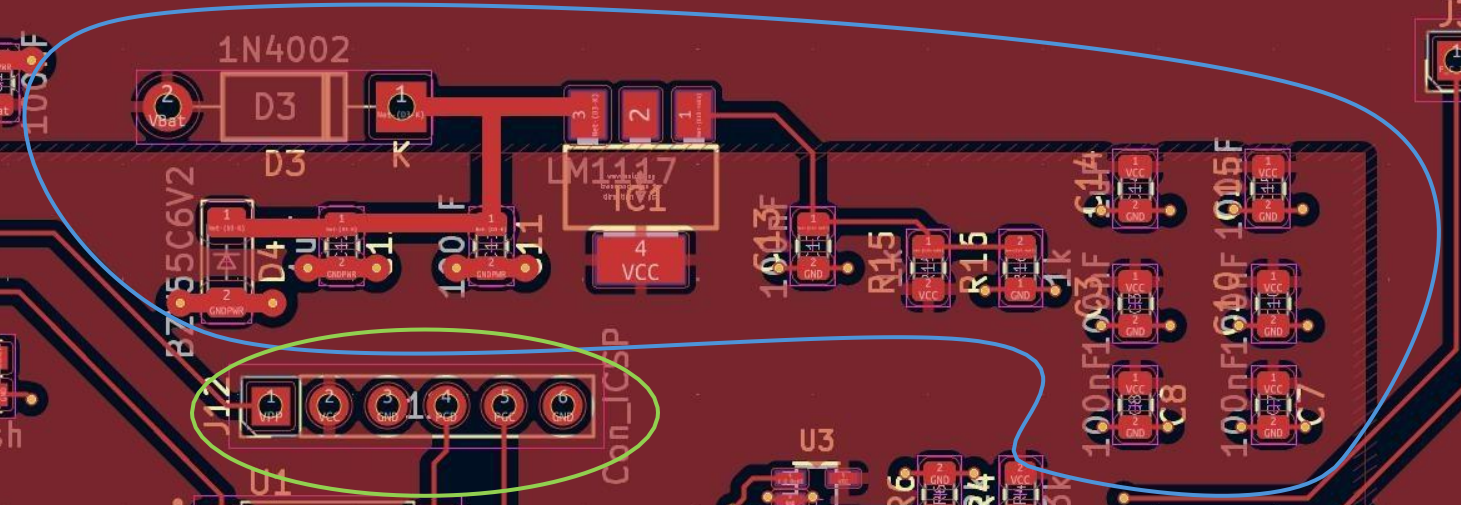
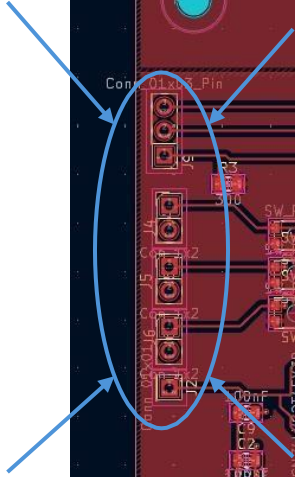


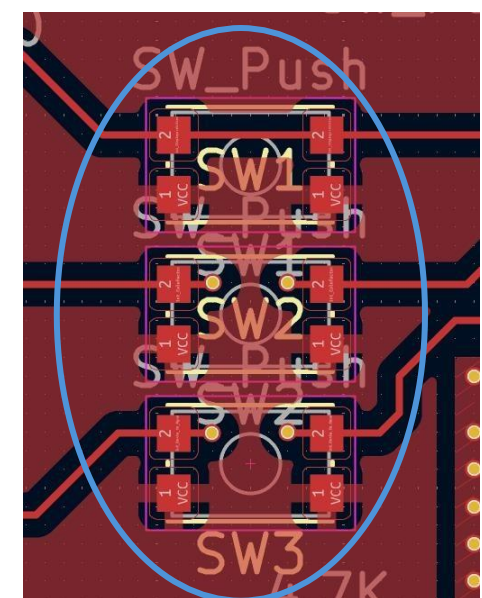
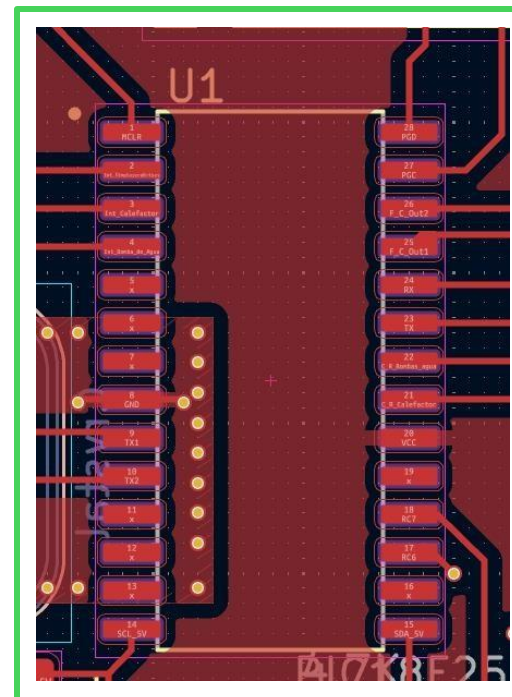
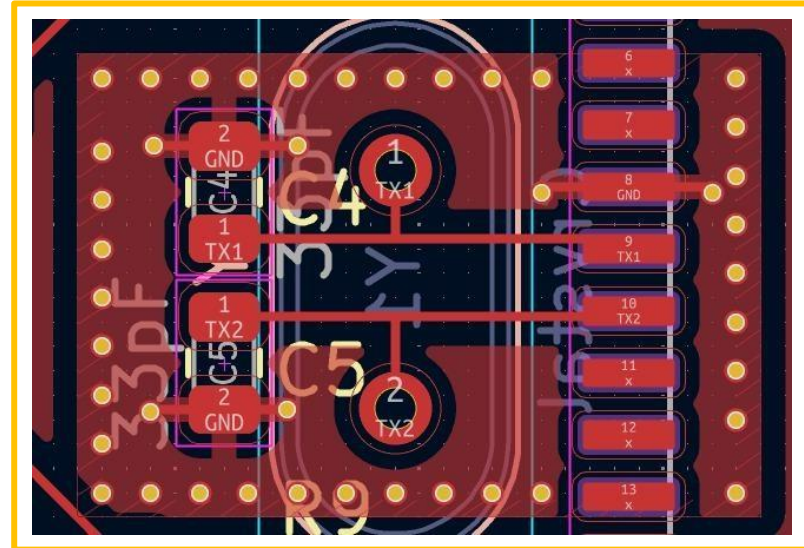
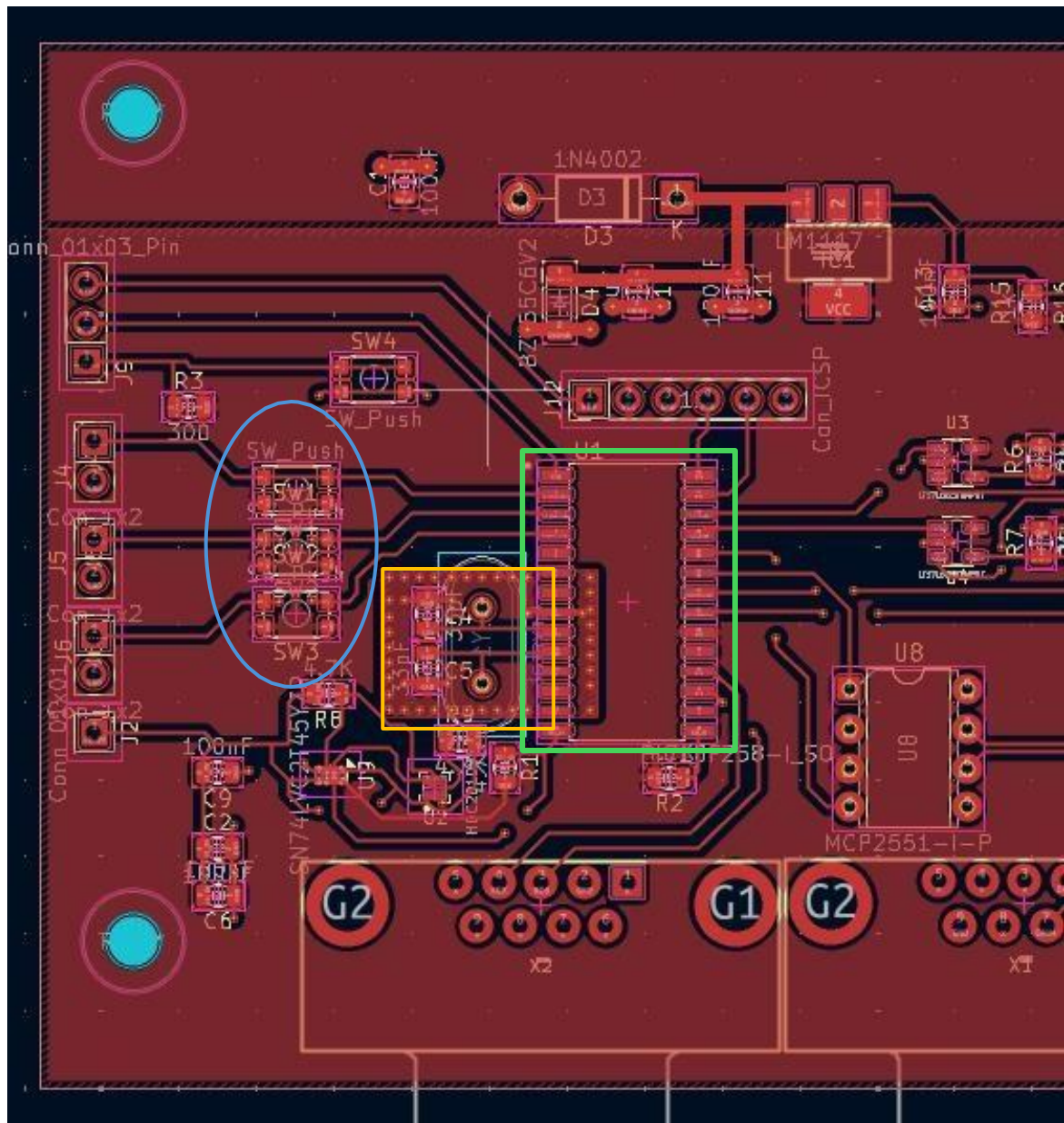


# Layout (TOP)







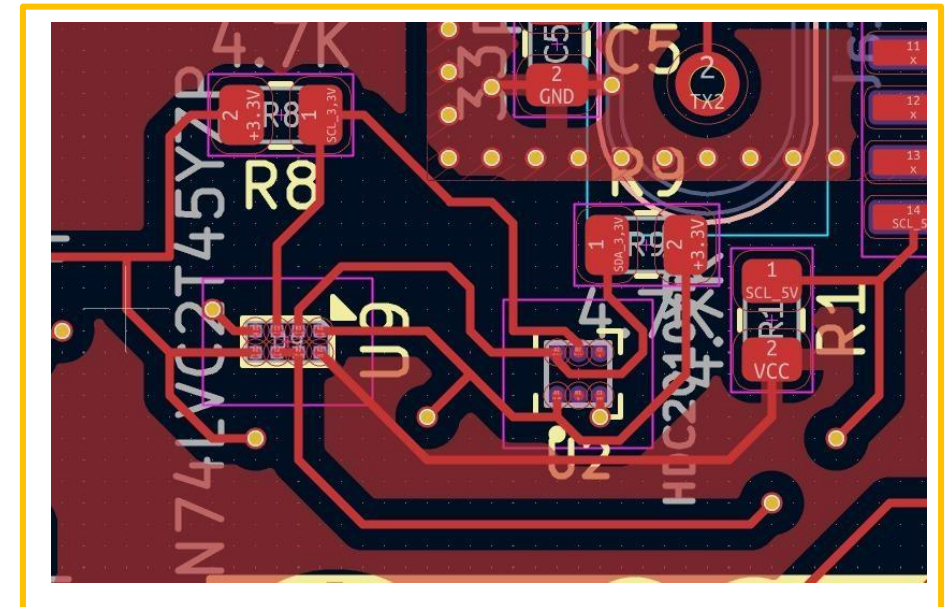
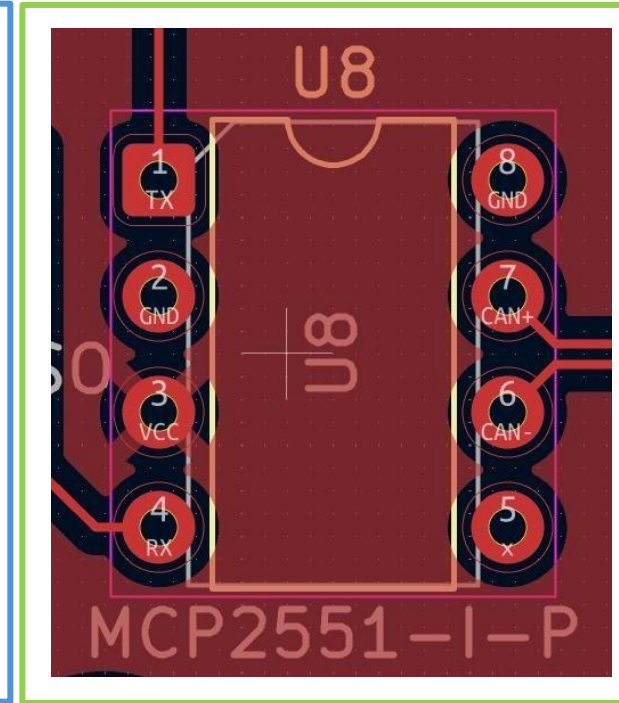
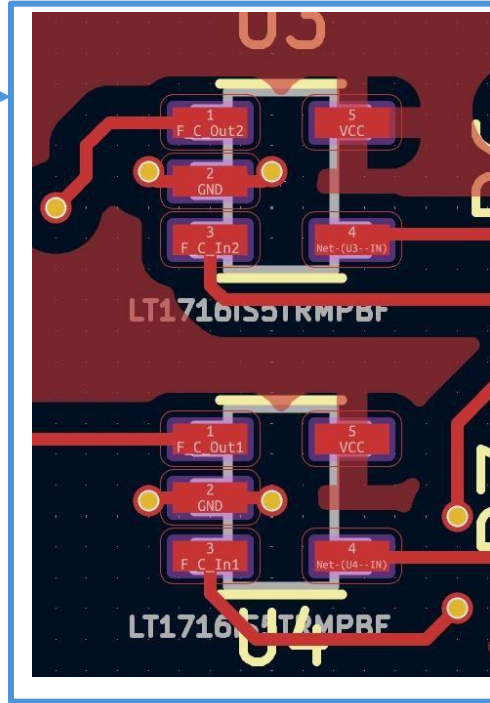
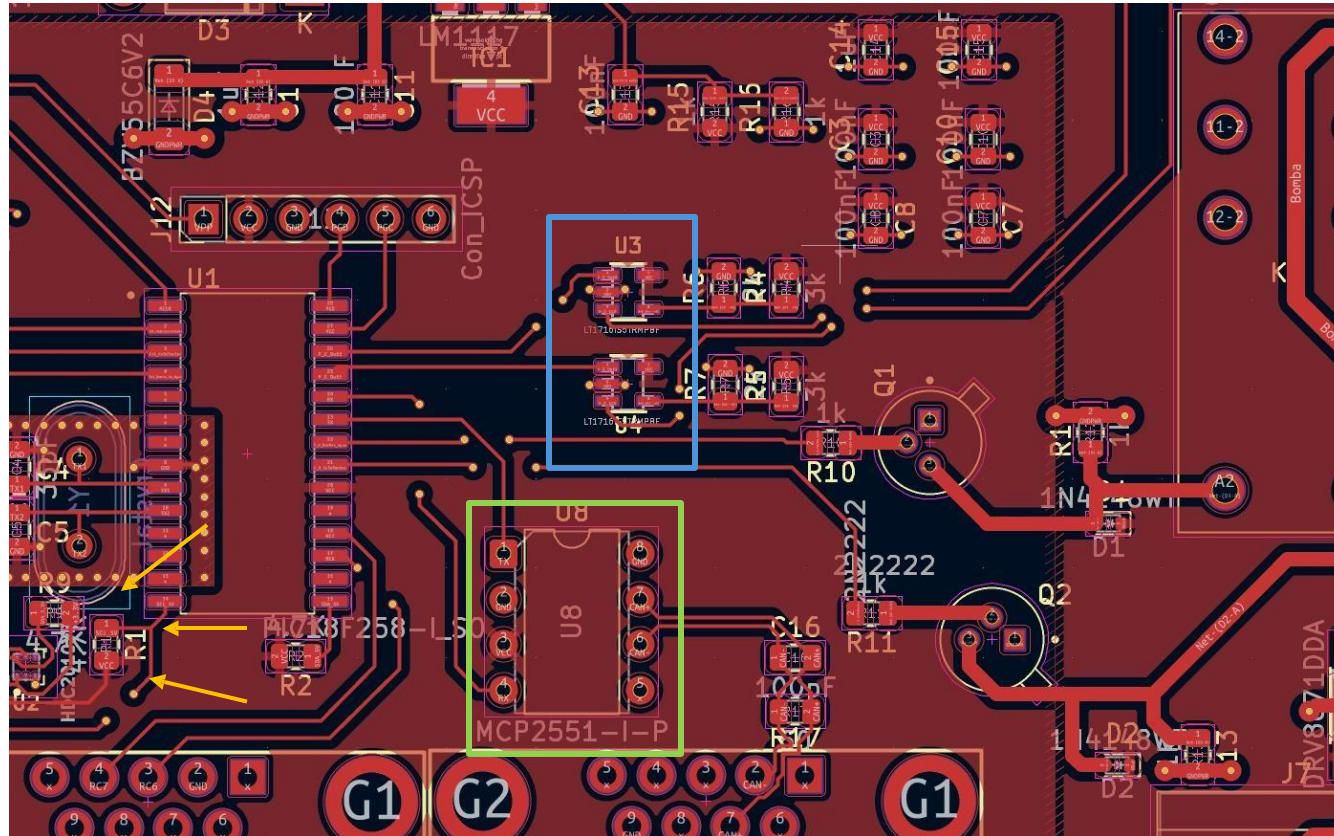


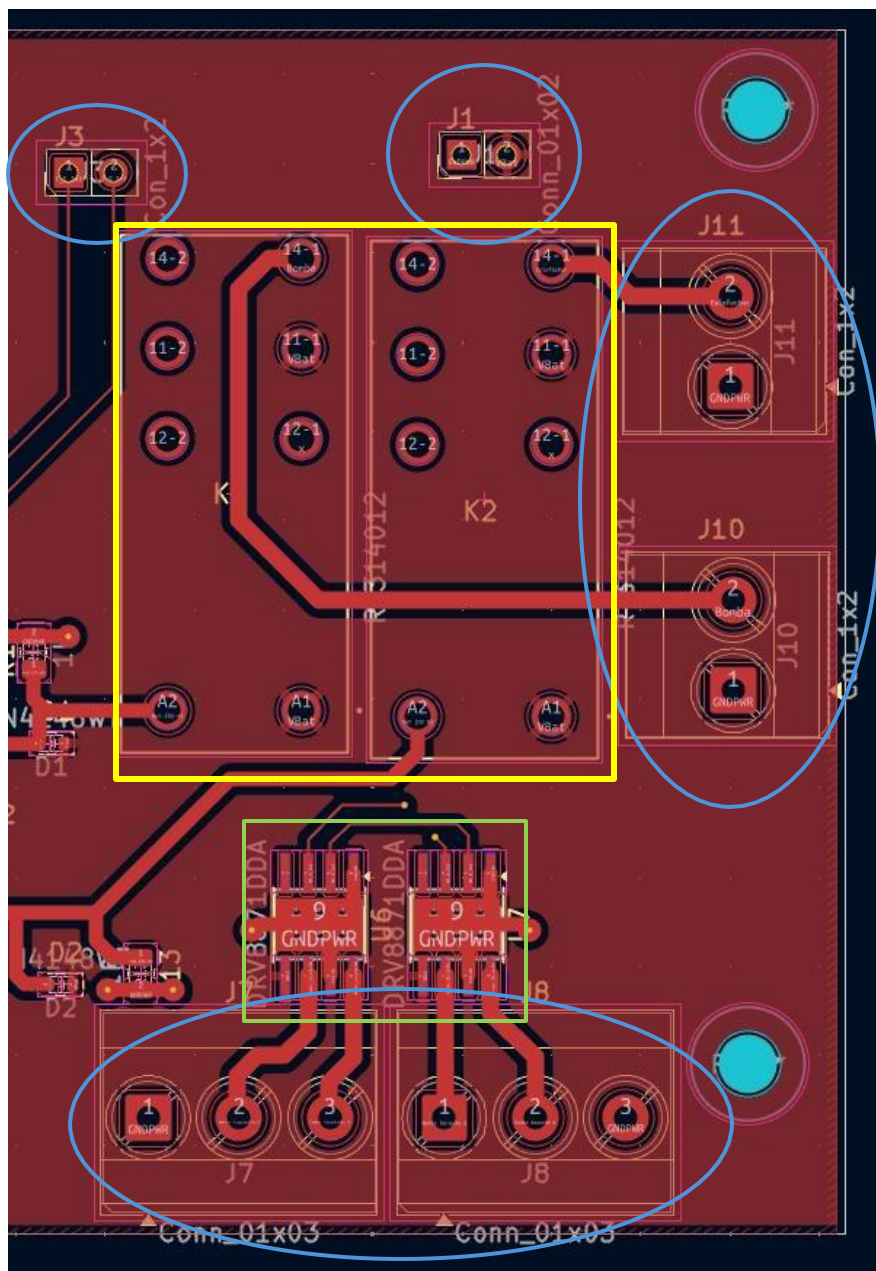
## Botonera

## Microcontrolador

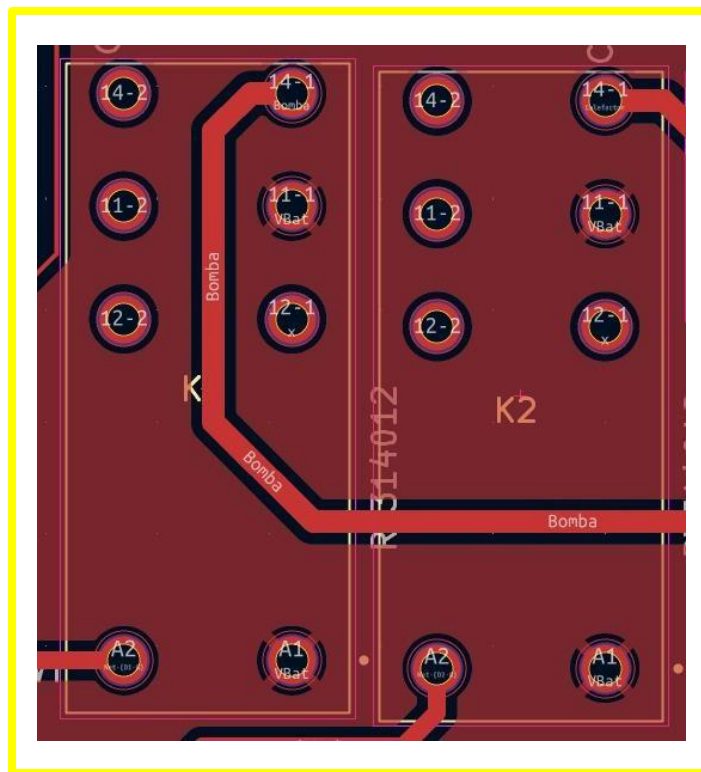


Finales de Carrera

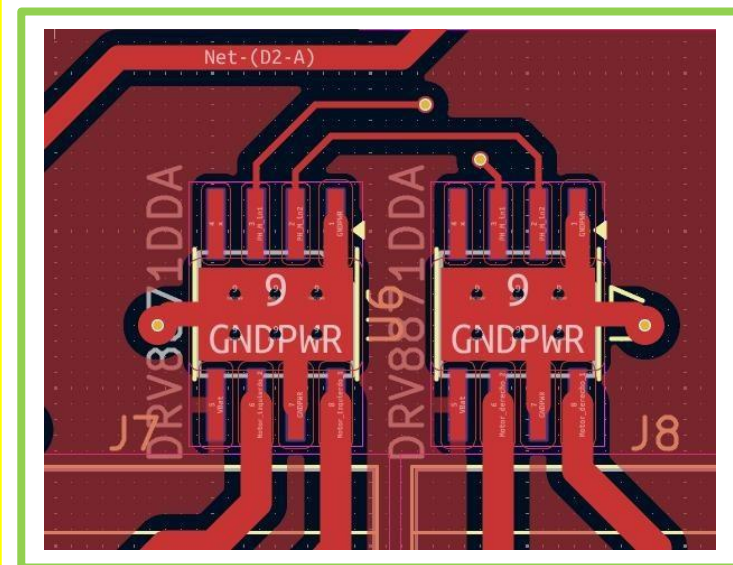




Relés de activación

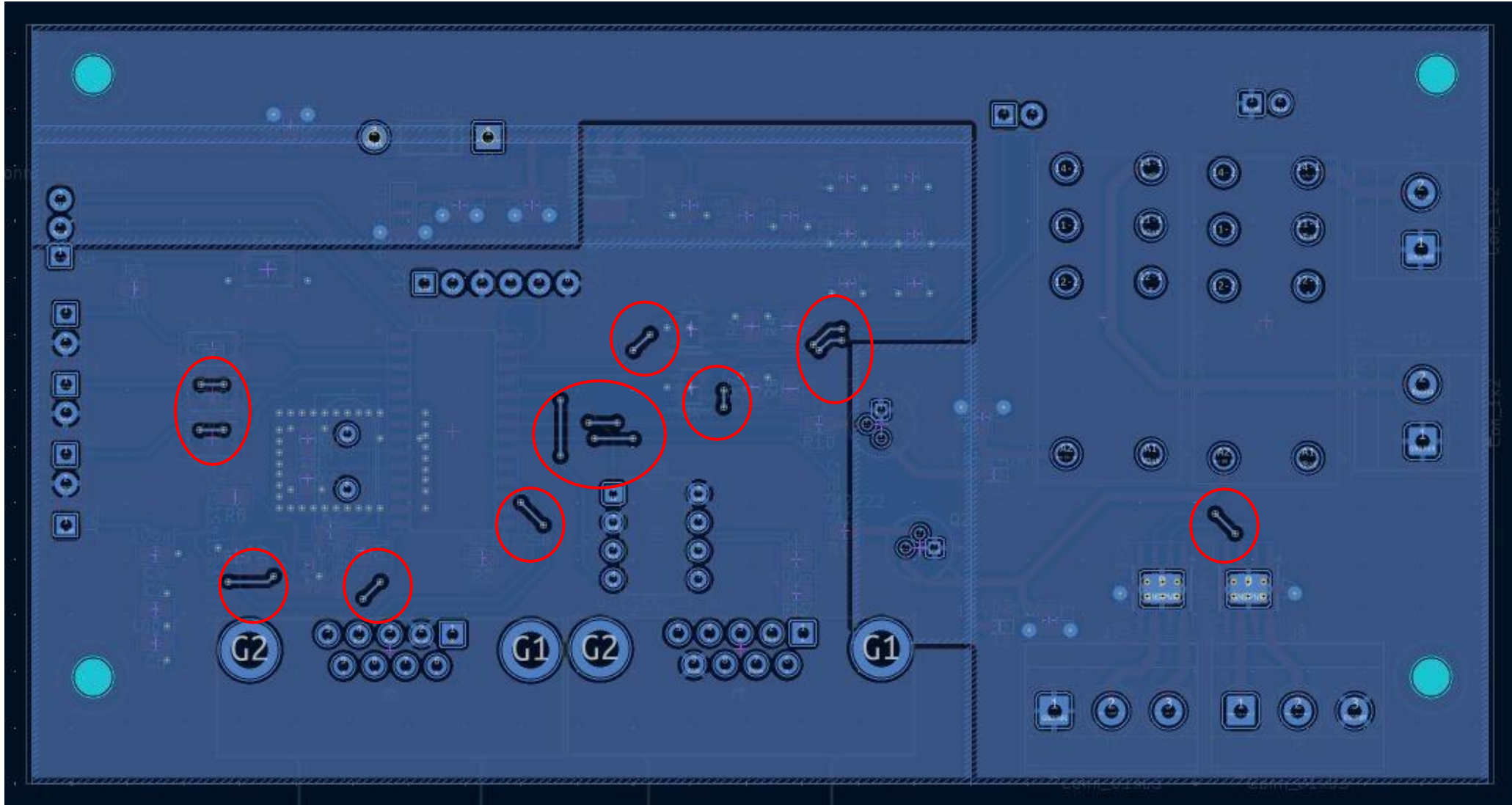


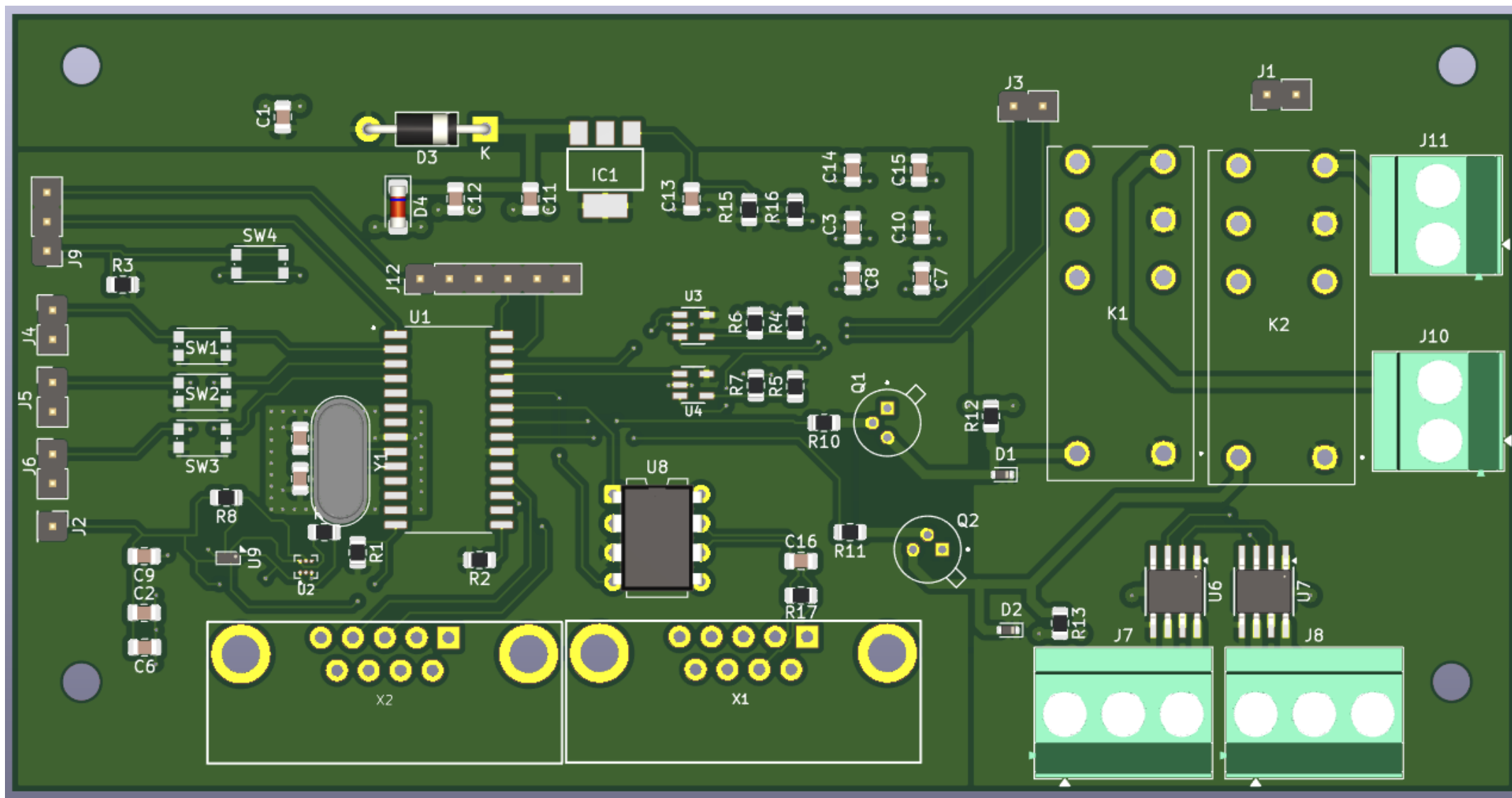
Puentes H

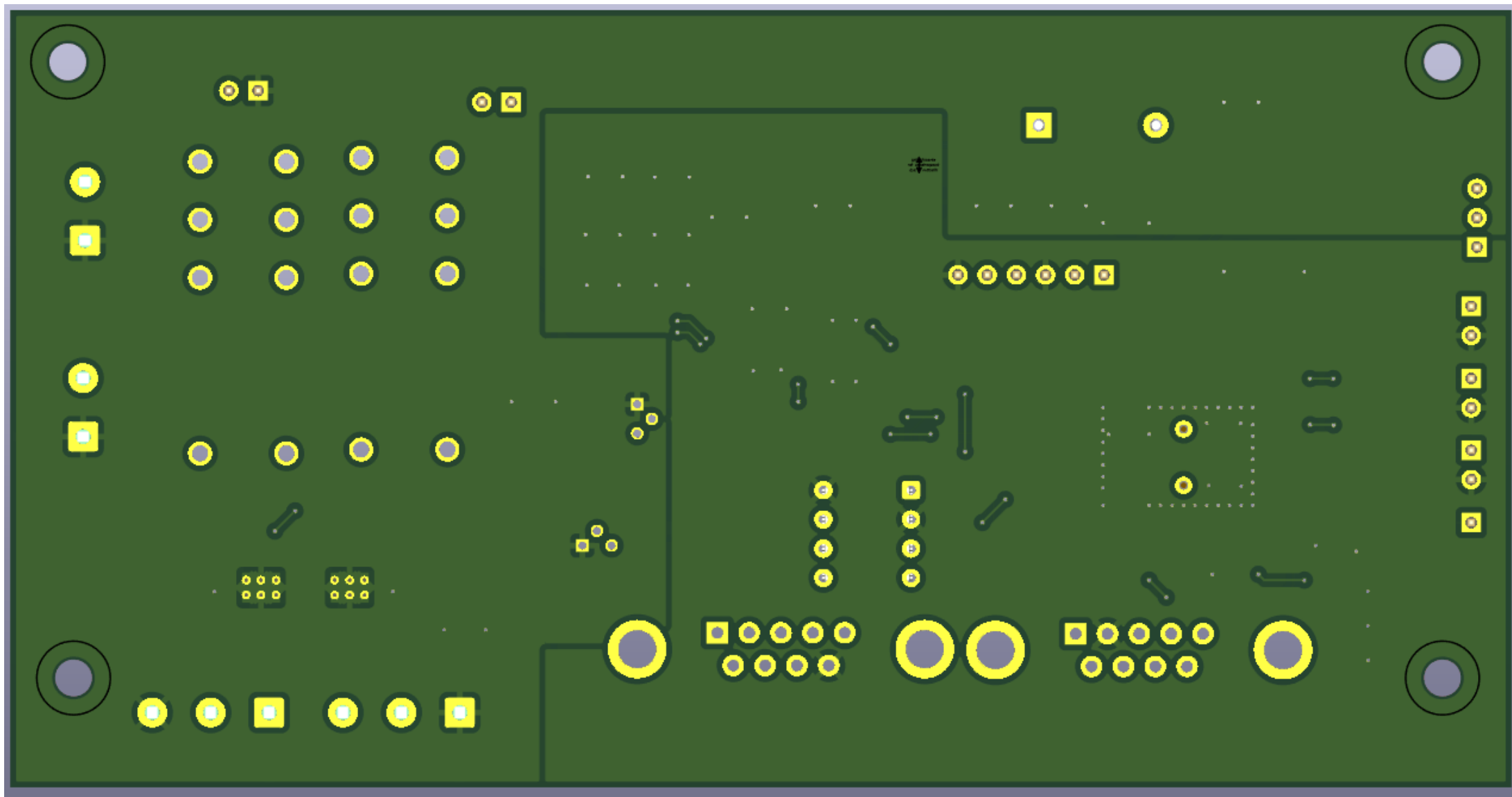




# Layout (Bottom)







x10							
Producto	Descripción	Enlace	Cantidad por PCB	Cantidad total	Precio por unidad	Total	
Resistencia 4.7K $\Omega$	ERA-6VEB4701V	<a href="#">701V?qs=sGAEpiMZZMvdGkmg054twK</a>	4	40	0,241	9,601	
Resistencia 3K $\Omega$	TNPW08053K00FEEA	<a href="#">e/TNPW08053K00FEEA?qs=sGAEpiM</a>	2	20	0,121	2,481	
Resistencia 2K $\Omega$	ERJ-UP6D2001V	<a href="#">26D2001V?qs=sGAEpiMZZMvdGkmg05</a>	2	20	0,141	2,721	
Resistencia 1K $\Omega$	ERA-6AED102V	<a href="#">ERA-6AED102V?qs=sGAEpiMZZMvdGk</a>	6	60	0,181	10,681	
Resistencia 300 $\Omega$	SFR10EZPF3000	<a href="#">SFR10EZPF3000?qs=sGAEpiMZZMvdG</a>	1	10	0,091	0,891	
Resistencia 68 $\Omega$	MCU08050C6809FP50	<a href="#">MCU08050C6809FP50?qs=sGAEpiM</a>	1	10	0,161	1,621	
Capacitor 1uF	KGM21AR71C105JU	<a href="#">A-AVX/KGM21AR71C105JU?qs=Jm2G</a>	2	20	0,161	3,141	
Capacitor 100nF	VJ0805Y104KXBAT	<a href="#">shay-Vitramon/VJ0805Y104KXBAT?qs</a>	11	110	0,221	24,201	
Capacitor 100pF	08051C101JAT2A	<a href="#">YDCERA-AVX/08051C101JAT2A?qs=L</a>	1	10	0,111	1,141	
Capacitor 33pF	08052U330JAT2A	<a href="#">YDCERA-AVX/08052U330JAT2A?qs</a>	2	20	0,191	3,841	
Diodo 1N4148	1N4148WT-7	<a href="#">Q%2F%2FQgYDIMYETiwNccQ%3D%</a>	2	20	0,061	1,141	
Diodo 1N4002	1N4002-T	<a href="#">Po9uwV21tVJBR%252BhrQ%3D%3D</a>	1	10	0,121	1,191	
Diodo BZV55C6V2	BZV55C6V2	<a href="#">eTHU%2FIV7kTyT6aGdLZjLeJA%3D%3</a>	1	10	0,131	1,321	
Regulador de tensión	LM1117T	<a href="#">as-Instruments/LM1117T-3.3-NOPB?qs</a>	1	10	1,101	11,001	
Conector 1x1	PH1-01-UA	<a href="#">.com/en/products/detail/adam-tech/P</a>	1	10	0,021	0,181	
Conector 1x2	61300211121	<a href="#">en/products/detail/w%3C%BCrth-elektro</a>	5	50	0,081	4,001	
Conector 1x3	M20-9990345	<a href="#">com/en/products/detail/harwin-inc/M20</a>	1	10	0,121	1,231	
Conector 1x6	61300611121	<a href="#">en/products/detail/w%3C%BCrth-elektro</a>	1	10	0,271	2,681	
Conector BLK 1x2	1729128	<a href="#">.com/en/products/detail/phoenix-conta</a>	2	20	0,951	19,001	
Conector BLK 1x3	1729131	<a href="#">.com/en/products/detail/phoenix-conta</a>	2	20	1,381	27,581	
Relé	RT314012	<a href="#">Bd%2FXtjBhAgQQMm4w%3D%3D&amp;s</a>	2	20	2,671	53,401	
Transistor BJT	2N2222	<a href="#">2-PBFBEE/4806844?srlid=AfmBQopt</a>	2	20	1,901	38,081	
Botón	TS526SK15SMTR2-LF	<a href="#">s/es/products/detail/c-k/PTS526SK15S</a>	4	40	0,121	4,761	
Microcontrolador	PIC18F2580-I/SO	<a href="#">e5Ww0vN22rFLg5k%2FqM4Xm9A%3D</a>	1	10	7,721	77,201	
Sensor de lluvia	HDC2010YPAR	<a href="#">EQ9ffTwc2CasHMLP4bA%3D%3D&amp;srs</a>	1	10	1,231	12,301	
Amplificador Operacional	LT1716	<a href="#">clh7QUVlaNMG%252B3EhQ%3D%3D</a>	2	20	2,981	59,601	
Transceptor de Voltaje	TXS0108EPWR	<a href="#">bkBnfnSQLgiWtCbWtYQw%3D%3D&amp;s</a>	1	10	0,861	8,601	
Puente H	DRV8871DDA	<a href="#">n/es/products/detail/texas-instruments</a>	2	20	2,401	48,081	
Controlador CAN	MCP2551	<a href="#">eVnQzuzr35GHkGDCgnw0F9A%3D%3</a>	1	10	1,511	15,101	
Conector DB9	SD9S	<a href="#">digikey.es/es/products/detail/l-com/SD9</a>	2	20	3,471	69,361	
Cristal	HC-49/U	<a href="#">49-U-S16384000ABJB/284225?srlid</a>	1	10	0,431	4,281	
PCB	-	<a href="#">e=18&amp;stencilwidth=100&amp;stencillength=</a>	1	10	1,791	17,901	

<b>Total:</b>	<b>538,29 €</b>
<b>Total por placa:</b>	<b>53,83 €</b>



x50						
Producto	Descripción	Enlace	Cantidad por PCB	Cantidad total	Precio por unidad	Total
Resistencia 4.7KΩ	ERA-6VEB4701V	<a href="#">A-6VEB4701V?qs=sGAEpiMZZMvdGkrng054twKD</a>	4	200	0,21 €	42,00 €
Resistencia 3KΩ	TNPW08053K00FEEA	<a href="#">hay-Dale/TNPW08053K00FEEA?qs=sGAEpiMZZM</a>	2	100	0,10 €	10,30 €
Resistencia 2KΩ	ERJ-UP6D2001V	<a href="#">c/ERJ-UP6D2001V?qs=sGAEpiMZZMvdGkrng054t</a>	2	100	0,08 €	7,90 €
Resistencia 1KΩ	ERA-6AED102V	<a href="#">nasonic/ERA-6AED102V?qs=sGAEpiMZZMvdGkr</a>	6	300	0,11 €	31,50 €
Resistencia 300Ω	SFR10EZPF3000	<a href="#">nductor/SFR10EZPF3000?qs=sGAEpiMZZMvdGk</a>	1	50	0,09 €	4,45 €
Resistencia 68Ω	MCU08050C6809FP500	<a href="#">eyschlag/MCU08050C6809FP500?qs=sGAEpiMZZM</a>	1	50	0,16 €	8,10 €
Capacitor 1uF	KGM21AR71C105JU	<a href="#">l/KYOCERA-AVX/KGM21AR71C105JU?qs=Jm2GQyT</a>	2	100	0,09 €	9,30 €
Capacitor 100nF	VJ0805Y104KXBAT	<a href="#">Detail/Vishay-Vitramon/VJ0805Y104KXBAT?qs=Z</a>	11	550	0,18 €	99,00 €
Capacitor 100pF	08051C101JAT2A	<a href="#">Detail/KYOCERA-AVX/08051C101JAT2A?qs=LzfKP</a>	1	50	0,11 €	5,70 €
Capacitor 33pF	08052U330JAT2A	<a href="#">tDetail/KYOCERA-AVX/08052U330JAT2A?qs=PWg</a>	2	100	0,11 €	10,90 €
Diodo 1N4148	1N4148WT-7	<a href="#">-7?qs=FITO%2F%2FQgYDIMYETivVNccQ%3D%3D</a>	2	100	0,05 €	5,30 €
Diodo 1N4002	1N4002-T	<a href="#">qs=rGAXPo9uwV21tVJRR%252BhxrQ%3D%3D&amp;sr</a>	1	50	0,12 €	5,95 €
Diodo BZV55C6V2	BZV55C6V2	<a href="#">C6V2?qs=tHU%2FIV7kTyT6aGdLZiLeJA%3D%3D&amp;s</a>	1	50	0,13 €	6,60 €
Regulador de tensión	LM1117T	<a href="#">tail/Texas-Instruments/LM1117T-3.3-NOPB?qs=</a>	1	50	0,95 €	47,45 €
Conector 1x1	PH1-01-UA	<a href="#">gikey.com/en/products/detail/adam-tech/PH1</a>	1	50	0,02 €	0,90 €
Conector 1x2	61300211121	<a href="#">om/en/products/detail/w%C3%BCrth-elektronik</a>	5	250	0,06 €	15,98 €
Conector 1x3	M20-9990345	<a href="#">ikey.com/en/products/detail/harwin-inc/M20-</a>	1	50	0,12 €	6,20 €
Conector 1x6	61300611121	<a href="#">om/en/products/detail/w%C3%BCrth-elektronik</a>	1	50	0,19 €	9,30 €
Conector BLK 1x2	1729128	<a href="#">ikey.com/en/products/detail/phoenix-contact</a>	2	100	0,84 €	84,00 €
Conector BLK 1x3	1729131	<a href="#">ikey.com/en/products/detail/phoenix-contact</a>	2	100	1,27 €	127,10 €
Relé	RT314012	<a href="#">s=h4sDRd%2FXttfRhAgOQMm4w%3D%3D&amp;srsit</a>	2	100	2,60 €	260,00 €
Transistor BJT	2N2222	<a href="#">orp/2N2222-PBFFREE/4806844?srsitid=AfmBOopb</a>	2	100	1,32 €	132,00 €
Botón	PTS526SK15SMTR2-LFS	<a href="#">ikey.es/es/products/detail/c-k/PTS526SK15SM</a>	4	200	0,11 €	21,40 €
Microcontrolador	PIC18F2580-I/SO	<a href="#">I-SO?qs=5Wx0vN22rFLg5k%2FqM4Xm9A%3D%3D</a>	1	50	7,72 €	386,00 €
Sensor de lluvia	HDC2010YPAR	<a href="#">?qs=EU6FO9fftWc2CasHMLP4bA%3D%3D&amp;srsIti</a>	1	50	1,18 €	59,00 €
Amplificador Operacional	LT1716	<a href="#">?qs=vtflclh7QUVlaNMG%252B3ElxQ%3D%3D&amp;s</a>	2	100	2,46 €	246,00 €
Transceptor de Voltaje	TXS0108EPWR	<a href="#">?qs=IUbkBnfnSQLgiWtCbWtYOW%3D%3D&amp;srsIt</a>	1	50	0,78 €	38,95 €
Puente H	DRV8871DDA	<a href="#">v.com/es/products/detail/texas-instruments/D</a>	2	100	2,02 €	202,00 €
Controlador CAN	MCP2551	<a href="#">E-SN?qs=Vn0zuzr35GHkGDCgnw0F9A%3D%3D&amp;s</a>	1	50	1,48 €	74,00 €
Conector DB9	SD9S	<a href="#">www.digikey.es/es/products/detail/l-com/SD9S</a>	2	100	2,94 €	294,00 €
Cristal	HC-49/U	<a href="#">o-ltd/HC-49-U-S16384000ABJB/284225?srsitid=At</a>	1	50	0,39 €	19,40 €
PCB	-	<a href="#">ILayer=1&amp;stencilWidth=100&amp;stencilLength=100</a>	1	50	1,07 €	53,40 €

<b>Total:</b>	<b>2.324,08 €</b>
<b>Total por placa:</b>	<b>46,48 €</b>

x1000						
Producto	Descripción	Enlace	Cantidad por PCB	Cantidad total	Precio por unidad	Total
Resistencia 4.7KΩ	ERA-6VEB4701V	<a href="#">/EB4701V?qs=sGAEpiMZZMvdGkrng054tw</a>	4	4000	0,20 €	784,00 €
Resistencia 3KΩ	TNPW08053K00FEEA	<a href="#">-Dale/TNPW08053K00FEEA?qs=sGAEpiM</a>	2	2000	0,08 €	168,00 €
Resistencia 2KΩ	ERJ-UP6D2001V	<a href="#">RJ-UP6D2001V?qs=sGAEpiMZZMvdGkrng0</a>	2	2000	0,05 €	102,00 €
Resistencia 1KΩ	ERA-6AED102V	<a href="#">onic/ERA-6AED102V?qs=sGAEpiMZZMvdG</a>	6	6000	0,06 €	336,00 €
Resistencia 300Ω	SFR10EZPF3000	<a href="#">uctor/SFR10EZPF3000?qs=sGAEpiMZZMvd</a>	1	1000	0,03 €	31,00 €
Resistencia 68Ω	MCU08050C6809FP500	<a href="#">hlag/MCU08050C6809FP500?qs=sGAEpiM</a>	1	1000	0,06 €	64,00 €
Capacitor 1uF	KGM21AR71C105JU	<a href="#">OCERA-AVX/KGM21AR71C105JU?qs=Jm2G</a>	2	2000	0,07 €	134,00 €
Capacitor 100nF	VJ0805Y104KXBAT	<a href="#">ail/Vishay-Vitramon/VJ0805Y104KXBAT?q</a>	11	11000	0,13 €	1.430,00 €
Capacitor 100pF	08051C101JAT2A	<a href="#">tail/KYOCERA-AVX/08051C101JAT2A?qs=Lz</a>	1	1000	0,05 €	46,00 €
Capacitor 33pF	08052U330JAT2A	<a href="#">tail/KYOCERA-AVX/08052U330JAT2A?qs=P</a>	2	2000	0,09 €	178,00 €
Diodo 1N4148	1N4148WT-7	<a href="#">gs=FITO%2F%2FQgYDIMYETivNccQ%3D%</a>	2	2000	0,04 €	78,00 €
Diodo 1N4002	1N4002-T	<a href="#">rGAXPo9uwV21tVJRR%2528hxrQ%3D%3D</a>	1	1000	0,03 €	34,00 €
Diodo BZV55C6V2	BZV55C6V2	<a href="#">2?qs=tHU%2FIV7kTyT6aGdLZiLeJA%3D%3D</a>	1	1000	0,04 €	39,00 €
Regulador de tensión	LM1117T	<a href="#">/Texas-Instruments/LM1117T-3.3-NOP8?</a>	1	1000	0,80 €	801,00 €
Conector 1x1	PH1-01-UA	<a href="#">ey.com/en/products/detail/adam-tech/</a>	1	1000	0,01 €	12,60 €
Conector 1x2	61300211121	<a href="#">/en/products/detail/w%C3%BCrth-elektro</a>	5	5000	0,06 €	300,00 €
Conector 1x3	M20-9990345	<a href="#">y.com/en/products/detail/harwin-inc/M</a>	1	1000	0,09 €	89,00 €
Conector 1x6	61300611121	<a href="#">/en/products/detail/w%C3%BCrth-elektro</a>	1	1000	0,15 €	153,00 €
Conector BLK 1x2	1729128	<a href="#">y.com/en/products/detail/phoenix-cont</a>	2	2000	0,84 €	1.684,40 €
Conector BLK 1x3	1729131	<a href="#">y.com/en/products/detail/phoenix-cont</a>	2	2000	1,27 €	2.542,00 €
Relé	RT314012	<a href="#">4sDRd%2FXttifRhAgOQMm4w%3D%3D&amp;s</a>	2	2000	2,32 €	4.640,00 €
Transistor BJT	2N2222	<a href="#">/2N2222-PBFFREE/4806844?srsId=AfmBOc</a>	2	2000	0,92 €	1.846,00 €
Botón	PTS526SK15SMTR2-LFS	<a href="#">y.es/es/products/detail/c-k/PTS526SK15</a>	4	4000	0,08 €	323,60 €
Microcontrolador	PIC18F2580-I/SO	<a href="#">Q?qs=5Wx0vN22rFLg5k%2FqM4Xm9A%3D%</a>	1	1000	7,72 €	7.720,00 €
Sensor de lluvia	HDC2010YPAR	<a href="#">s=EU6FO9ffTwc2CasHMLP4bA%3D%3D&amp;sr</a>	1	1000	0,99 €	988,00 €
Amplificador Operacional	LT1716	<a href="#">s=ytficlh7QUVlaNMG%252B3ElxQ%3D%3D</a>	2	2000	2,06 €	4.120,00 €
Transceptor de Voltaje	TXS0108EPWR	<a href="#">s=lUbkBnfnSQLgiWtCbWtYOW%3D%3D&amp;s</a>	1	1000	0,58 €	581,00 €
Puente H	DRV8871DDA	<a href="#">m/es/products/detail/texas-instrument</a>	2	2000	1,76 €	3.520,00 €
Controlador CAN	MCP2551	<a href="#">N?qs=Vn0zuzr35GHkGDCgnw0F9A%3D%3D</a>	1	1000	1,26 €	1.260,00 €
Conector DB9	SD9S	<a href="#">.digikey.es/es/products/detail/i-com/SD</a>	2	2000	2,50 €	5.000,00 €
Cristal	HC-49/U	<a href="#">d/HC-49-U-S16384000ABJB/284225?srsId</a>	1	1000	0,32 €	323,00 €
PCB	-	<a href="#">yer=1&amp;stencilWidth=100&amp;stencilLength=</a>	1	1000	0,41 €	405,60 €

<b>Total:</b>	<b>39.733,20 €</b>
<b>Total por placa:</b>	<b>39,73 €</b>

x20000						
Producto	Descripción	Enlace	Cantidad por PCB	Cantidad total	Precio por unidad	Total
Resistencia 4.7KΩ	ERA-6VEB4701V	<a href="#">A-6VEB4701V?qs=sGAEpiMZZMvdGkrng054twKD</a>	4	80000	0,17 €	13.600,00 €
Resistencia 3KΩ	TNPW08053K00FEEA	<a href="#">hay-Dale/TNPW08053K00FEEA?qs=sGAEpiMZZM</a>	2	40000	0,06 €	2.480,00 €
Resistencia 2KΩ	ERJ-UP6D2001V	<a href="#">c/ERJ-UP6D2001V?qs=sGAEpiMZZMvdGkrng054t</a>	2	40000	0,04 €	1.560,00 €
Resistencia 1KΩ	ERA-6AED102V	<a href="#">nasonic/ERA-6AED102V?qs=sGAEpiMZZMvdGkr</a>	6	120000	0,05 €	6.120,00 €
Resistencia 300Ω	SFR10EZPF3000	<a href="#">nductor/SFR10EZPF3000?qs=sGAEpiMZZMvdGk</a>	1	20000	0,02 €	440,00 €
Resistencia 68Ω	MCU08050C6809FP500	<a href="#">eyschlag/MCU08050C6809FP500?qs=sGAEpiMZZM</a>	1	20000	0,06 €	1.280,00 €
Capacitor 1uF	KGM21AR71C105JU	<a href="#">l/KYOCERA-AVX/KGM21AR71C105JU?qs=Jm2GQvT</a>	2	40000	0,05 €	1.960,00 €
Capacitor 100nF	VJ0805Y104KXBAT	<a href="#">Detail/Vishay-Vitramon/VJ0805Y104KXBAT?qs=Z</a>	11	220000	0,12 €	26.400,00 €
Capacitor 100pF	08051C101JAT2A	<a href="#">Detail/KYOCERA-AVX/08051C101JAT2A?qs=LzfKP</a>	1	20000	0,04 €	760,00 €
Capacitor 33pF	08052U330JAT2A	<a href="#">tDetail/KYOCERA-AVX/08052U330JAT2A?qs=PWg</a>	2	40000	0,05 €	2.120,00 €
Diodo 1N4148	1N4148WT-7	<a href="#">-7?qs=FITO%2F%2FQgYDIMYETivVnccQ%3D%3D</a>	2	40000	0,02 €	880,00 €
Diodo 1N4002	1N4002-T	<a href="#">qs=rGAXPo9uwV21tVJRR%252BhxrQ%3D%3D&amp;sr</a>	1	20000	0,03 €	560,00 €
Diodo BZV55C6V2	BZV55C6V2	<a href="#">6V2?qs=tHU%2FIV7kTyT6aGdLzJLeJA%3D%3D&amp;s</a>	1	20000	0,03 €	520,00 €
Regulador de tensión	LM1117T	<a href="#">tail/Texas-Instruments/LM1117T-3.3-NOPB?qs=</a>	1	20000	0,73 €	14.660,00 €
Conector 1x1	PH1-01-UA	<a href="#">gikey.com/en/products/detail/adam-tech/PH1</a>	1	20000	0,01 €	214,00 €
Conector 1x2	61300211121	<a href="#">om/en/products/detail/w%C3%BCrth-elektronik</a>	5	100000	0,06 €	6.000,00 €
Conector 1x3	M20-9990345	<a href="#">ikey.com/en/products/detail/harwin-inc/M20-</a>	1	20000	0,08 €	1.521,20 €
Conector 1x6	61300611121	<a href="#">om/en/products/detail/w%C3%BCrth-elektronik</a>	1	20000	0,15 €	3.078,00 €
Conector BLK 1x2	1729128	<a href="#">gikey.com/en/products/detail/phoenix-contact</a>	2	40000	0,84 €	33.688,00 €
Conector BLK 1x3	1729131	<a href="#">gikey.com/en/products/detail/phoenix-contact</a>	2	40000	1,27 €	50.840,00 €
Relé	RT314012	<a href="#">s=h4sDRd%2FXttfRhAgOQMm4w%3D%3D&amp;srsit</a>	2	40000	2,28 €	91.200,00 €
Transistor BJT	2N2222	<a href="#">prp/2N2222-P8FREE/4806844?srsitid=AfmBOopb</a>	2	40000	0,91 €	36.520,00 €
Botón	PTS526SK15SMTR2-LFS	<a href="#">ikey.es/es/products/detail/c-k/PTS526SK15SM</a>	4	80000	0,07 €	5.592,80 €
Microcontrolador	PIC18F2580-I/SO	<a href="#">I-SO?qs=5Wx0vN22rFLg5k%2FqM4Xm9A%3D%3D</a>	1	20000	7,72 €	154.400,00 €
Sensor de lluvia	HDC2010YPAR	<a href="#">?qs=EU6FO9ftTwc2CasHMLP4bA%3D%3D&amp;srsIti</a>	1	20000	0,90 €	18.060,00 €
Amplificador Operacional	LT1716	<a href="#">?qs=ytfclh7QUVlaNMG%252B3ElxQ%3D%3D&amp;s</a>	2	40000	2,05 €	82.000,00 €
Transceptor de Voltaje	TXS0108EPWR	<a href="#">?qs=IUbk8nfnSQLgiWtCbWtYOW%3D%3D&amp;srsit</a>	1	20000	0,54 €	10.820,00 €
Puente H	DRV8871DDA	<a href="#">y.com/es/products/detail/texas-instruments/D</a>	2	40000	1,76 €	70.400,00 €
Controlador CAN	MCP2551	<a href="#">E-SN?qs=Vn0zuzr35GHkGDCgnw0F9A%3D%3D&amp;s</a>	1	20000	1,26 €	25.200,00 €
Conector DB9	SD9S	<a href="#">www.digikey.es/es/products/detail/l-com/SD9S</a>	2	40000	2,35 €	93.920,00 €
Cristal	HC-49/U	<a href="#">p-ltd/HC-49-U-S16384000ABJB/284225?srsitid=Af</a>	1	20000	0,28 €	5.618,00 €
PCB	-	<a href="#">ILayer=1&amp;stencilWidth=100&amp;stencilLength=100</a>	1	20000	0,32 €	6.313,00 €

Total:	768.725,00 €
Total por placa:	38,44 €

# Bibliografía

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