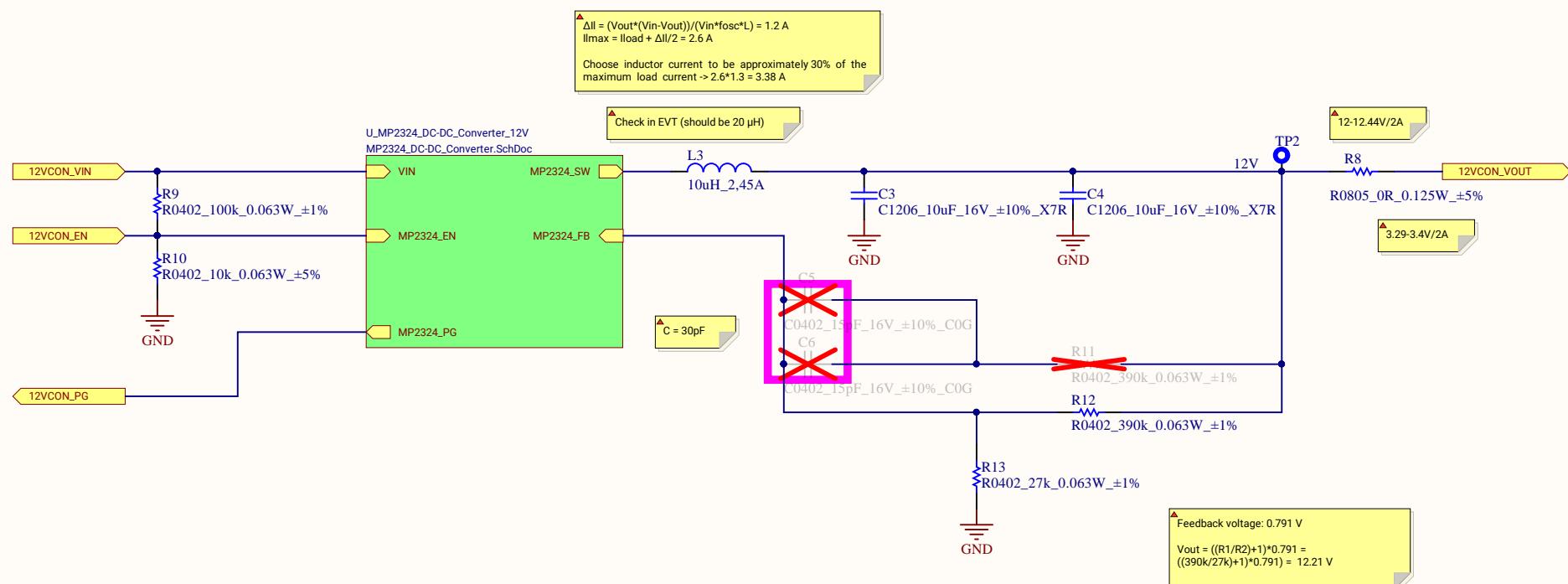


A



Title 12V_Converter		
Project 0003160.PpjPcb		
Author Álvaro Hernando		
Size: A4	Number: 1	Revision: 1.2
Date: 24/04/2018	Time: 15:24:25	Sheet 2 of 30

A

A

B

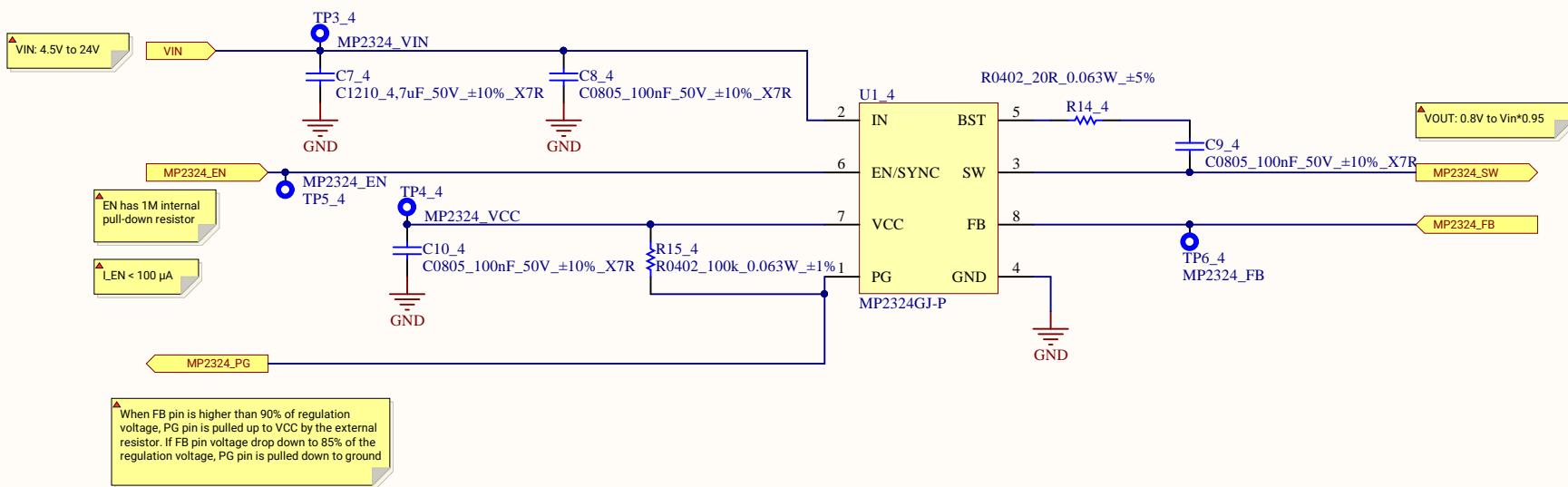
B

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A

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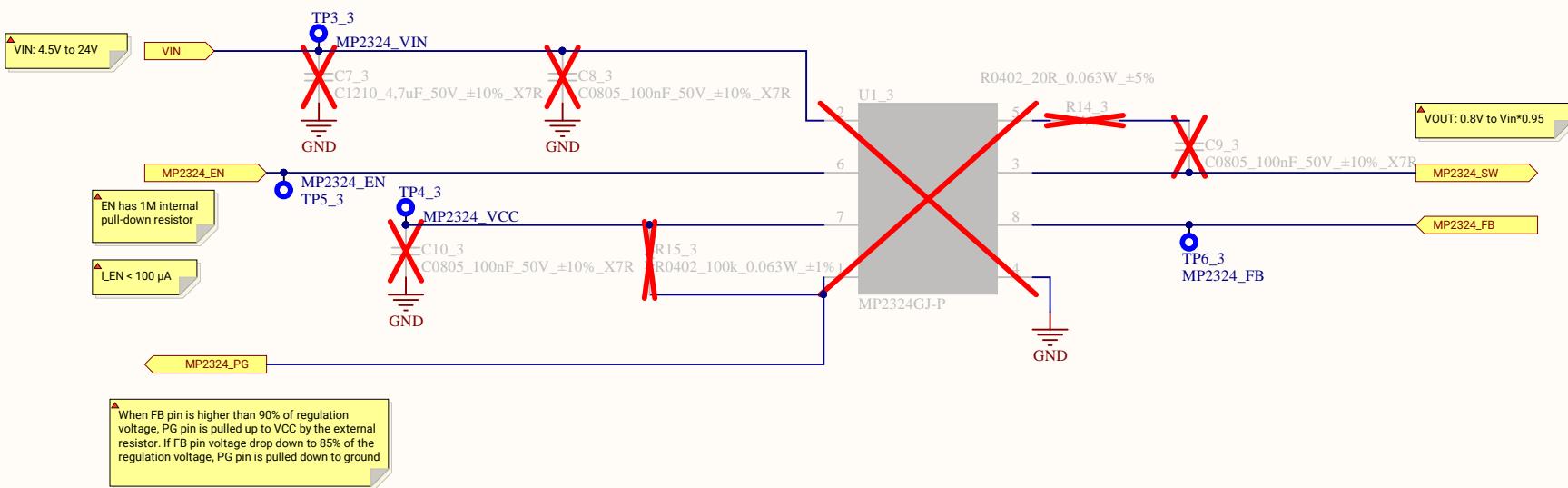
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C

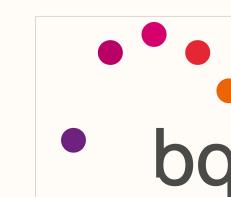
C

D

D



X_1 -> DC_DC_Converter_3V3
 X_2 -> DC_DC_Converter_3V7
 X_3 -> DC_DC_Converter_5V
 X_4 -> DC_DC_Converter_12V



Title		
MP2324_DC-DC_Converter		
Project		
0003160.PpjPcb		
Author		
Álvaro Hernando		
Size:	A4	Number:
	1	Revision:
Date:	24/04/2018	Time:
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A

A

B

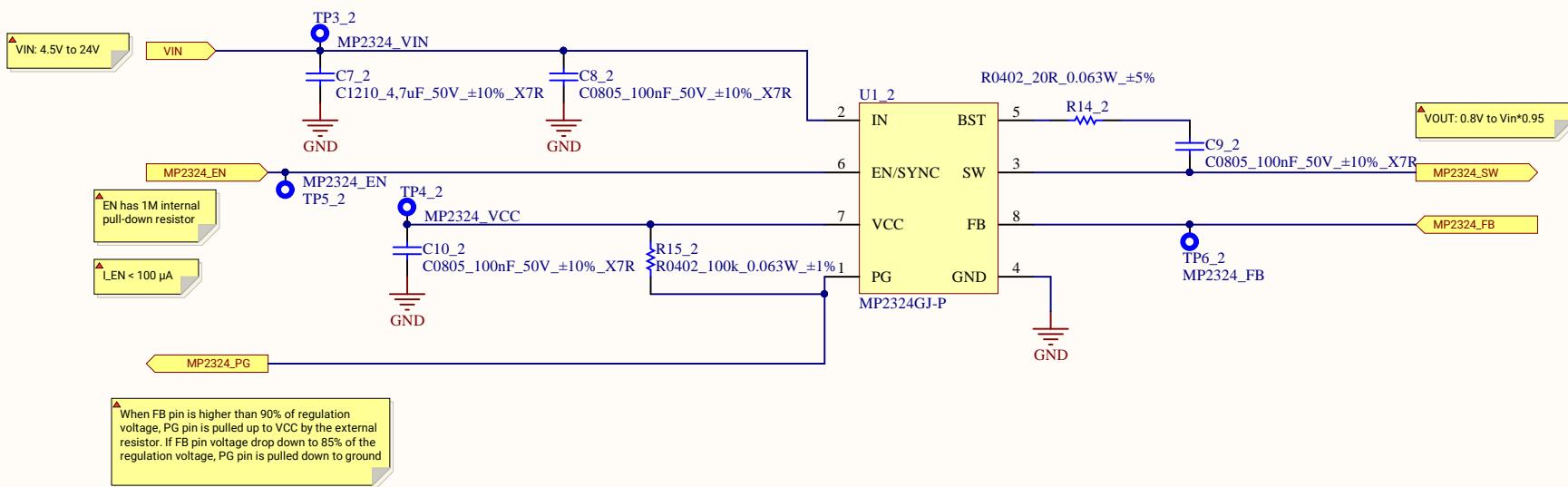
B

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D



X_1 -> DC_DC_Converter_3V3
 X_2 -> DC_DC_Converter_3V7
 X_3 -> DC_DC_Converter_5V
 X_4 -> DC_DC_Converter_12V



Title		
MP2324_DC-DC_Converter		
Project		
0003160.PpjPcb		
Author		
Álvaro Hernando		
Size:	A4	Number:
	1	Revision:
Date:	24/04/2018	Time:
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A

A

B

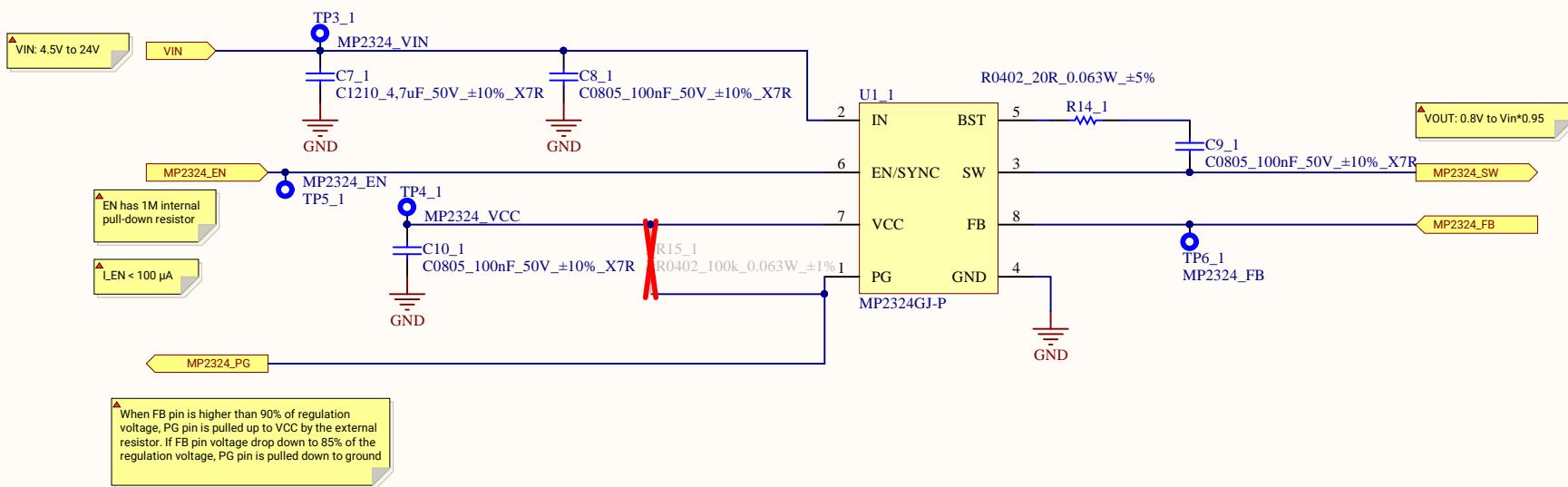
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C

D

D



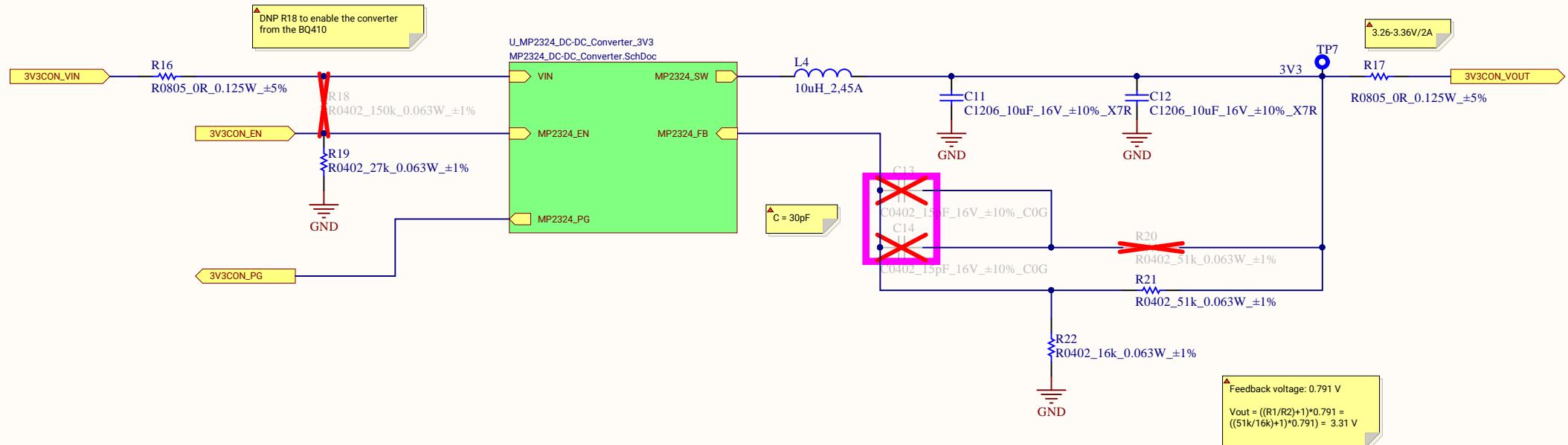
X_1 -> DC_DC_Converter_3V3
 X_2 -> DC_DC_Converter_3V7
 X_3 -> DC_DC_Converter_5V
 X_4 -> DC_DC_Converter_12V



Title		
MP2324_DC-DC_Converter		
Project		
0003160.PpjPcb		
Author		
Álvaro Hernando		
Size:	A4	Number:
Revision:	1.2	Time:
Date:	24/04/2018	Sheet 3 of 38

A

A



B

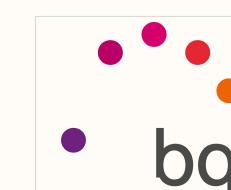
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C

C

D

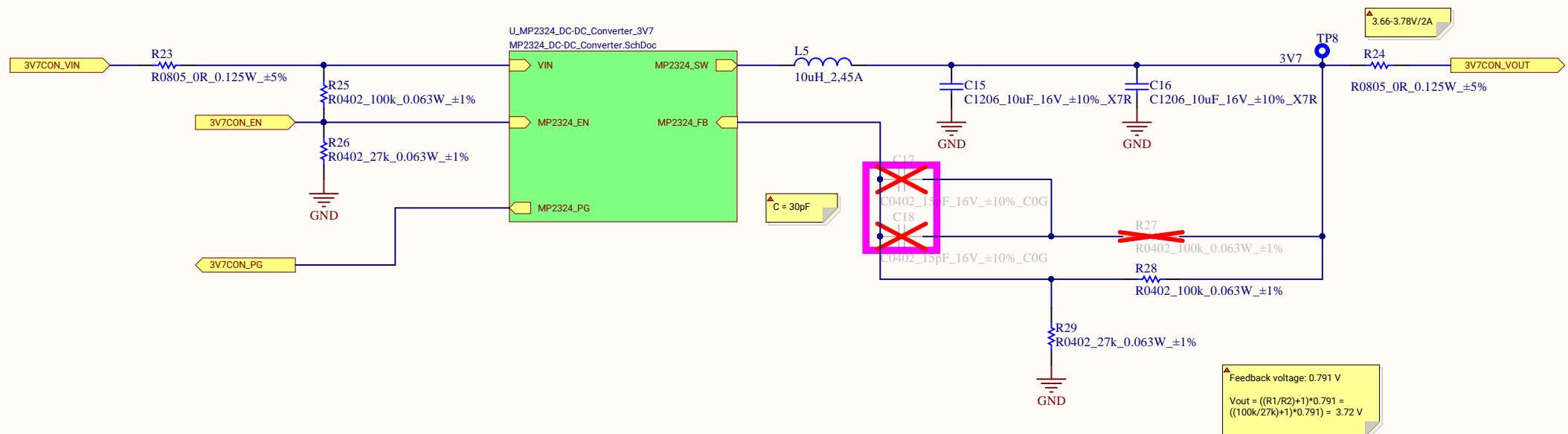
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Title 3V3_Converter		
Project 0003160.PrjPcb		
Author Álvaro Hernando		
Size: A4	Number: 1	Revision: 1.2
Date: 24/04/2018	Time: 15:24:26	Sheet 4 of 30

A

A



B

B

C

C

D

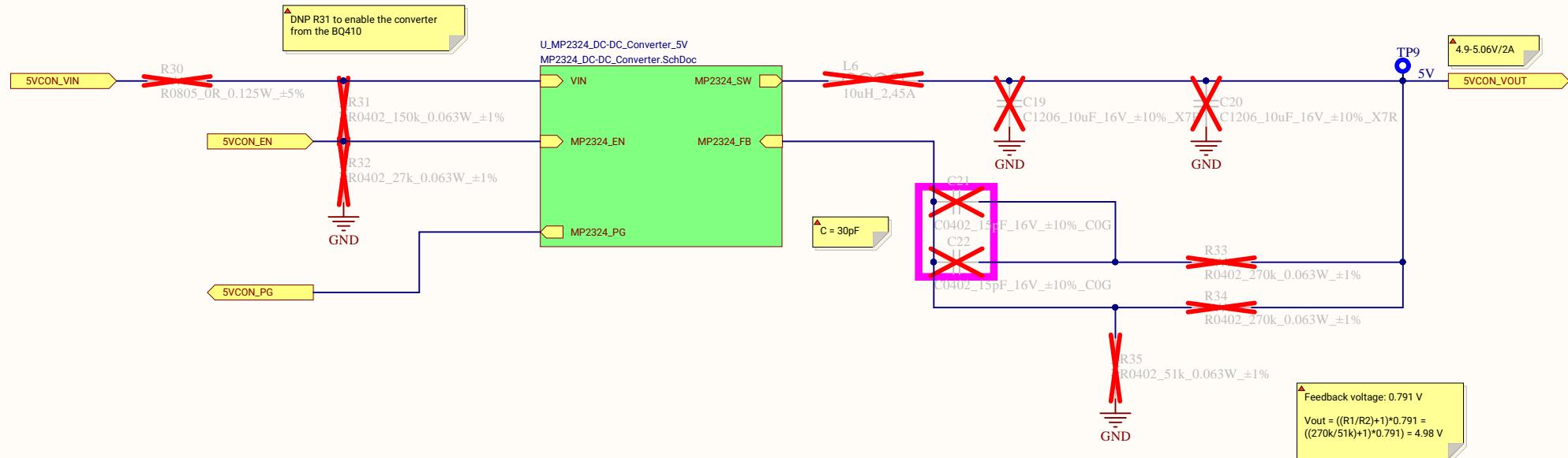
D



Title 3V7_Converter		
Project 0003160.PrjPcb		
Author Álvaro Hernando		
Size: A4	Number: 1	Revision: 1.2
Date: 24/04/2018	Time: 15:24:26	Sheet 5 of 30

A

A



B

B

C

C

D

D



Title 5V_Converter		
Project 0003160.PpjPcb		
Author Álvaro Hernando		
Size: A4	Number: 1	Revision: 1.2
Date: 24/04/2018	Time: 15:24:26	Sheet 6 of 38

A

A

B

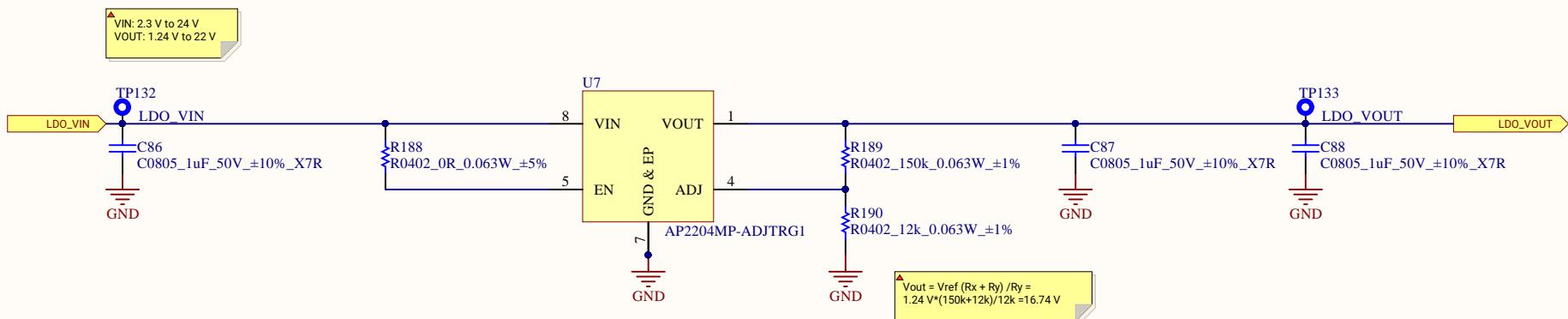
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C

C

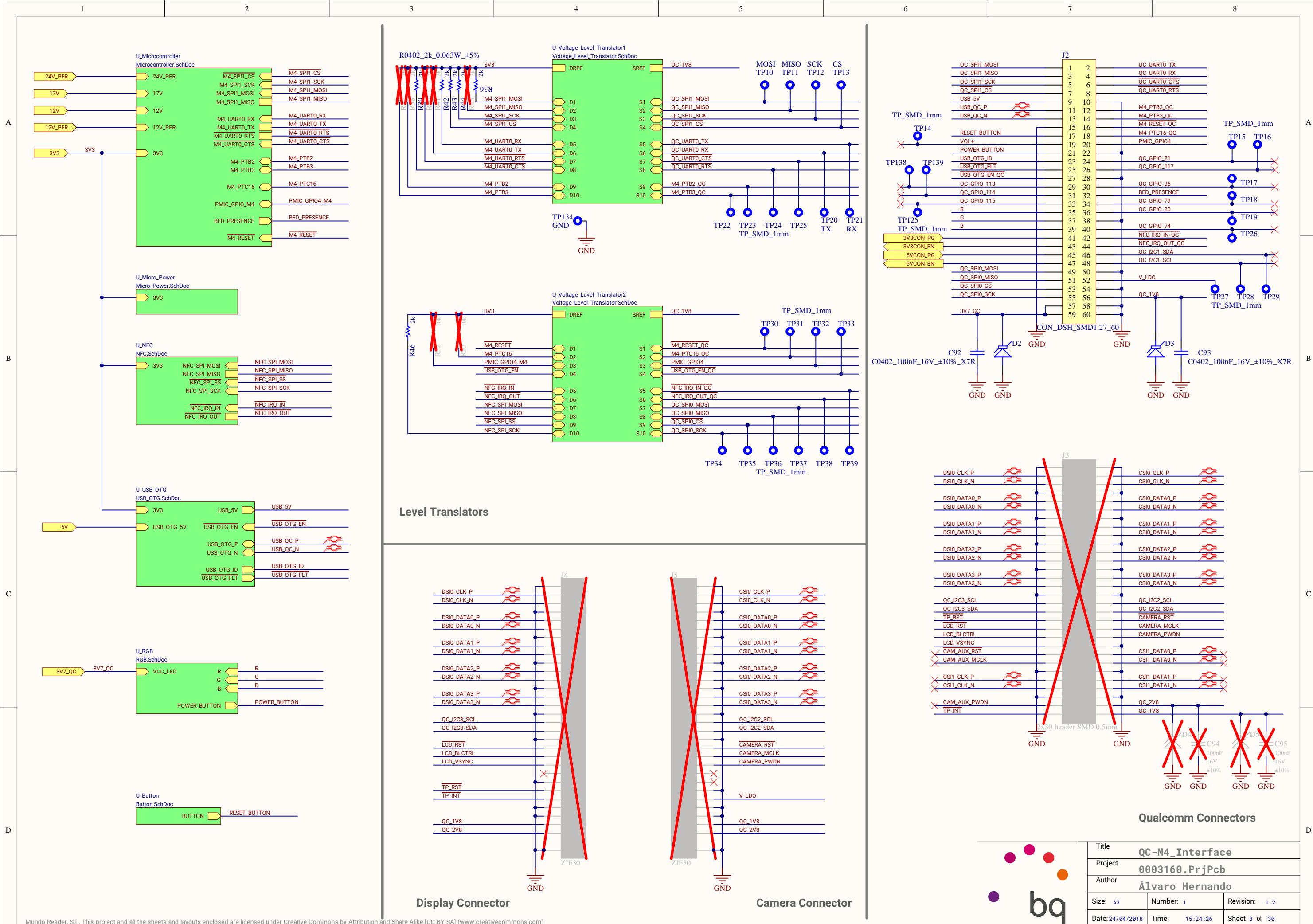
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D



Title Adj_LDO		
Project 0003160.PrjPcb		
Author Álvaro Hernando		
Size: A4	Number: 1	Revision: 1.2
Date: 24/04/2018	Time: 15:24:26	Sheet 7 of 38





A

A

B

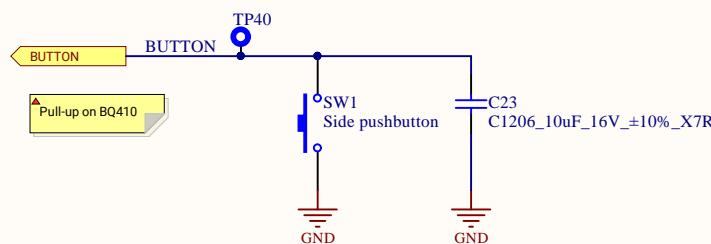
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C

C

D

D



Title Button		
Project 0003160.PjPcb		
Author Álvaro Hernando		
Size: A4	Number: 1	Revision: 1.2
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bq

A

1

B

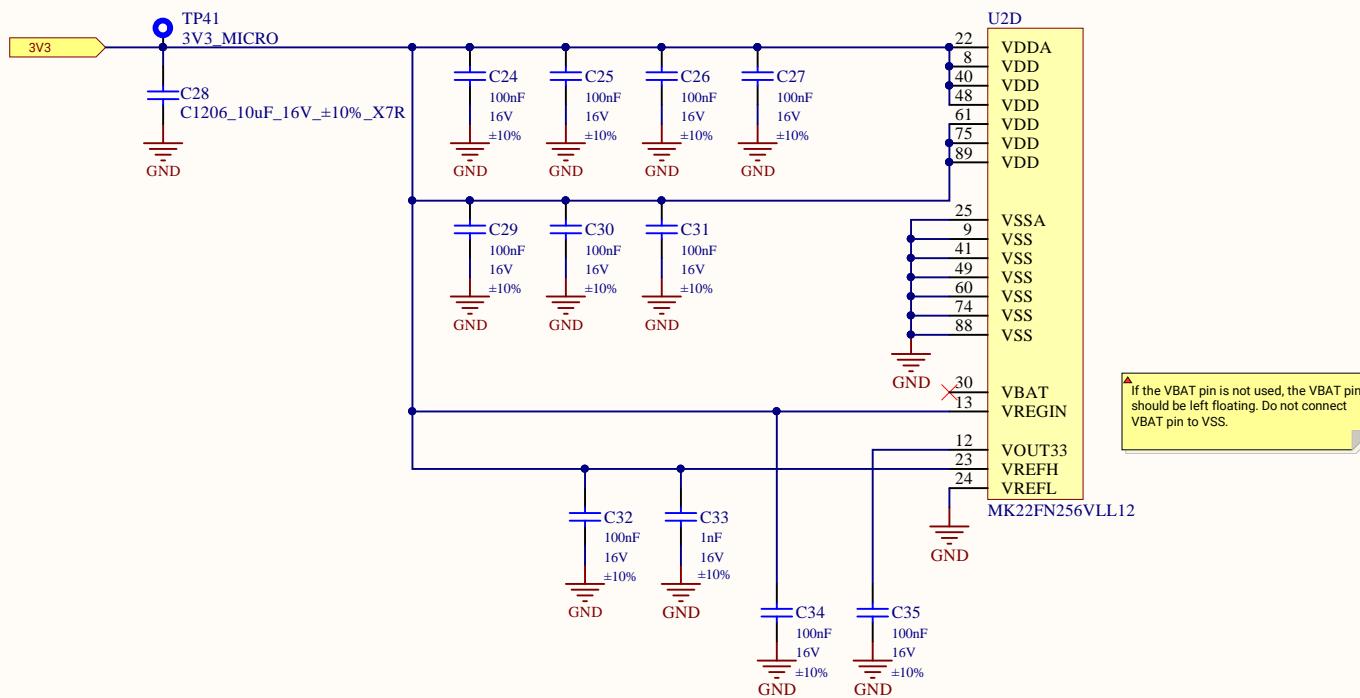
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C

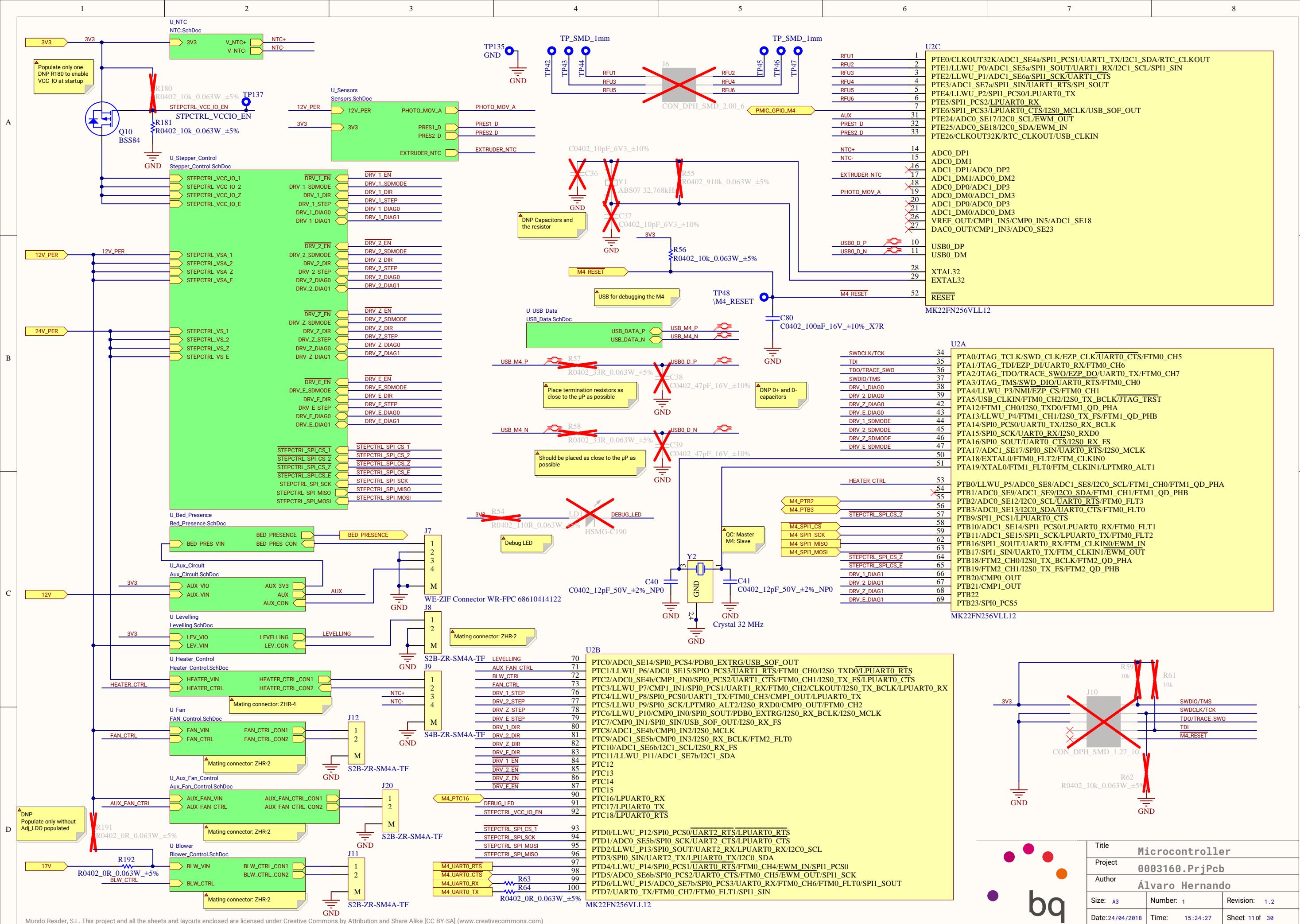
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E

1



Title	Micro_Power	
Project	0003160.PrjPcb	
Author	Álvaro Hernando	
Size:	A4	Number:
Date:	24/04/2018	Time:
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A

A

B

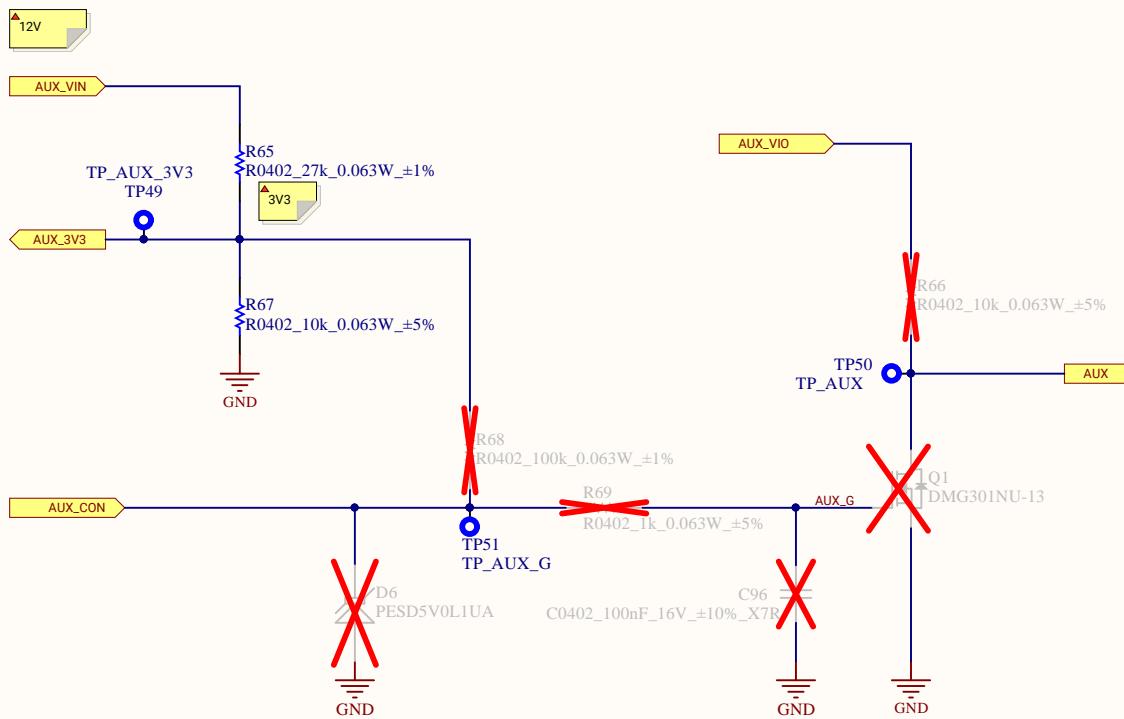
B

C

C

D

D



Title		
Aux_Circuit		
Project		
0003160.PpjPcb		
Author	Álvaro Hernando	
Size:	A4	Number: 1
Date:	24/04/2018	Revision: 1.2
Date:	24/04/2018	Time: 15:24:28
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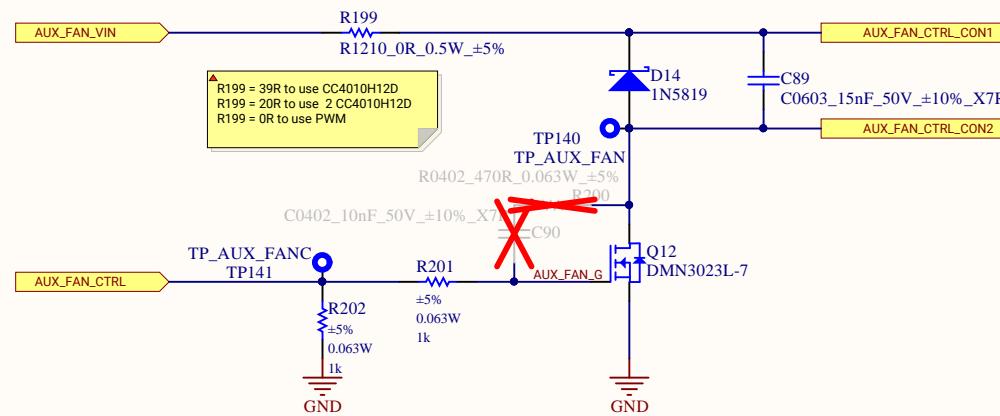
A

With Coolcox CC4010H12D:
 12 V Fan @ 0.10 A $\rightarrow R = 12 \text{ V} / 0.10 \text{ A} = 120 \text{ Ohm}$
 Needed 9 V Fan $\rightarrow I = 9 \text{ V} / 120 \text{ Ohm} = 0.075 \text{ A}$
 Resistance needed $\rightarrow R = (12 \text{ V} - 9 \text{ V}) / 0.075 \text{ A} = 40 \text{ Ohms}$
 Power dissipated in R $\rightarrow P = 0.225 \text{ W}$

Real values:
 $R = 39 \text{ Ohm} \pm 5\% \rightarrow U = 2.78 - 3.07 \text{ V}, P = 0.208 - 0.23 \text{ W}$

With 2 Coolcox CC4010H12D:
 (12 V Fan @ 0.10 A) $\times 2 \rightarrow R = 12 \text{ V} / 0.20 \text{ A} = 60 \text{ Ohm}$
 Needed 9 V Fans $\rightarrow I = 9 \text{ V} / 60 \text{ Ohm} = 0.15 \text{ A}$
 Resistance needed $\rightarrow R = (12 \text{ V} - 9 \text{ V}) / 0.15 \text{ A} = 20 \text{ Ohms}$
 Power dissipated in R $\rightarrow P = 0.45 \text{ W}$

Real values:
 $R = 20 \text{ Ohm} \pm 5\% \rightarrow U = 2.85 - 3.15 \text{ V}, P = 0.428 - 0.473 \text{ W}$



Title		
Aux_Fan_Control		
Project		
0003160.PpjPcb		
Author		
Álvaro Hernando		
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A

A

B

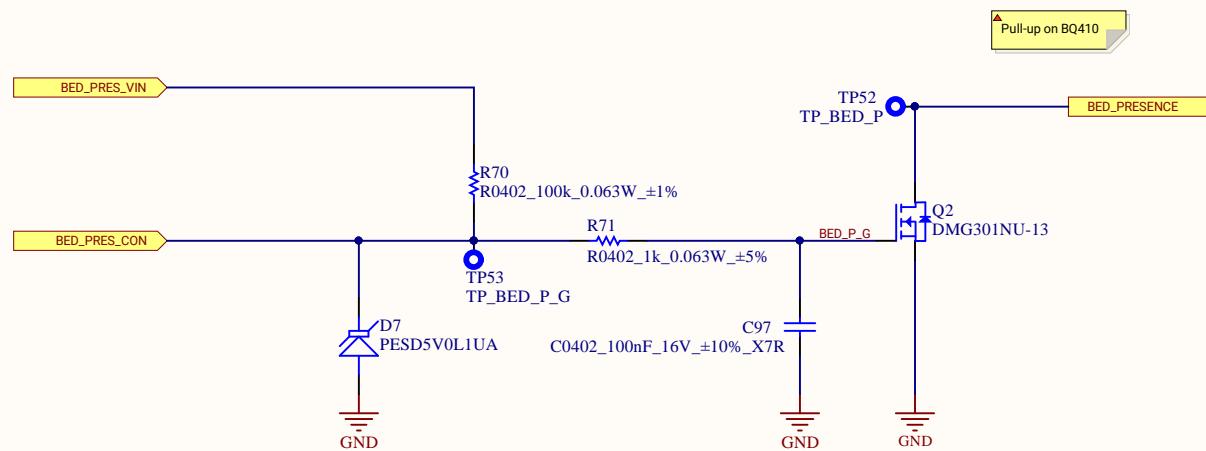
B

C

C

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D



Title		
Bed_Presence		
Project		
0003160.PrjPcb		
Author		
Álvaro Hernando		
Size:	A4	Number:
	1	Revision:
Date:	24/04/2018	Time:
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A

A

B

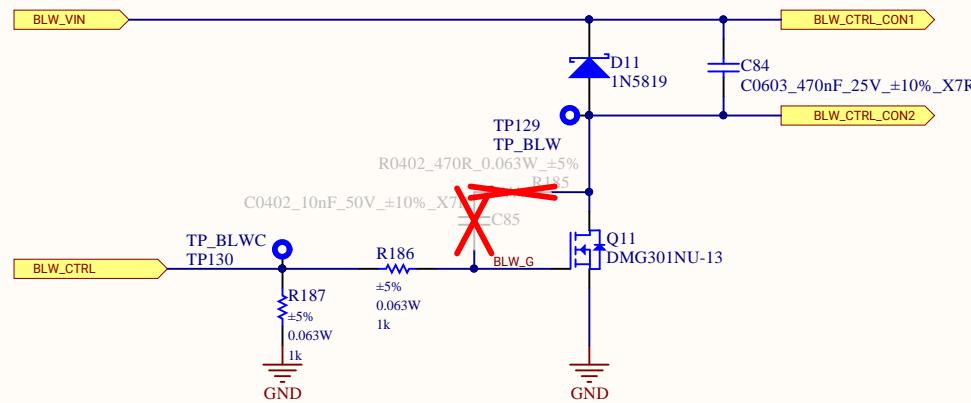
B

C

C

D

D



bq

Title		
Blower_Control		
Project		
0003160.PpjPcb		
Author		
Álvaro Hernando		
Size:	A4	Number:
	1	Revision:
Date:	24/04/2018	Time:
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A

A

B

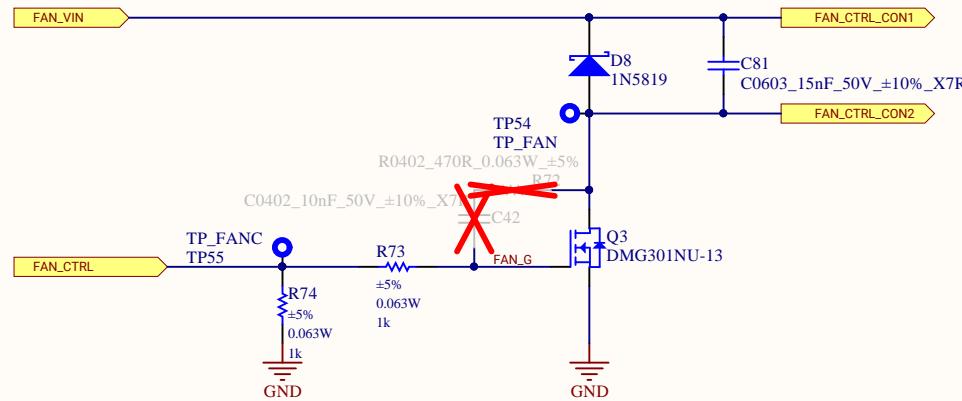
B

C

C

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D



Title Fan_Control		
Project 0003160.PpjPcb		
Author Álvaro Hernando		
Size: A4	Number: 1	Revision: 1.2
Date: 24/04/2018	Time: 15:24:28	Sheet 16 of 30

A

A

B

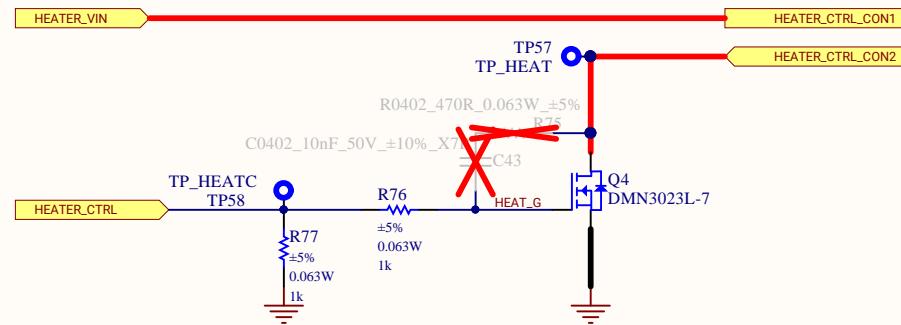
B

C

C

D

D



Title		
Heater_Control		
Project		
0003160.PpjPcb		
Author		
Álvaro Hernando		
Size:	A4	Number: 1
Revision:	1.2	
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A

A

B

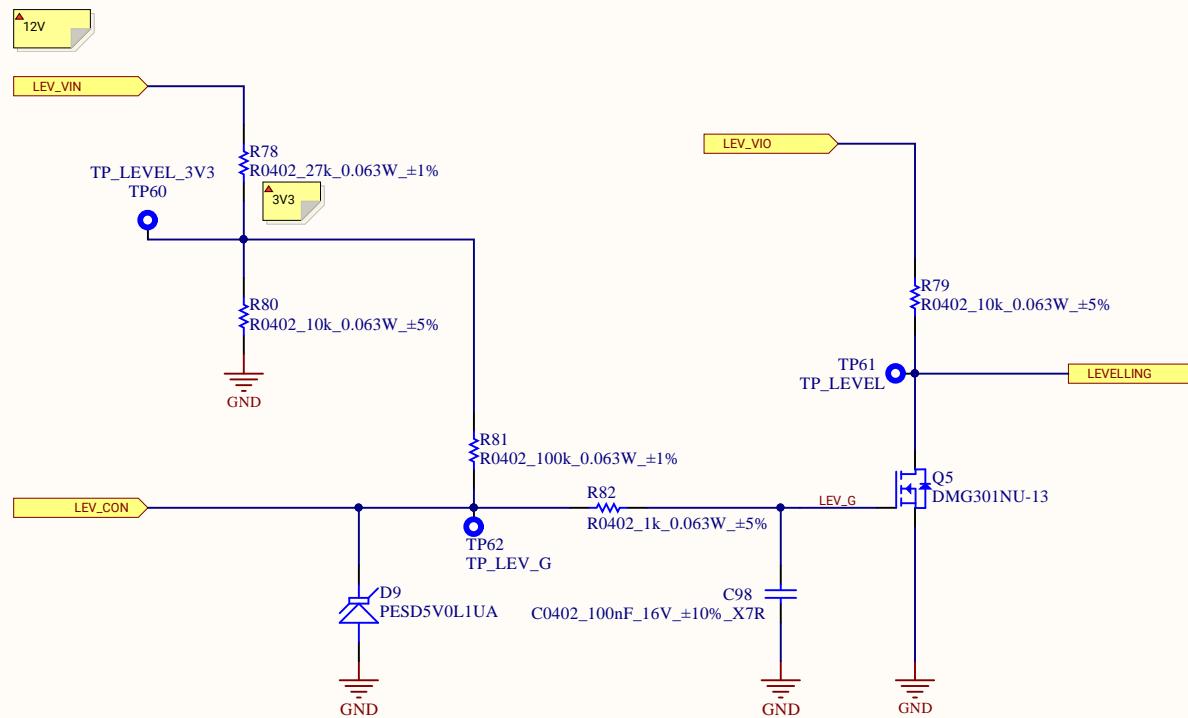
B

C

C

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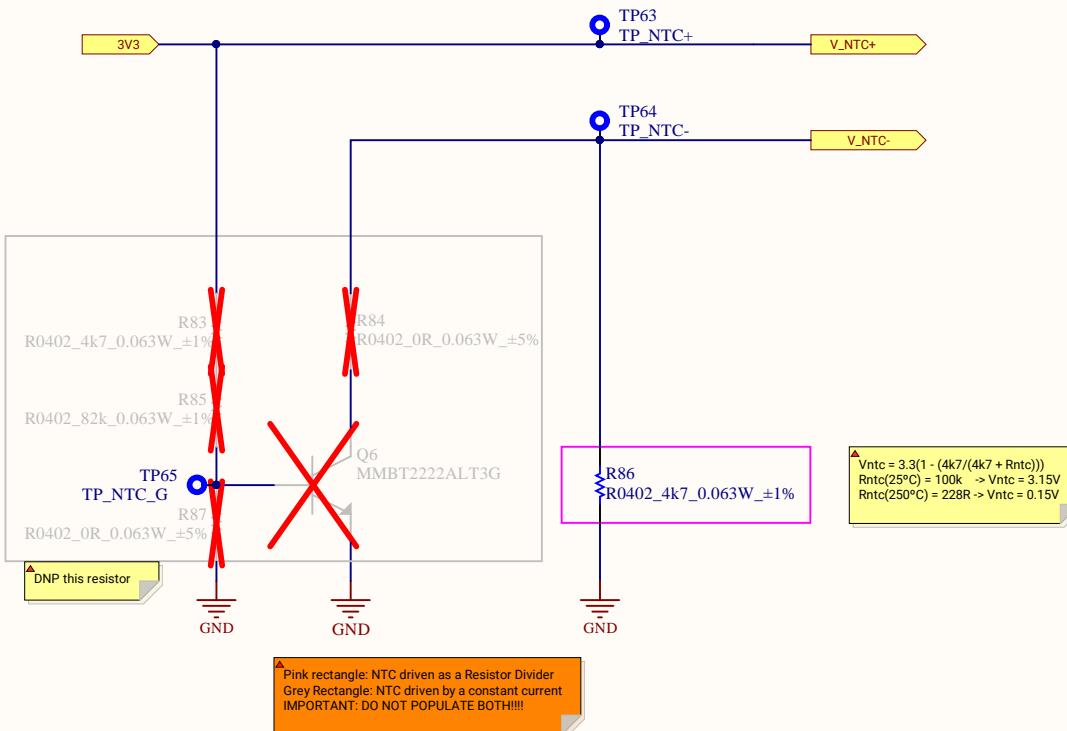
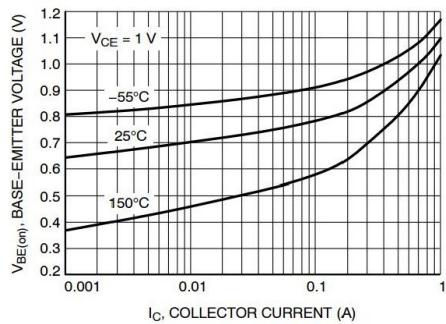
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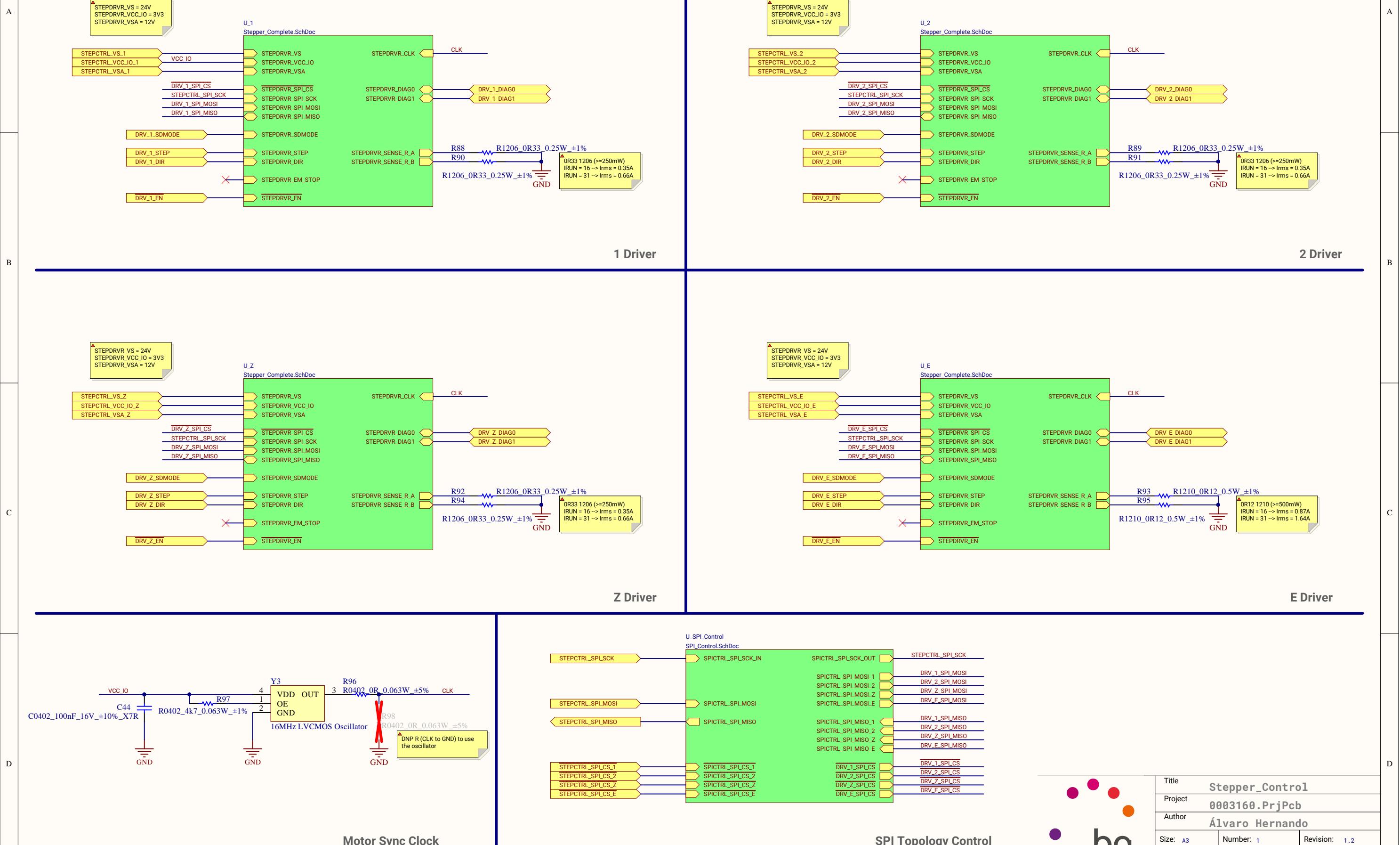
Title		
Levelling		
Project		
0003160.PpjPcb		
Author	Álvaro Hernando	
Size:	A4	Number: 1
Revision:	1.2	
Date:	24/04/2018	Time: 15:24:28
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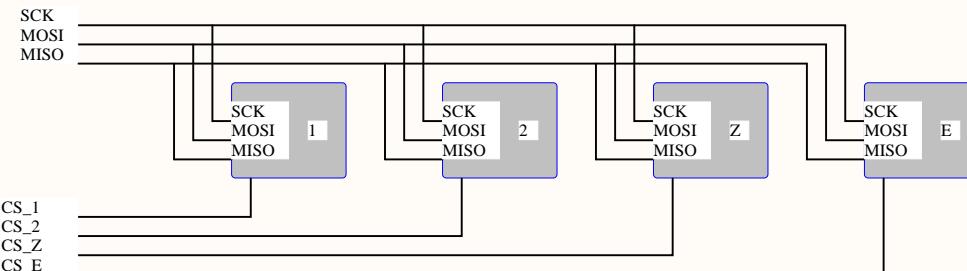
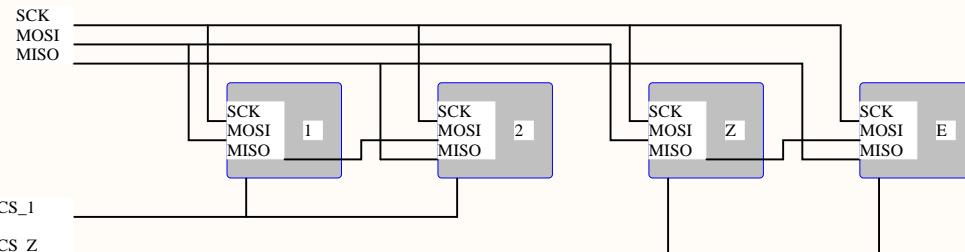
$\Delta R_{NTC} \text{ min } (200^\circ\text{C}) = 557\Omega$
 $I_c = 3.3V/557\Omega \approx 6mA$
 $hFE (25^\circ\text{C}@6mA) \approx 200$
 $I_b = 6mA/200 = 30\mu A$
 $R_{fja} = (3.3-0.7)/30\mu A = 86.7K$
 $I_{real} = 6mA$
 $V_{ntc}(200^\circ\text{C}) = 3.30V$
 $V_{ntc}(250^\circ\text{C}) = 1.37V$



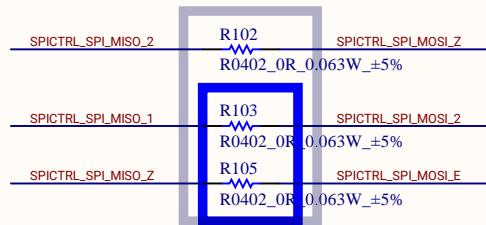
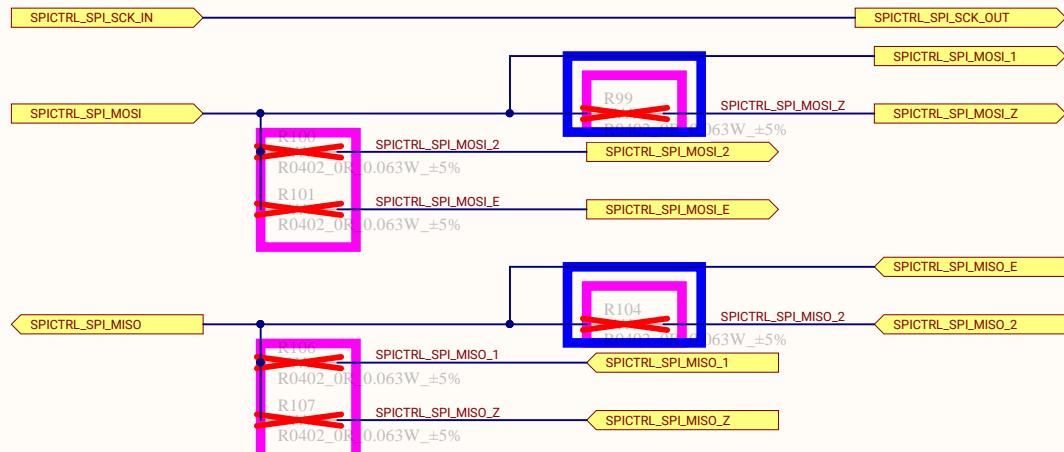
Title NTC		
Project 0003160.PpjPcb		
Author Álvaro Hernando		
Size: A4	Number: 1	Revision: 1.2
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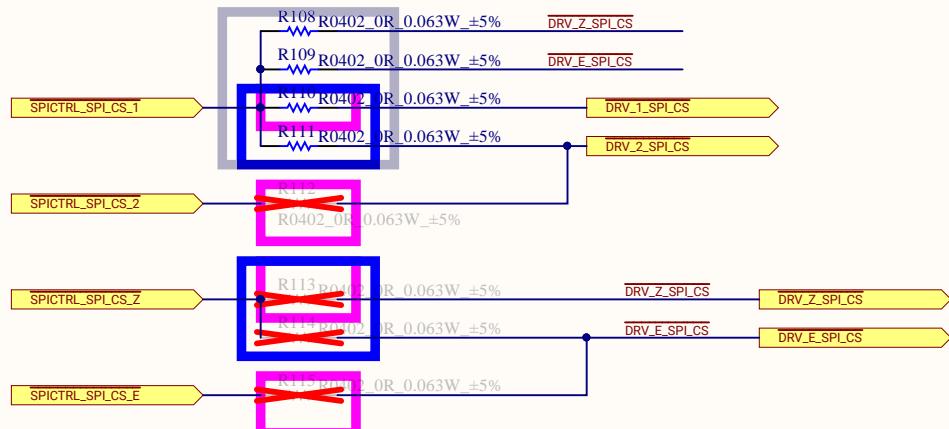
A



B



C



Normal mode:
Populate only resistors in pink boxes

 Daisy Chain mode 2-2:
Populate only resistors in blue boxes

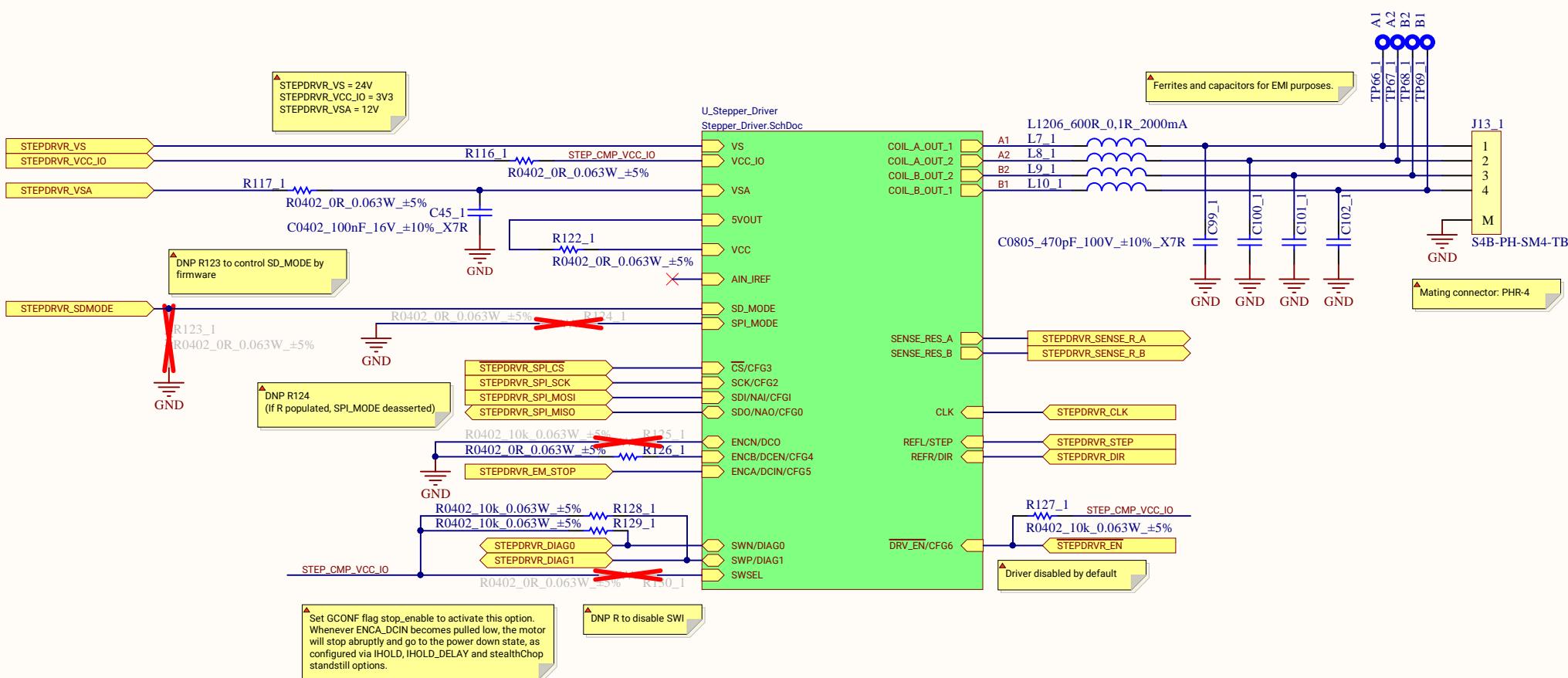
 Daisy Chain mode:
Populate only resistors in grey boxes

 The predefined mode will be daisy chain



Title	SPI_Control	
Project	0003160.PnjPcb	
Author	Álvaro Hernando	
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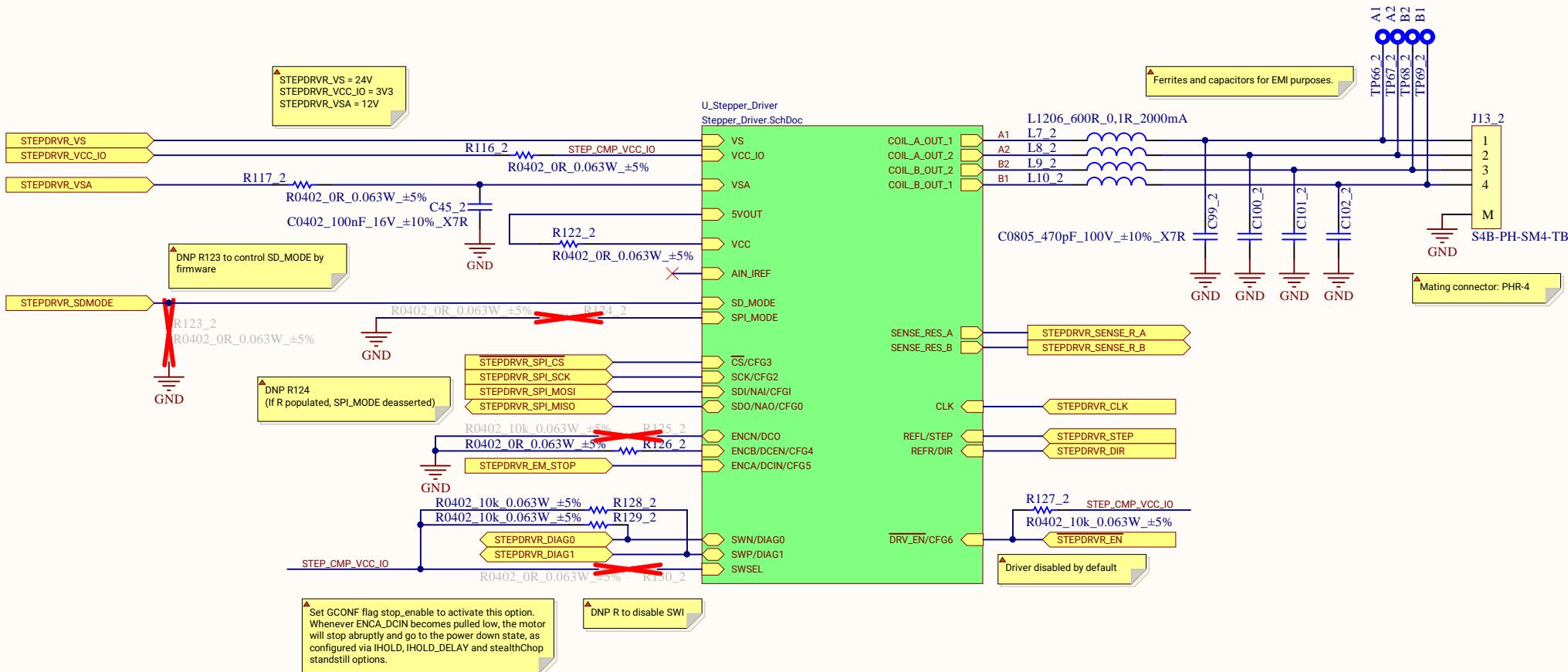
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Title		
Stepper_Complete		
Project		
0003160.PnjPcb		
Author		
Álvaro Hernando		
Size:	A4	Number: 1
Revision:	1.2	
Date:	24/04/2018	Time: 15:24:29
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A



B

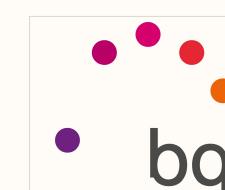
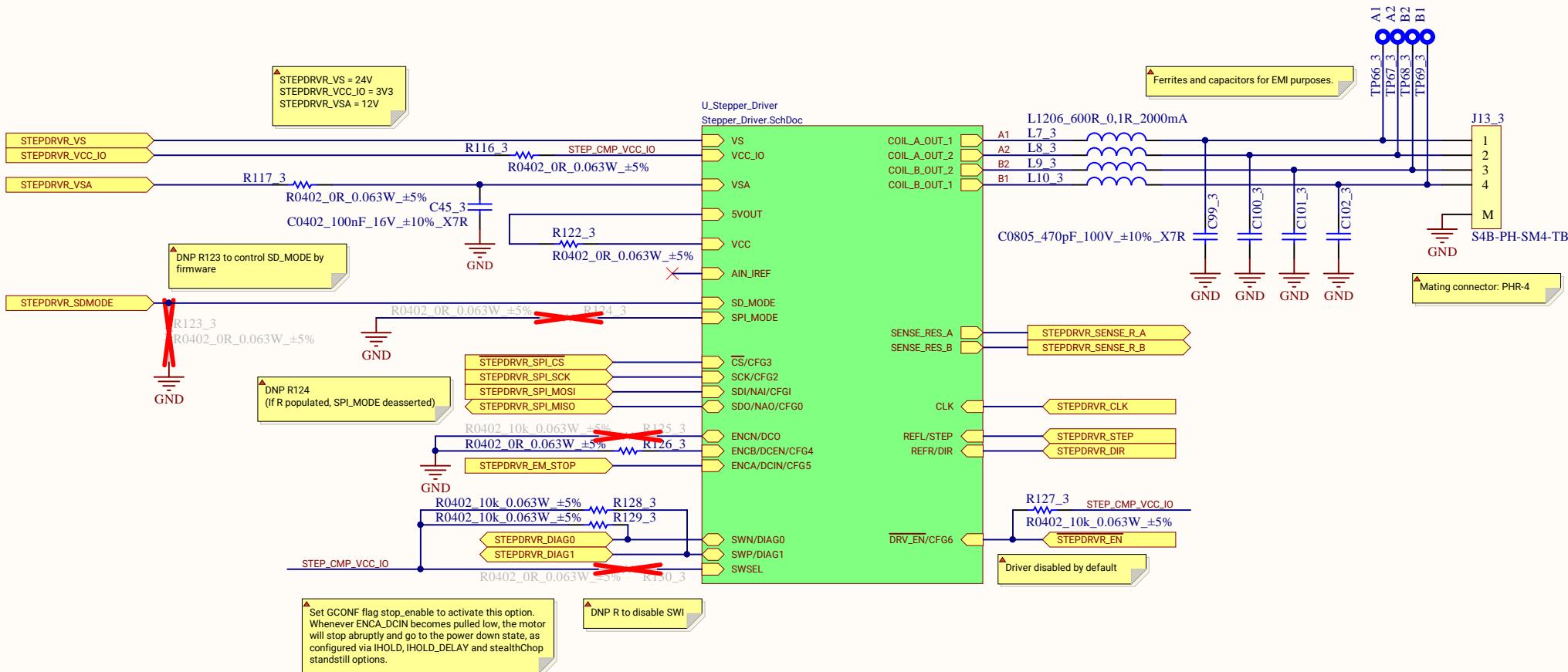
C

D



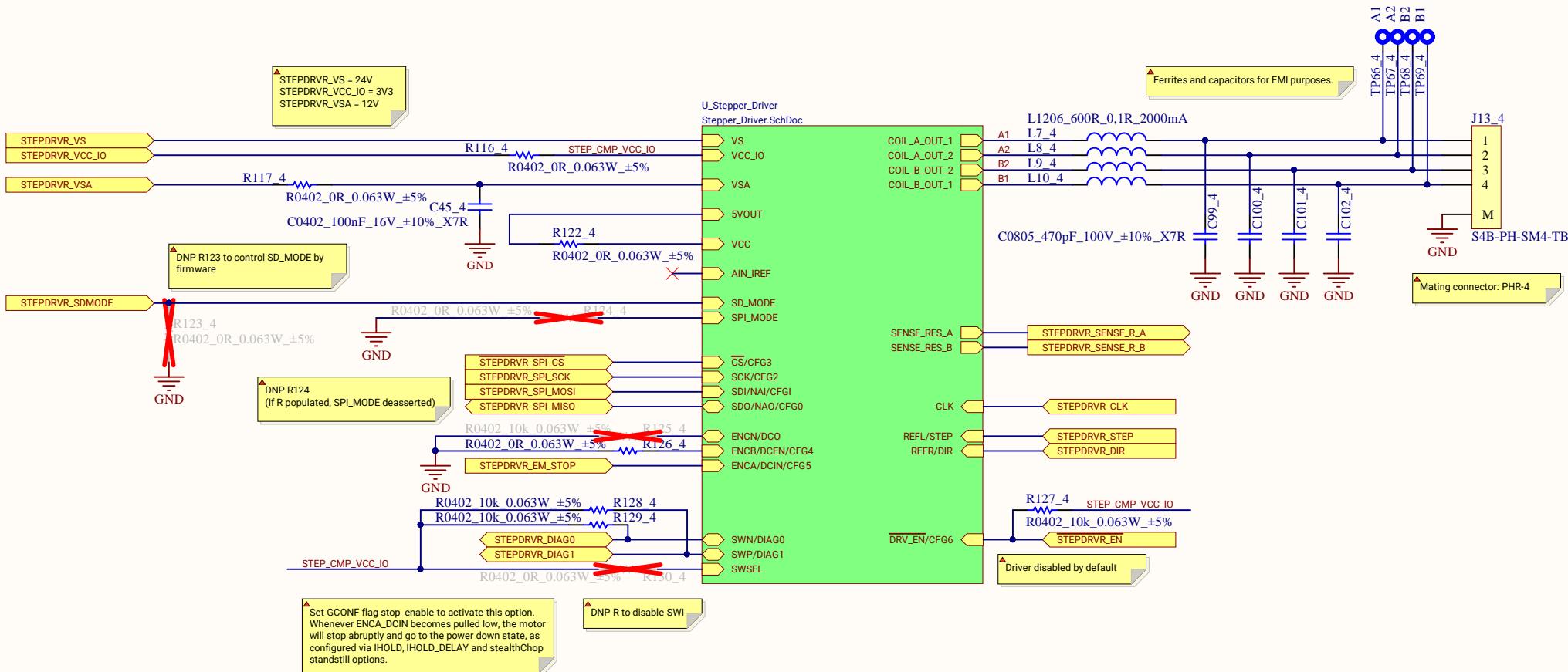
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Stepper_Complete		
Project		
0003160.PnjPcb		
Author		
Álvaro Hernando		
Size:	A4	Number: 1
Revision:	1.2	
Date:	24/04/2018	Time: 15:24:29
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A



Title		
Stepper_Complete		
Project		
0003160.PpjPcb		
Author	Álvaro Hernando	
Size: A4	Number: 1	Revision: 1.2
Date: 24/04/2018	Time: 15:24:30	Sheet 22 of 38

A



B

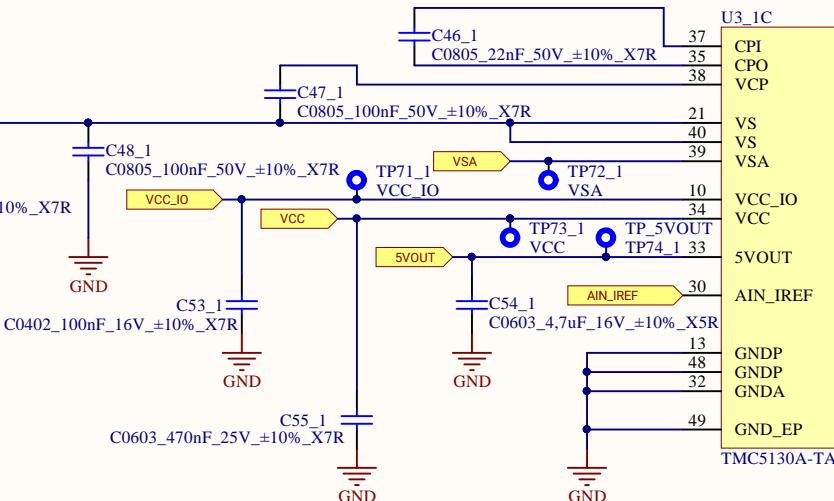
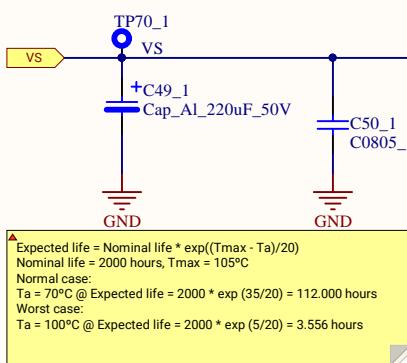
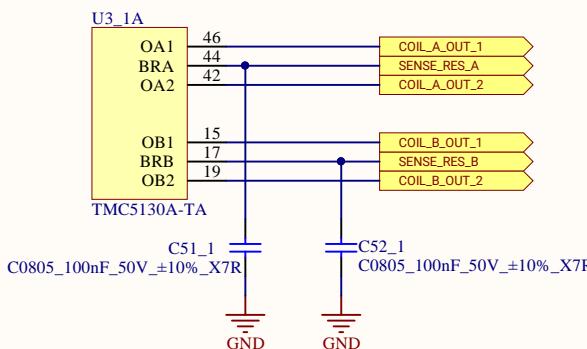
C

D

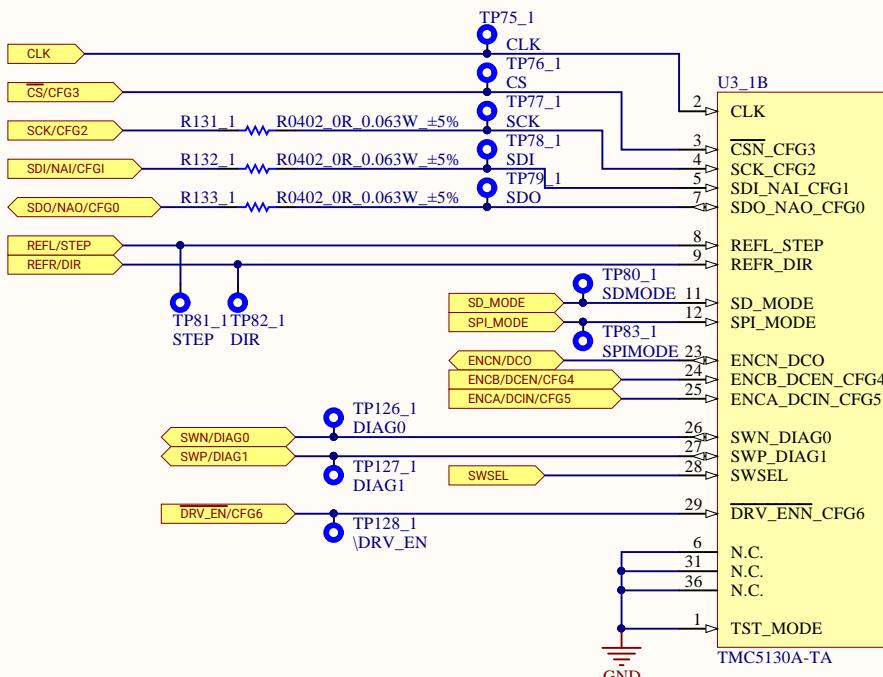


Title		
Stepper_Complete		
Project		
0003160.PnjPcb		
Author		
Álvaro Hernando		
Size:	A4	Number:
	1	Revision:
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A



B



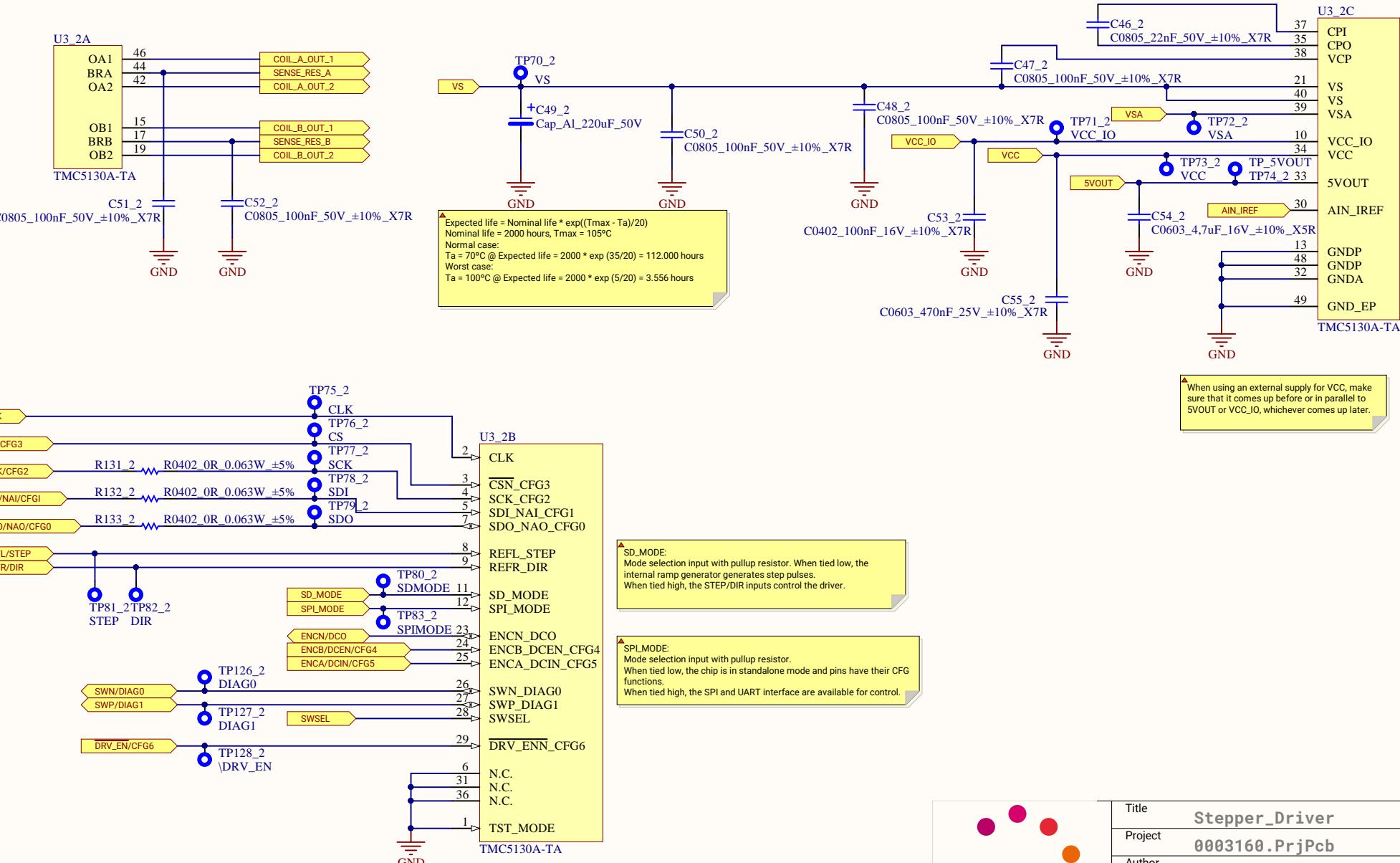
SD_MODE:
Mode selection input with pullup resistor. When tied low, the internal ramp generator generates step pulses.
When tied high, the STEP/DIR inputs control the driver.

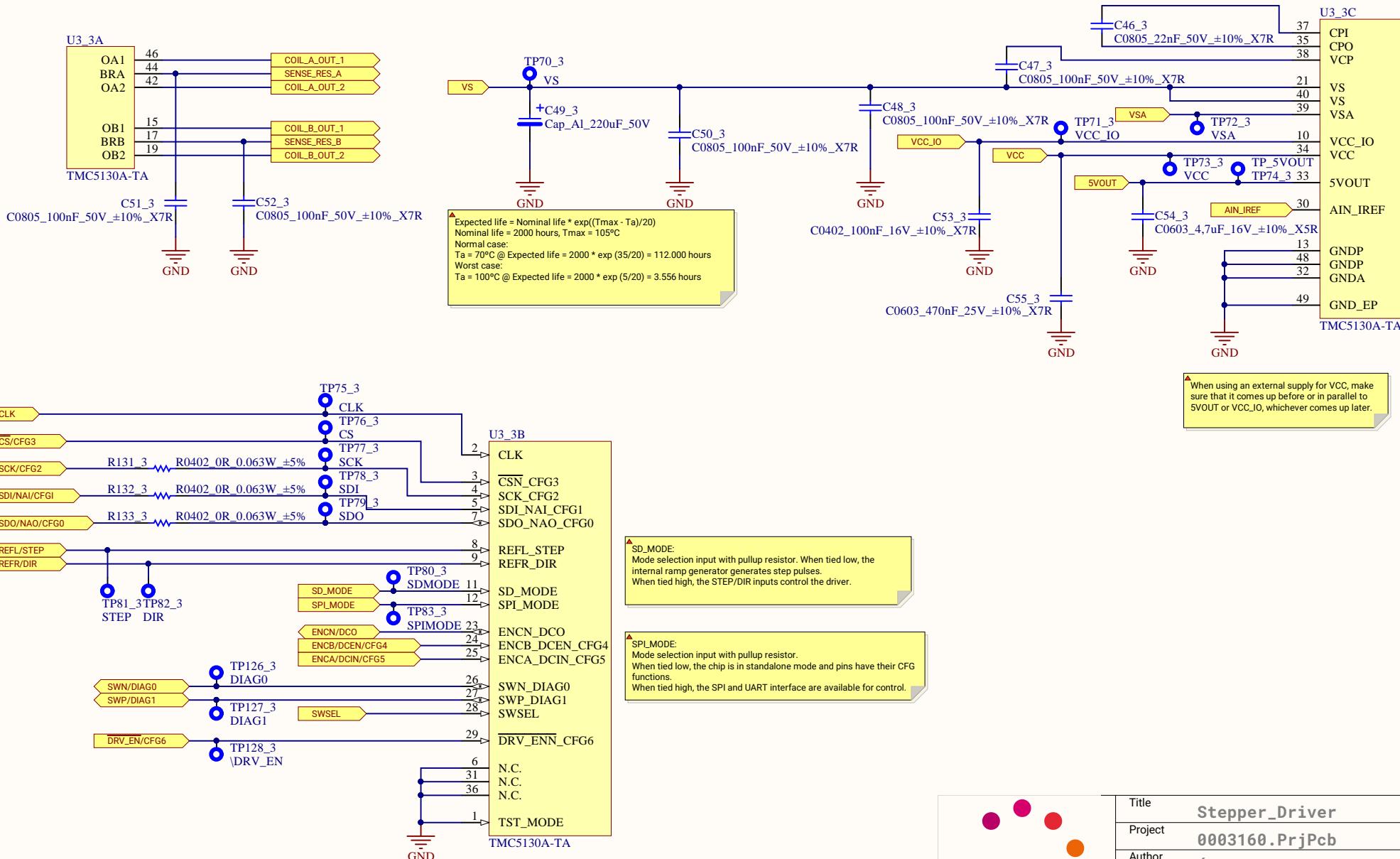
SPI_MODE:
Mode selection input with pullup resistor.
When tied low, the chip is in standalone mode and pins have their CFG functions.
When tied high, the SPI and UART interface are available for control.

C

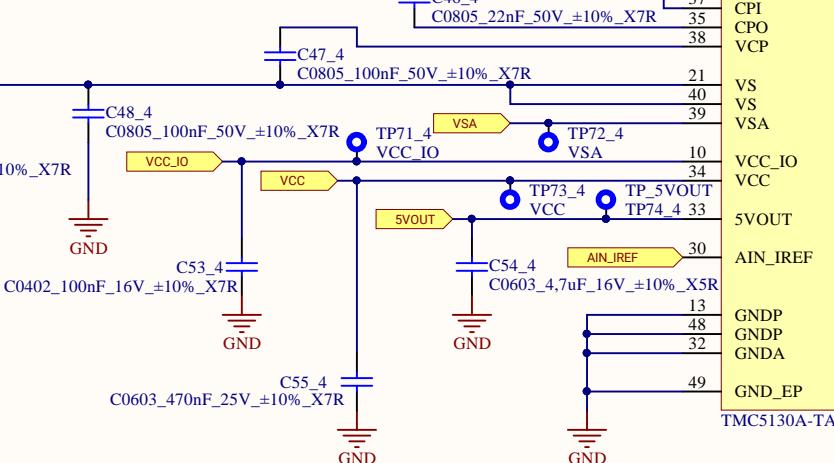
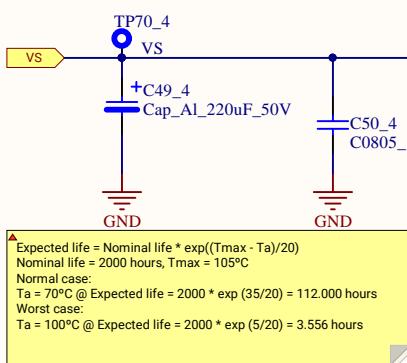
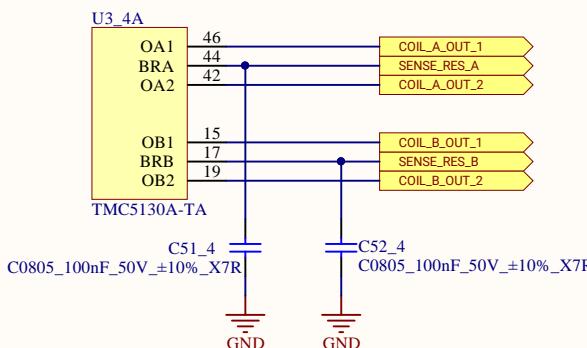
Title	Stepper_Driver	
Project	0003160.PnjPcb	
Author	Álvaro Hernando	
Size: A4	Number: 1	Revision: 1.2
Date: 24/04/2018	Time: 15:24:30	Sheet 23 of 30





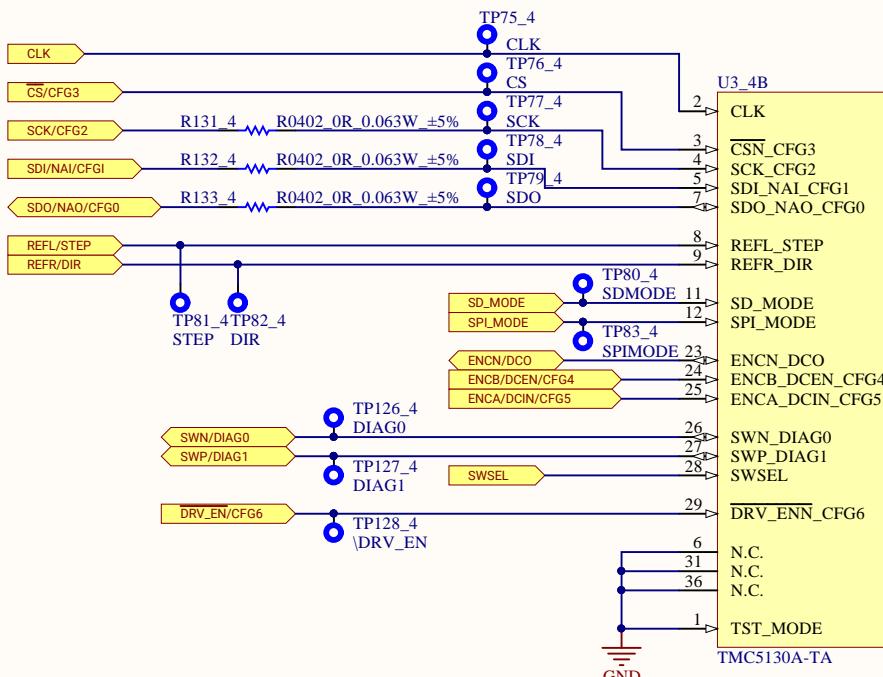


A



A

B



SD_MODE:
Mode selection input with pullup resistor. When tied low, the internal ramp generator generates step pulses.
When tied high, the STEP/DIR inputs control the driver.

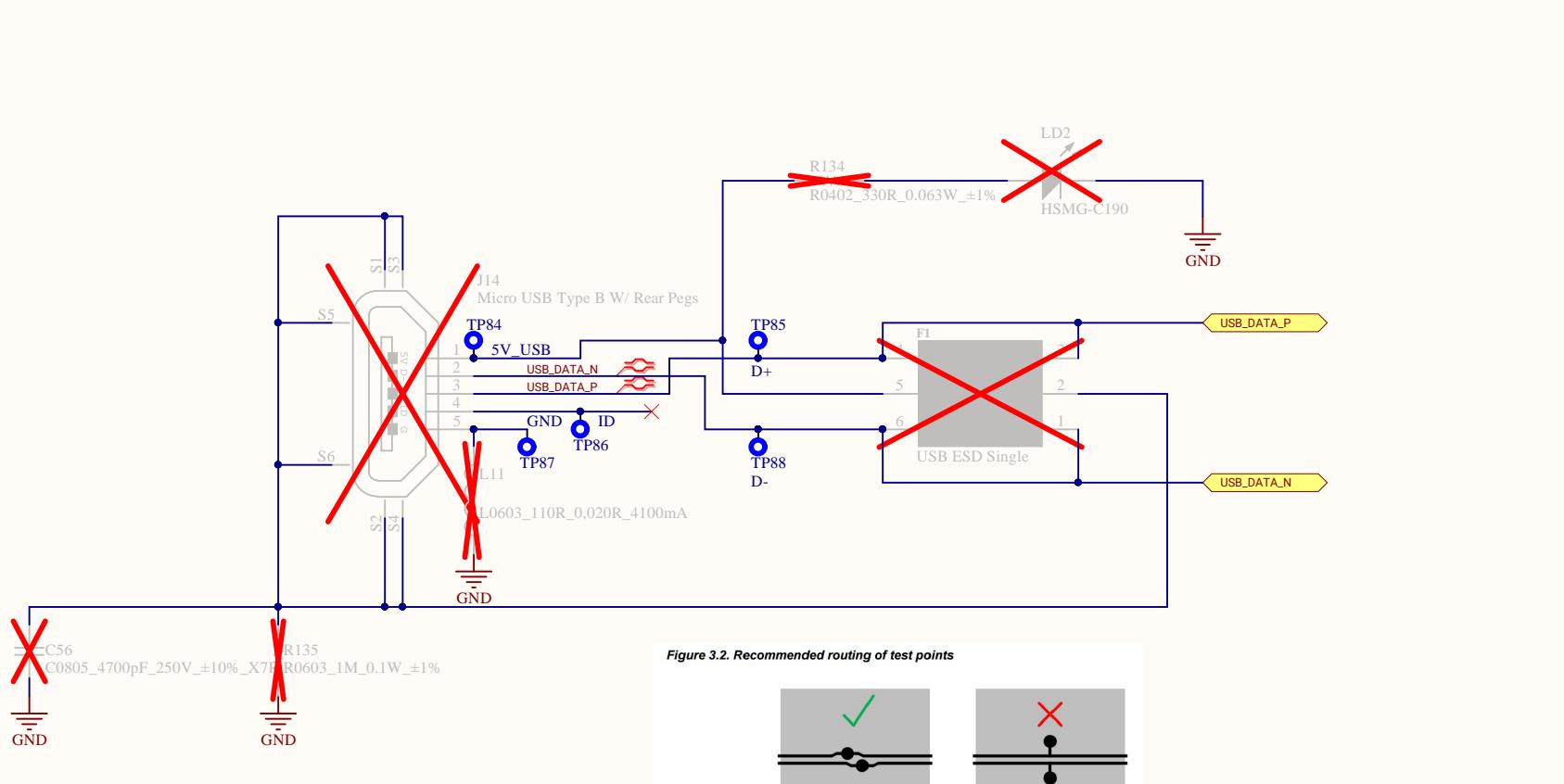
SPI_MODE:
Mode selection input with pullup resistor.
When tied low, the chip is in standalone mode and pins have their CFG functions.
When tied high, the SPI and UART interface are available for control.

B

C

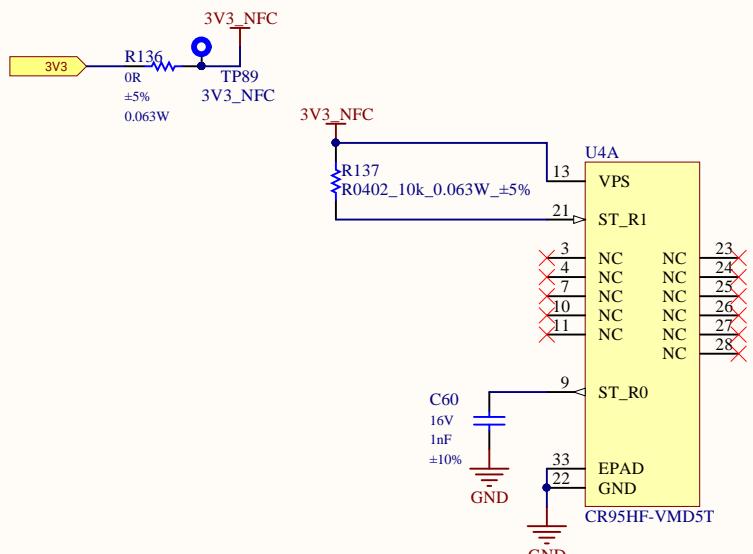
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Title	Stepper_Driver	
Project	0003160.PnjPcb	
Author	Álvaro Hernando	
Size:	A4	Number: 1
Revision:	1.2	
Date:	24/04/2018	Time: 15:24:31
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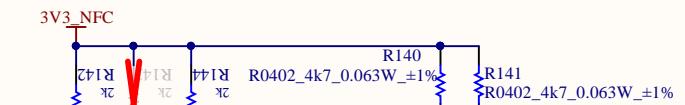


Title USB_Data		
Project 0003160.PpjPcb		
Author Álvaro Hernando		
Size: A4		
Number:	1	Revision: 1.2
Date: 24/04/2018	Time: 15:24:31	Sheet 24 of 38

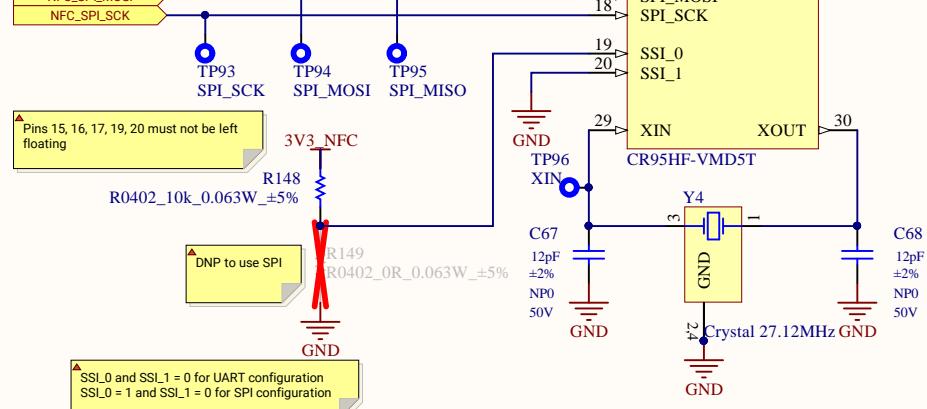
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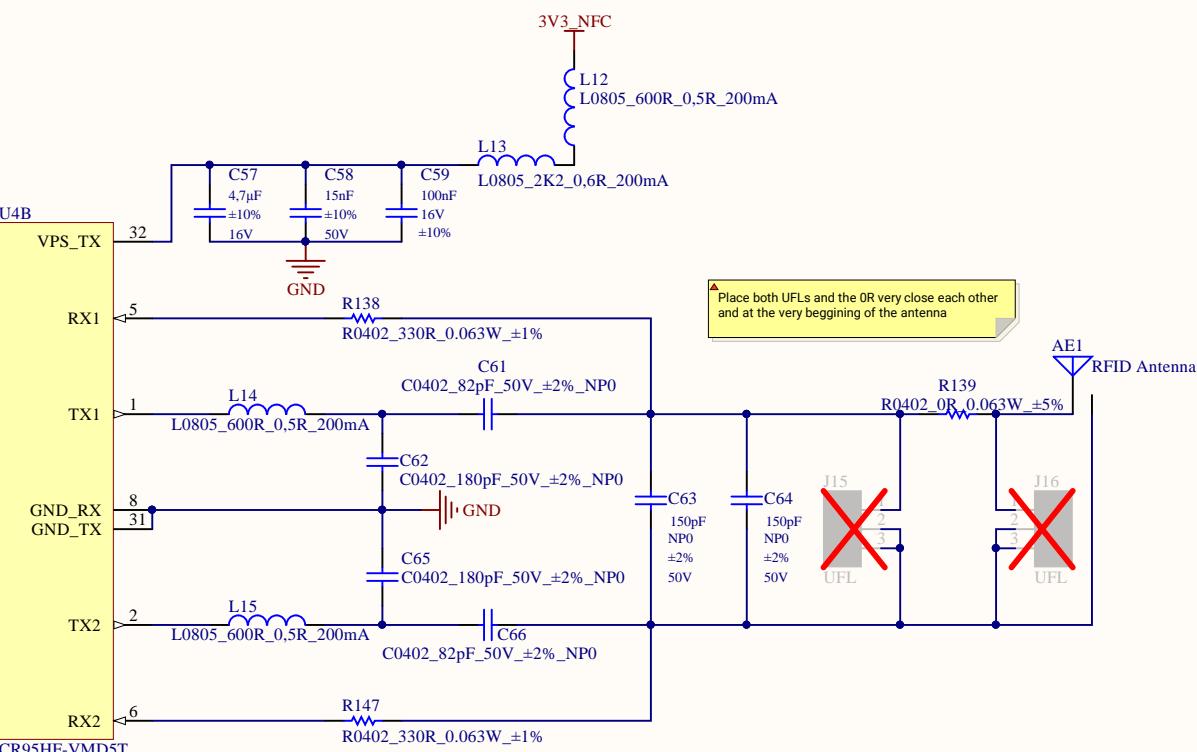
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C

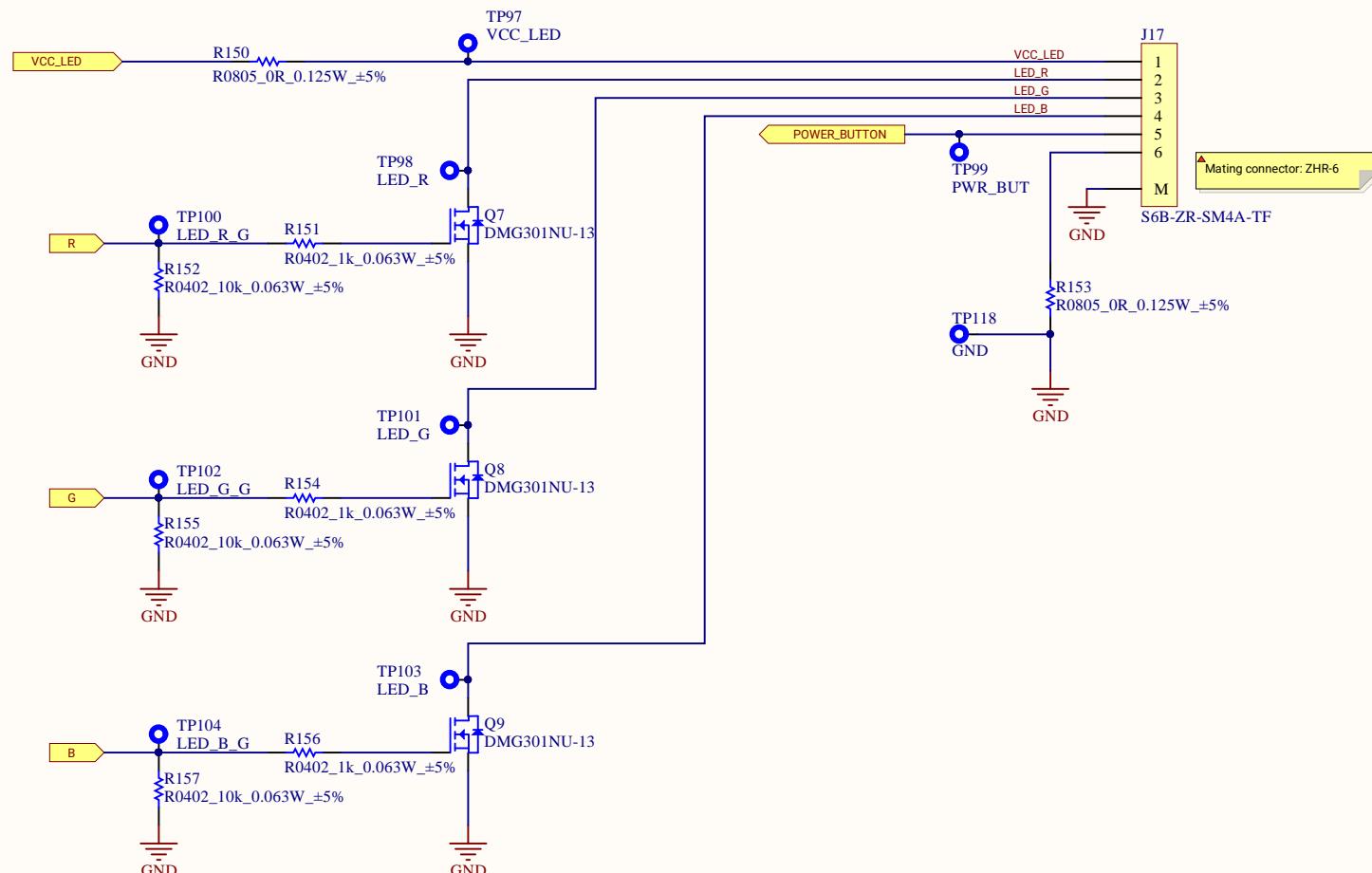


D



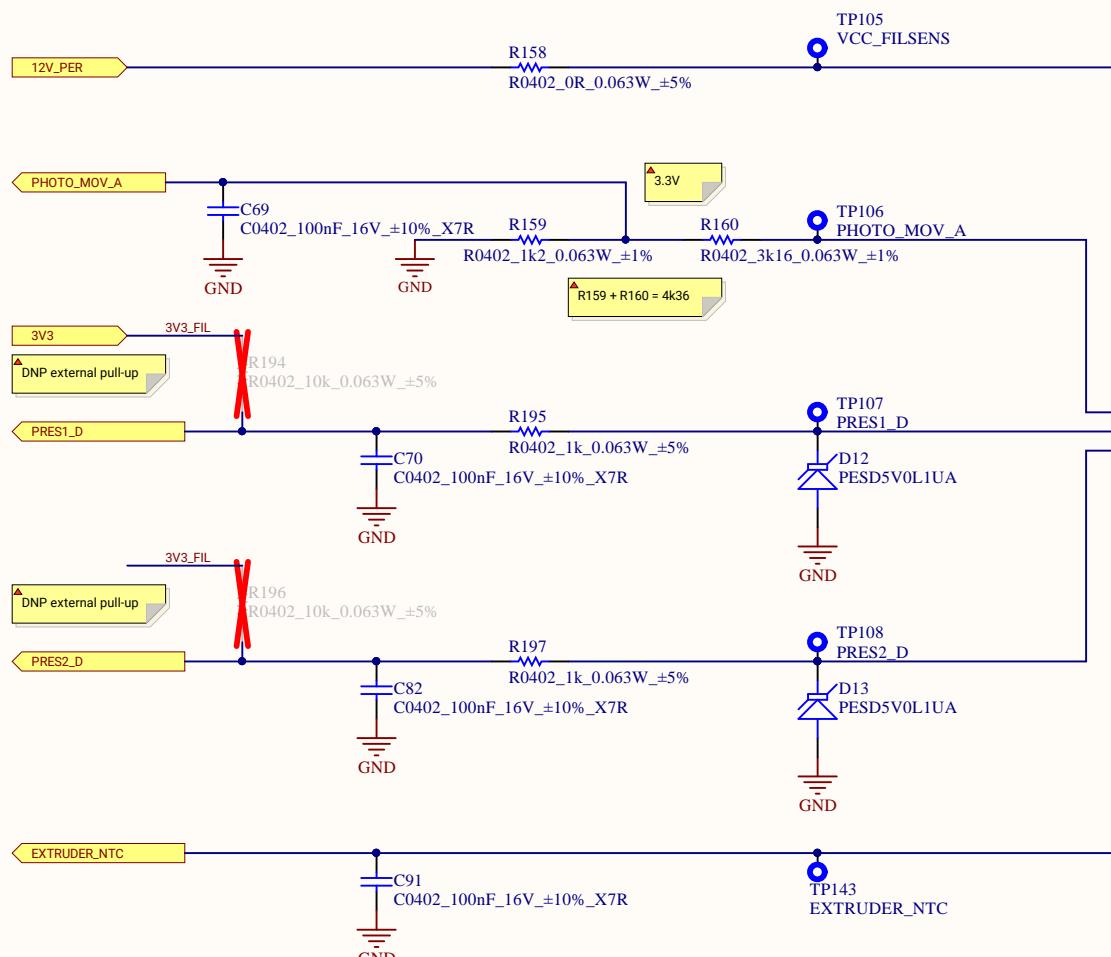
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Project	0003160.PrjPcb	
Author	Álvaro Hernando	
Size:	A4	Number: 1
Revision:	1.2	
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A



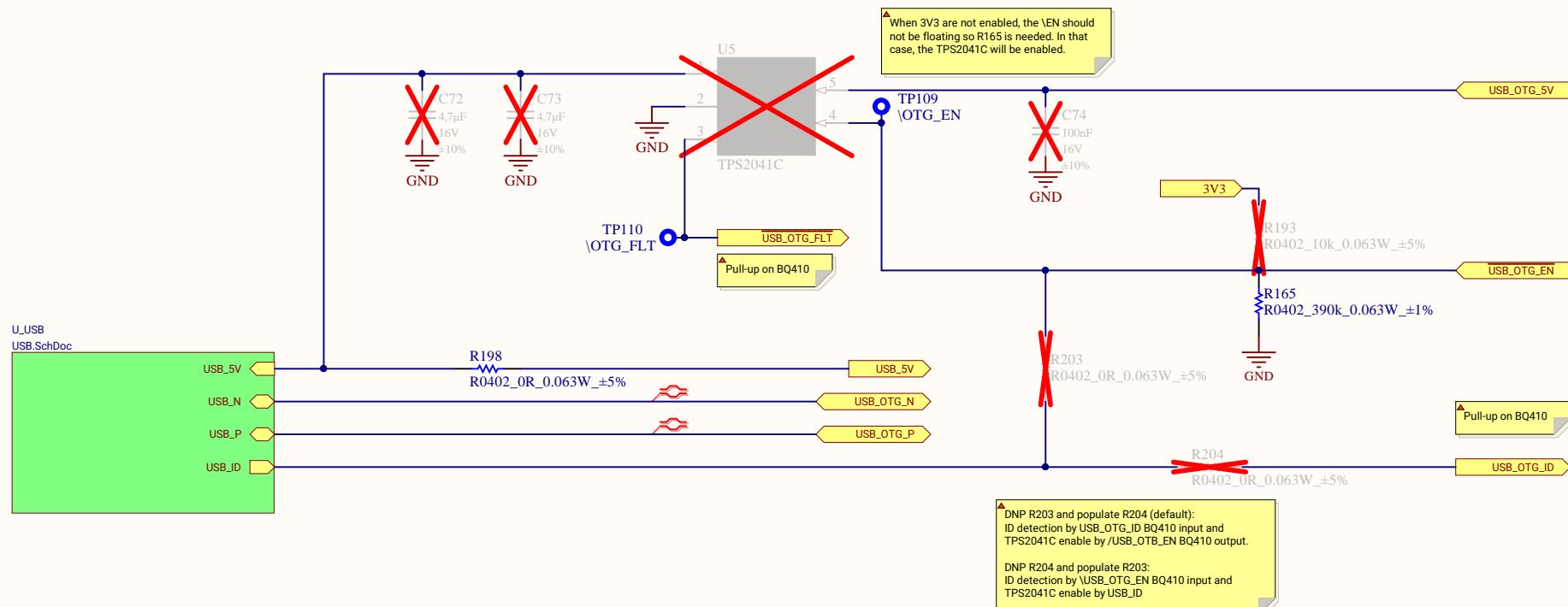
Title	RGB	
Project	0003160.PpjPcb	
Author	Álvaro Hernando	
Size: A4	Number: 1	Revision: 1.2
Date: 24/04/2018	Time: 15:24:32	Sheet 26 of 38

A



Title Sensors		
Project 0003160.PrjPcb		
Author Álvaro Hernando		
Size: A4 Number: 1 Revision: 1.2		
Date: 24/04/2018	Time: 15:24:32	Sheet 27 of 38

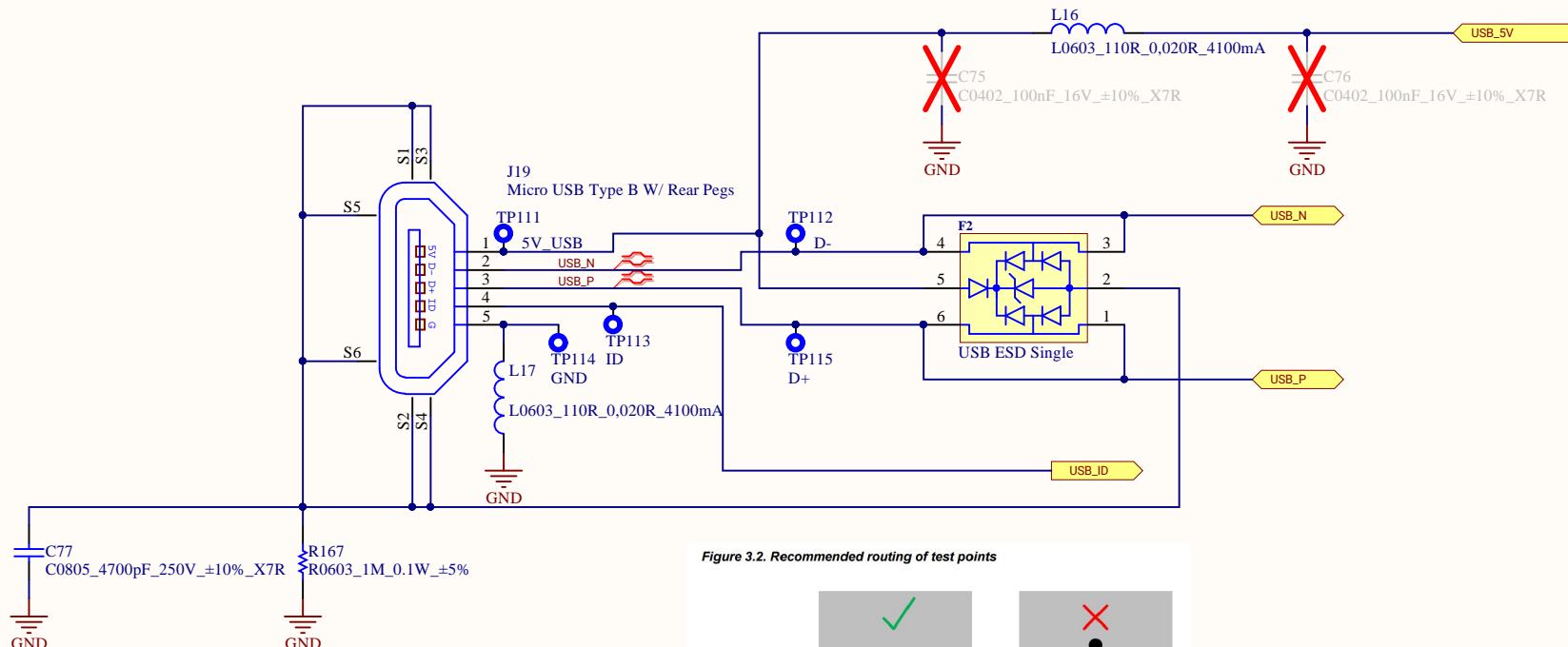
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Title USB_OTG		
Project 0003160.PjPcb		
Author Álvaro Hernando		
Size: A4	Number: 1	Revision: 1.2
Date: 24/04/2018	Time: 15:24:32	Sheet 28 of 30

A

A



Title		
USB		
Project		
0003160.PpjPcb		
Author	Álvaro Hernando	
Size:	A4	Number: 1
Revision:	1.2	
Date:	24/04/2018	Time: 15:24:32
Sheet	29 of 38	

A

A

B

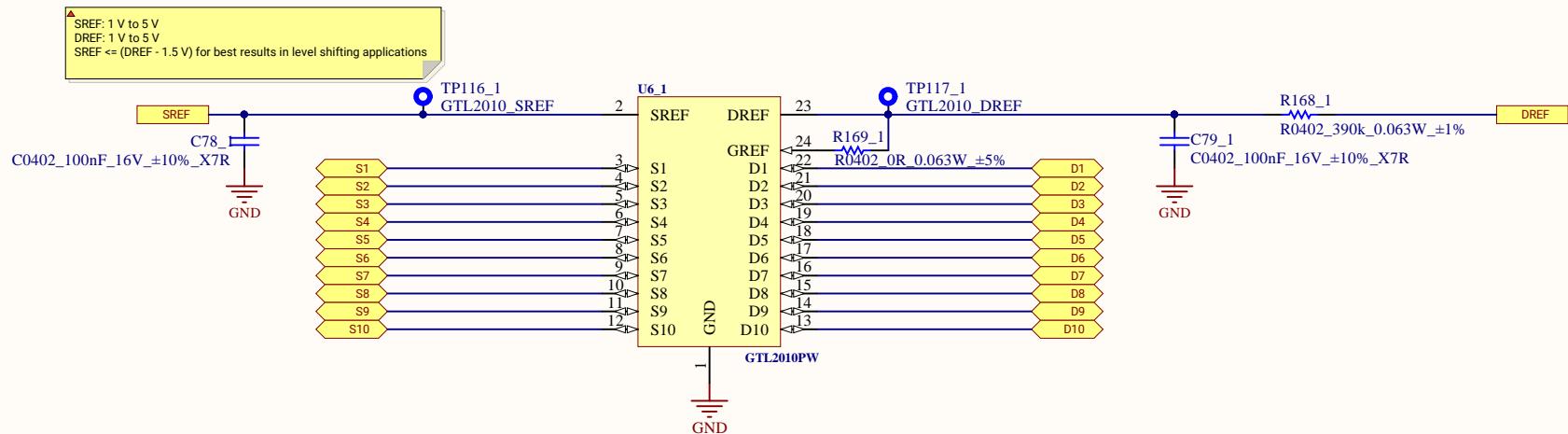
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C

C

D

D



Title		
Voltage_Level_Translator		
Project		
0003160.PpjPcb		
Author	Álvaro Hernando	
Size:	A4	Number: 1
Revision:	1.2	
Date:	24/04/2018	Time: 15:24:32
		Sheet 30 of 30



A

A

B

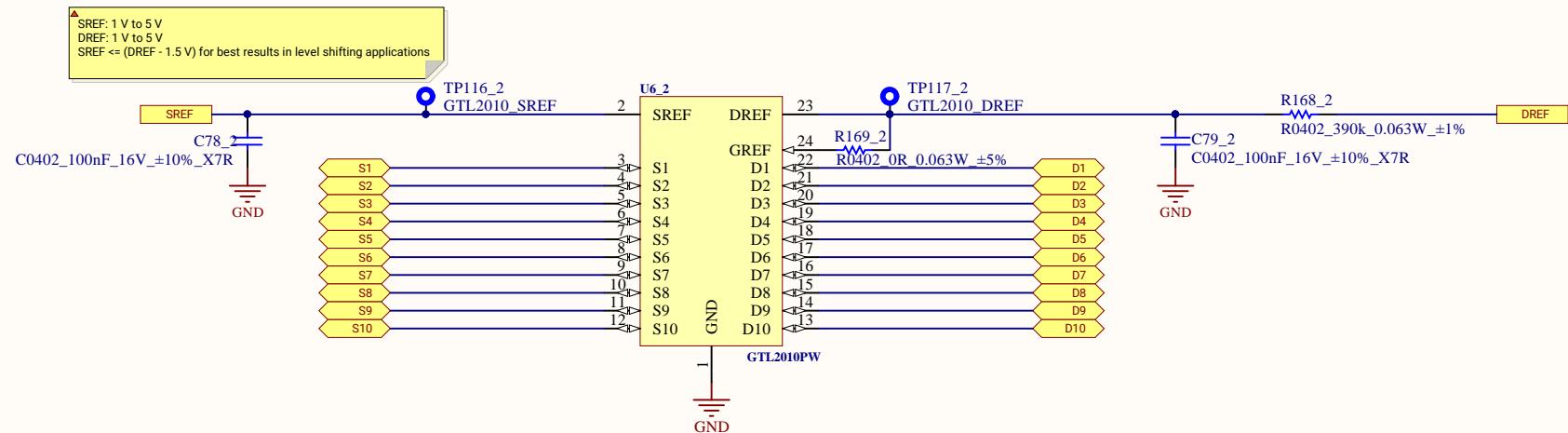
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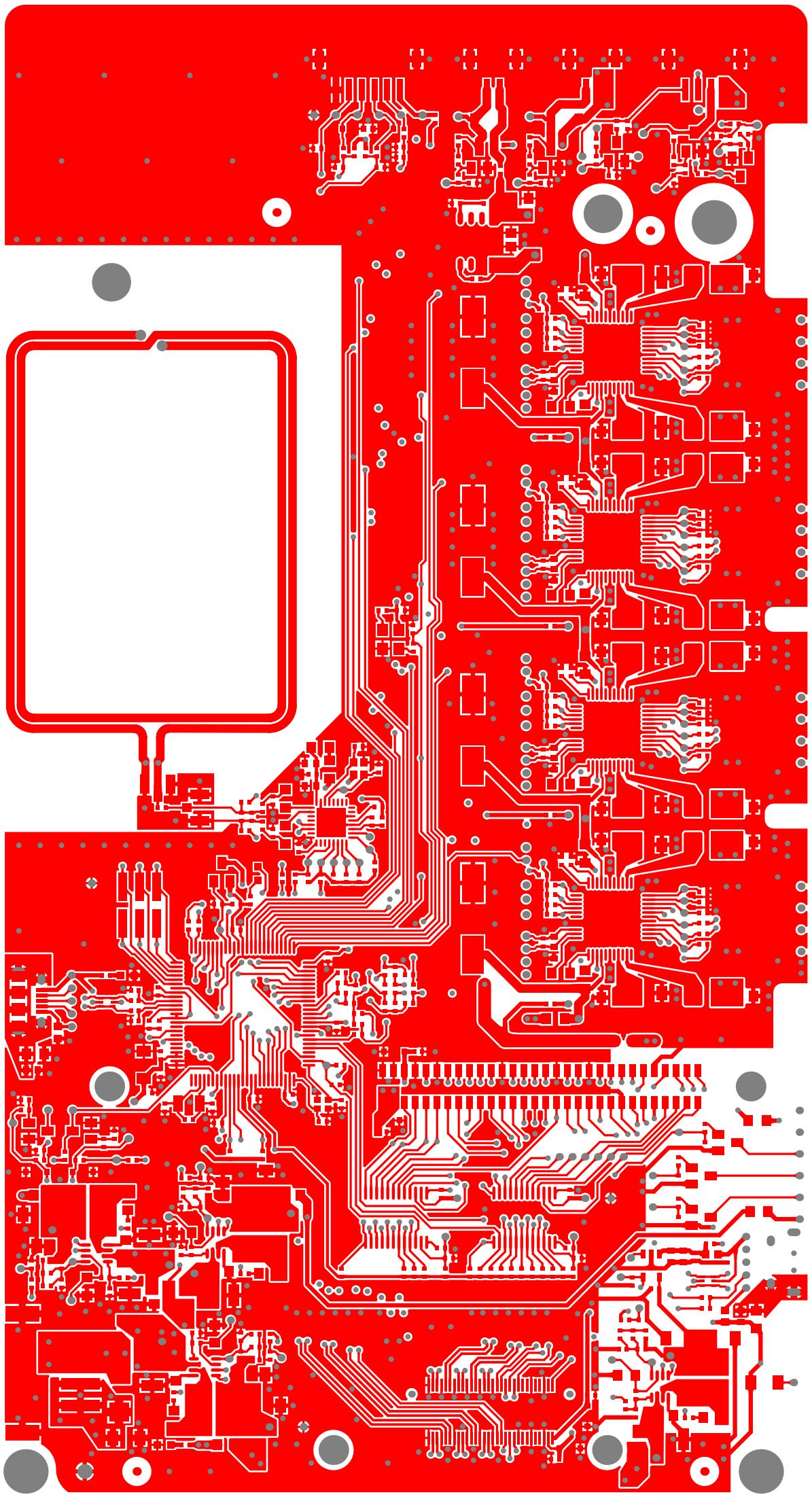
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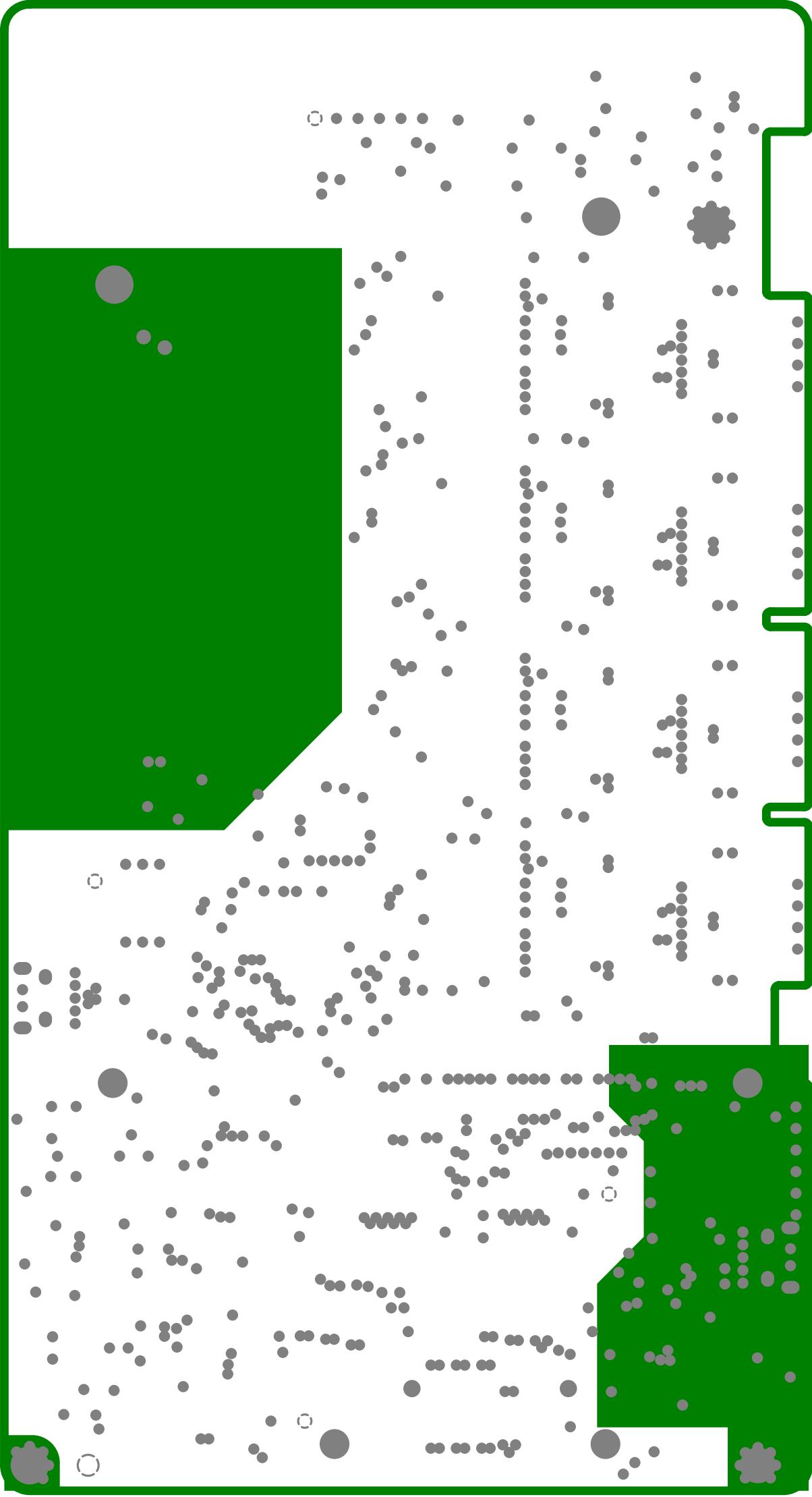
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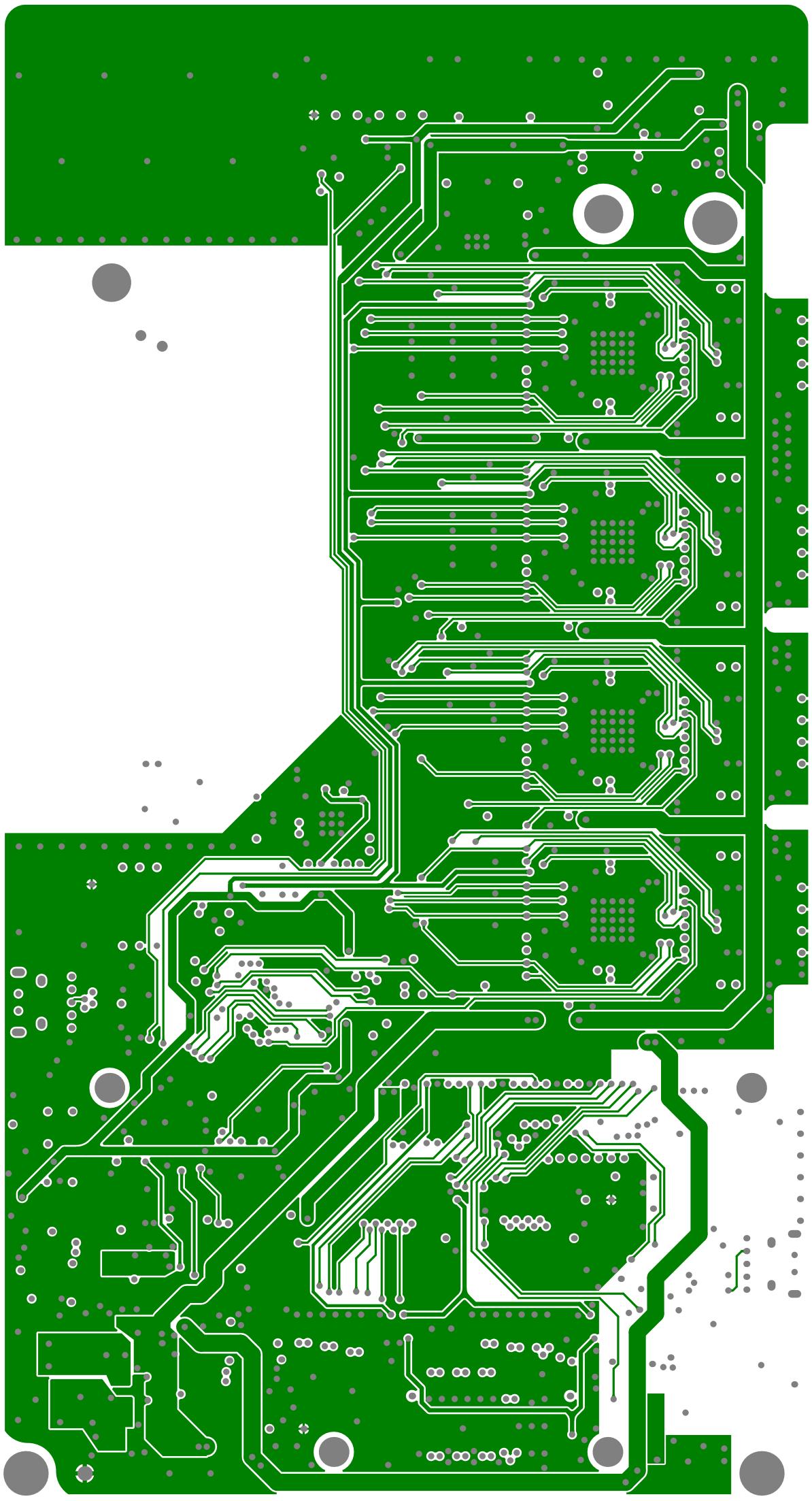


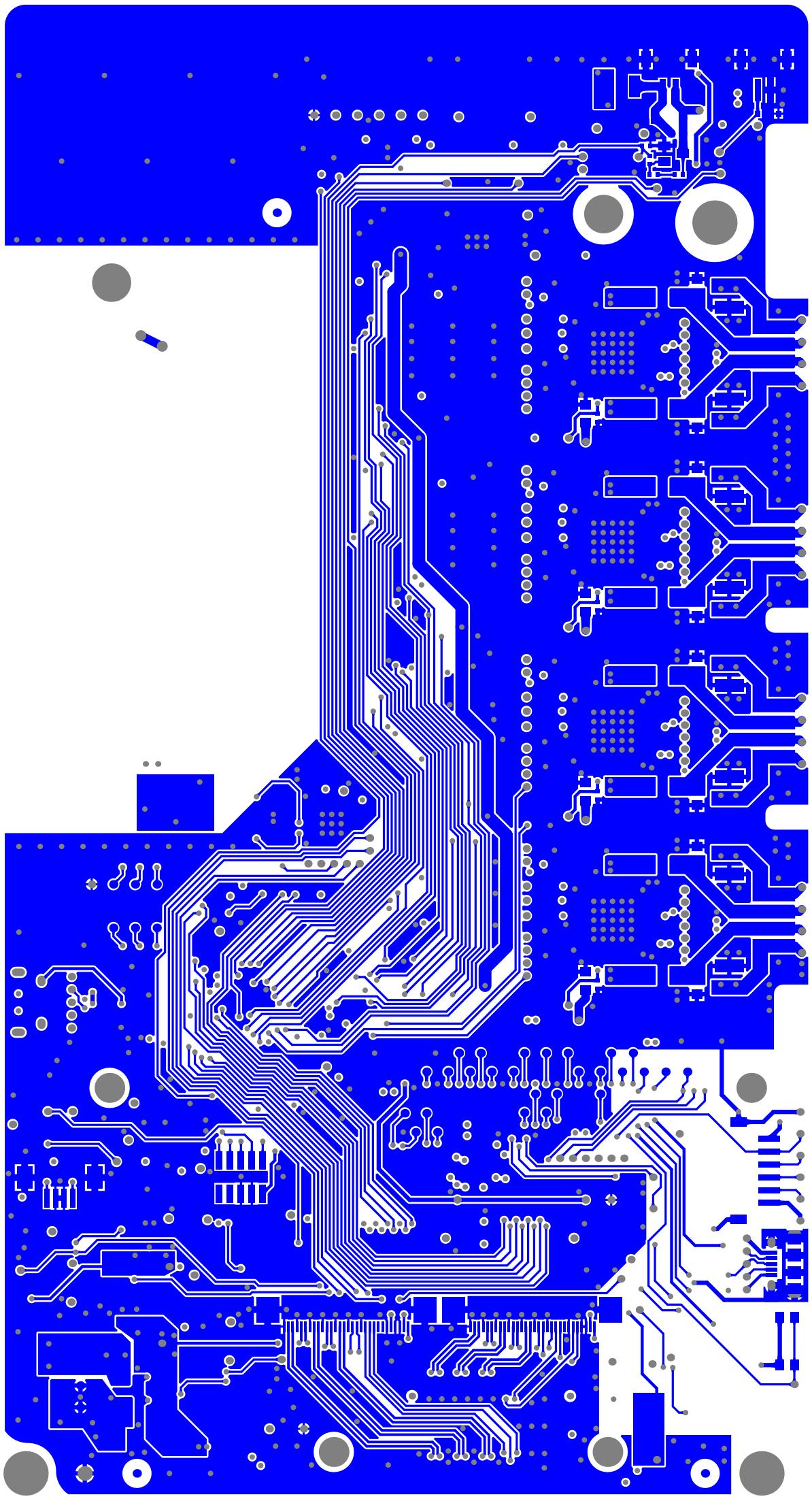
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Voltage_Level_Translator		
Project		
0003160.PrjPcb		
Author		
Álvaro Hernando		
Size:	A4	Number:
	1	Revision:
Date:	24/04/2018	Time:
	15:24:32	Sheet 30 of 30

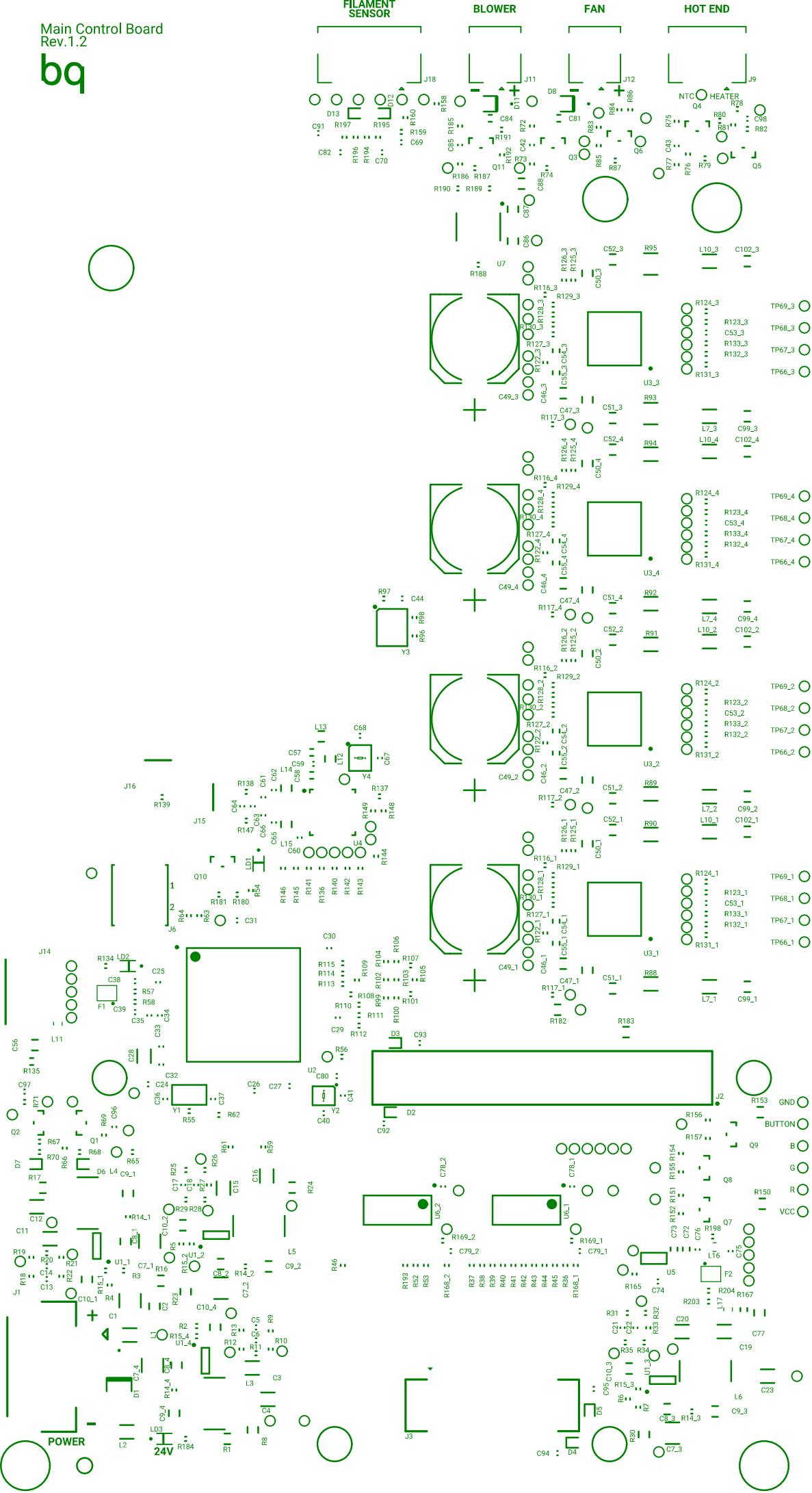


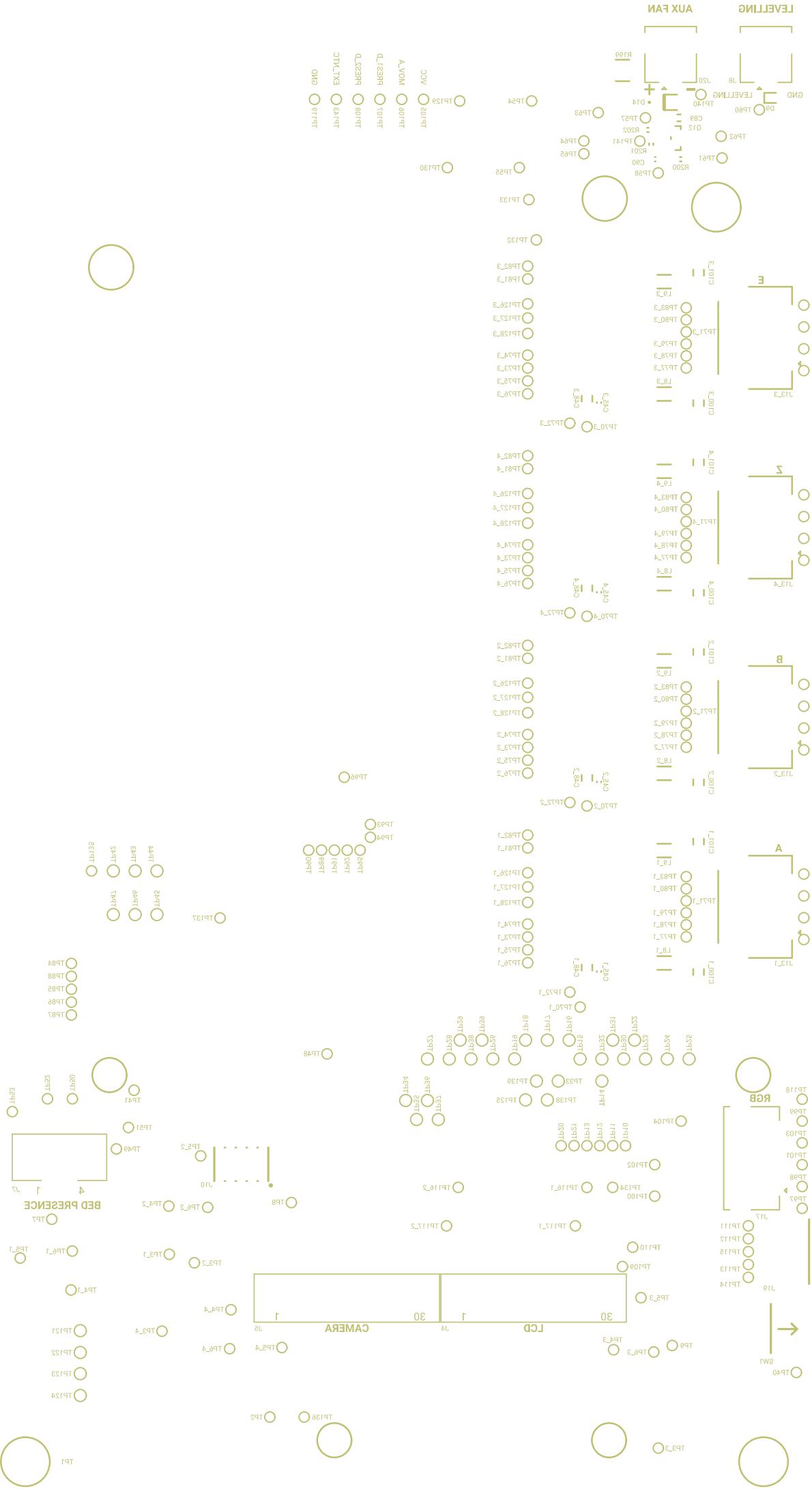


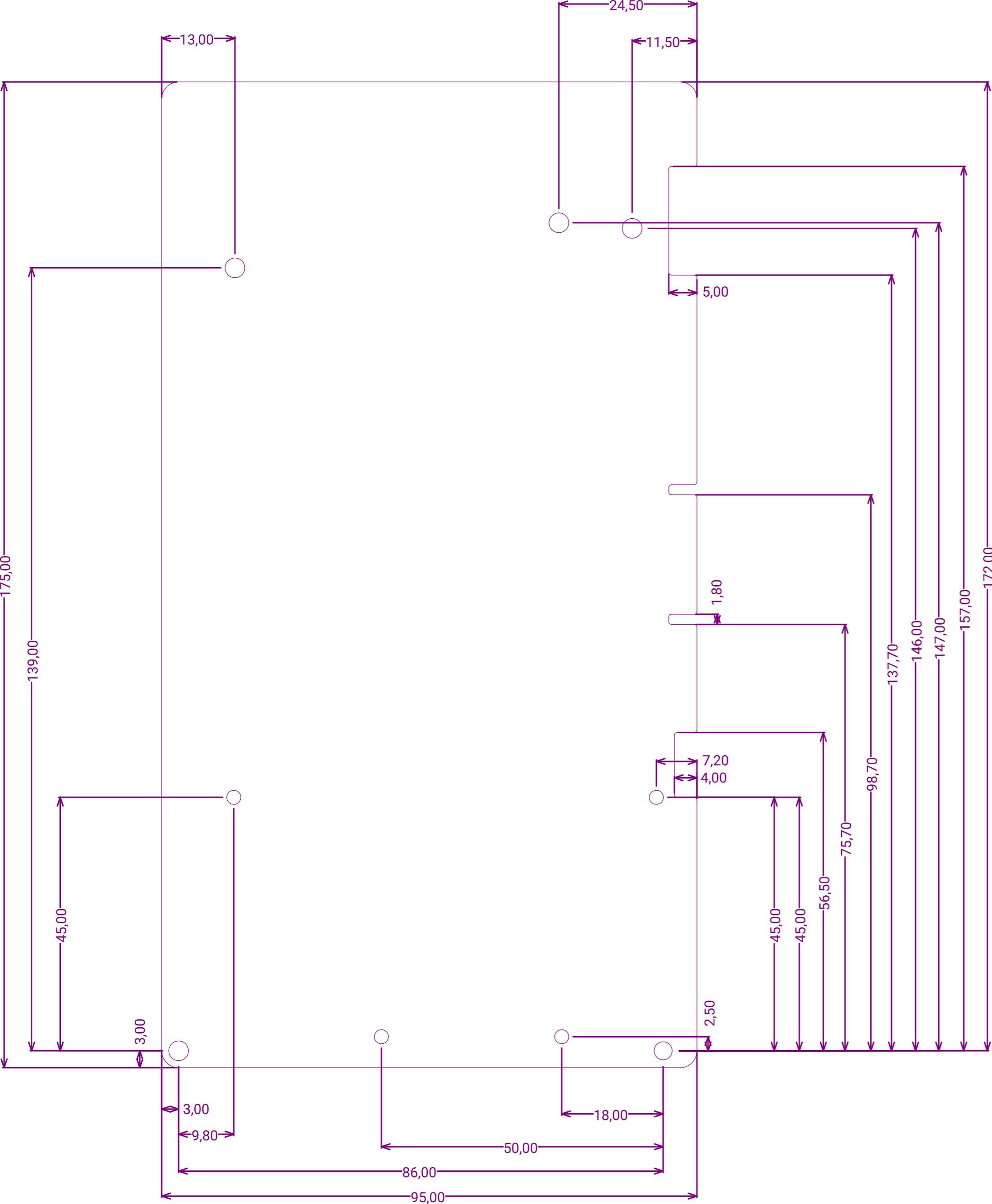












Layer	Name	Material	Thickness	Constant	Board Layer Stack
1	Top Overlay				
2	Top Solder	Solder Resist	0,010mm	3,5	
3	Top Layer	Copper	0,036mm		
4	Dielectric 1	FR-4	0,236mm	4,5	
5	Ground Plane	Copper	0,036mm		
6	Dielectric 2	FR-4	0,930mm	4,5	
7	Power Layer	Copper	0,036mm		
8	Dielectric 3	FR-4	0,236mm	4,5	
9	Bottom Layer	Copper	0,036mm		
10	Bottom Solder	Solder Resist	0,010mm	3,5	
11	Bottom Overlay				

