


2.25A current limit

Title <b><i>USB Channel</i></b>			OSRF 170 S. Whisman Road Building D, Suite A Mountain View, CA 94041 <a href="http://osrfoundation.org">http://osrfoundation.org</a>	 Open Source Robotics Foundation
Size: <b>A</b>	Number:	Revision: <b>C</b>		
Date: <b>4/6/2015</b>	Time: <b>10:12:00 AM</b>	Sheet <b>4</b> of		
Designer: <b>Morgan Quigley</b>				



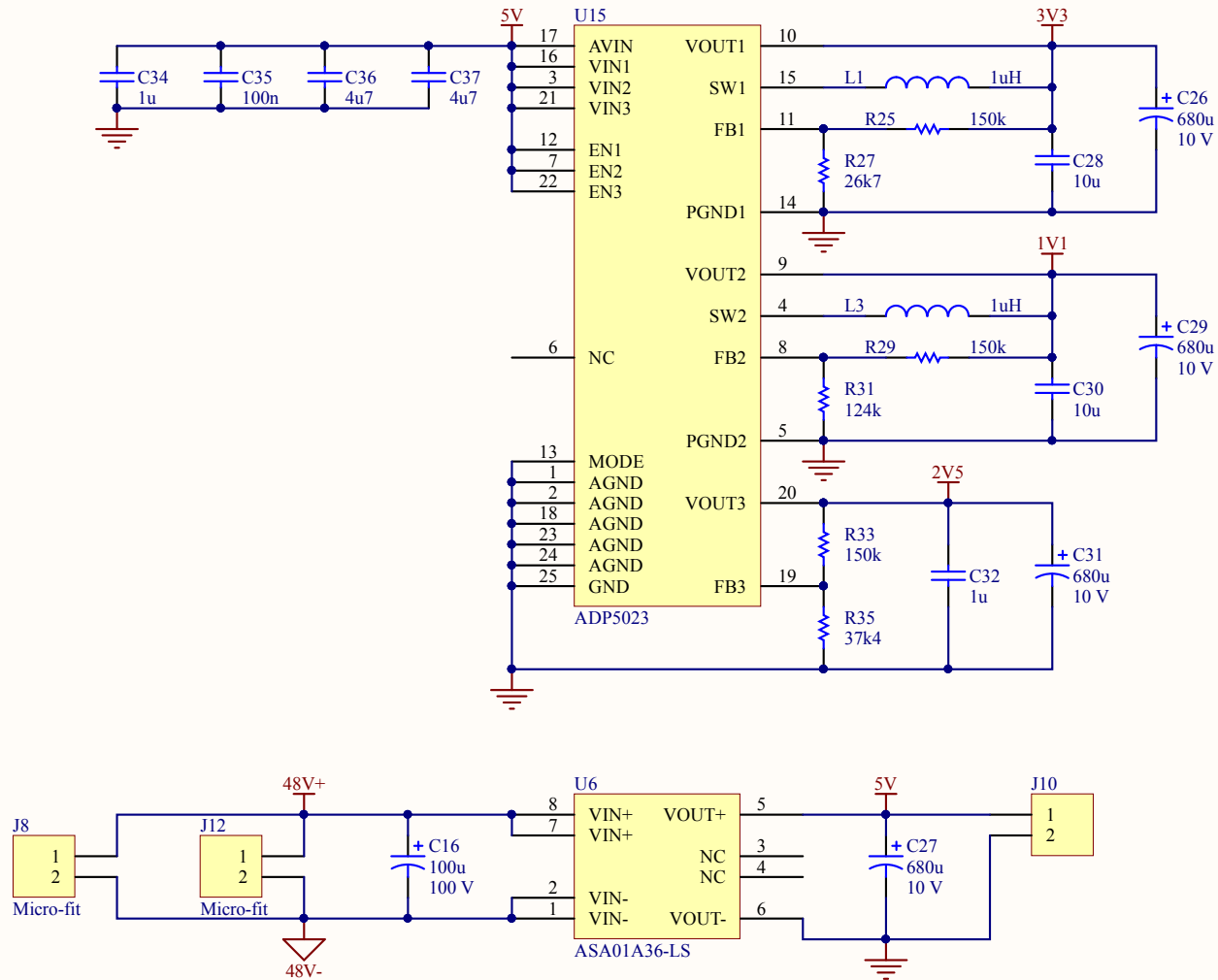
todo: consider feeding LDO from 3v3 output

$$V_{fb} = 0.5V$$

$$V_{out1} = V_{fb} * (R1 / R2 + 1) = 0.5 * (150k / 26.7k + 1) = 3.31V$$

$$V_{out2} = V_{fb} * (R1 / R2 + 1) = 0.5 * (150k / 124k + 1) = 1.10V$$

$$V_{out3} = V_{fb} * (R1 / R2 + 1) = 0.5 * (150k / 37.4k + 1) = 2.50V$$



Title **Power Supplies**

Size: **A**

Number:\*

Revision:**C**

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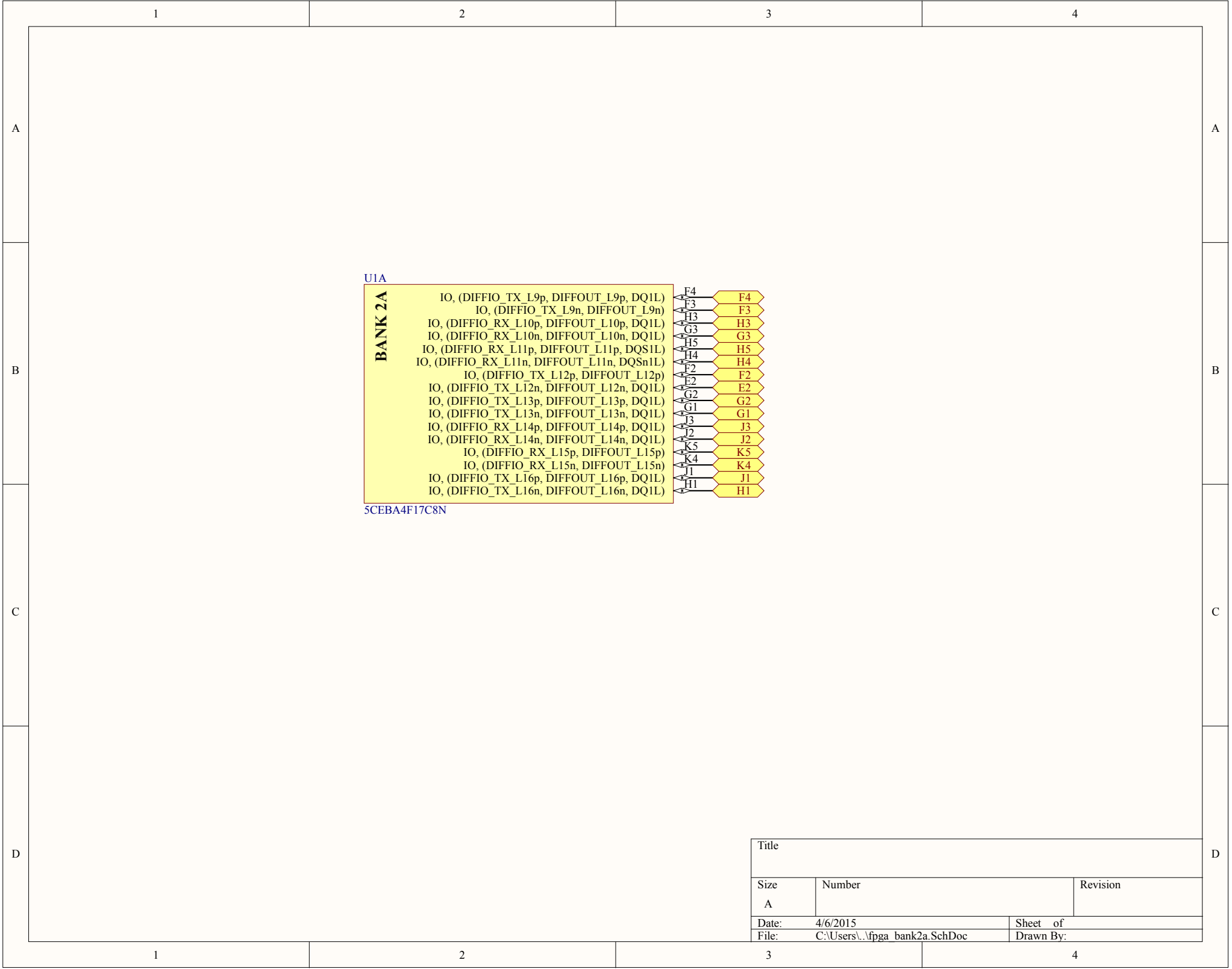
Sheet 6 of \*

Designer: **Morgan Quigley**

OSRF  
170 S. Whisman Road  
Building D, Suite A  
Mountain View, CA 94041  
<http://osrfoundation.org>



Open Source Robotics Foundation



1	2	3	4	
A				A
B	<div><div>UIB</div><div><div><div>BANK 3A</div><div>IO, DATA8, (DIFFIO_RX_B1p, DIFFOUT_B1p, DQ1B)</div><div>IO, DATA6, (DIFFIO_RX_B1n, DIFFOUT_B1n, DQ1B)</div><div>IO, DATA7, (DIFFIO_TX_B2p, DIFFOUT_B2p, DQ1B)</div><div>IO, DATA5, (DIFFIO_TX_B2n, DIFFOUT_B2n)</div><div>IO, DATA12, (DIFFIO_RX_B3p, DIFFOUT_B3p, DQS1B)</div><div>IO, DATA10, (DIFFIO_RX_B3n, DIFFOUT_B3n, DQSn1B)</div><div>IO, DATA11, (DIFFIO_TX_B4p, DIFFOUT_B4p)</div><div>IO, DATA9, (DIFFIO_TX_B4n, DIFFOUT_B4n, DQ1B)</div><div>IO, CLKUSR, (DIFFIO_RX_B5p, DIFFOUT_B5p, DQ1B)</div><div>IO, DATA14, (DIFFIO_RX_B5n, DIFFOUT_B5n, DQ1B)</div><div>IO, DATA15, (DIFFIO_TX_B6p, DIFFOUT_B6p, DQ1B)</div><div>IO, DATA13, (DIFFIO_TX_B6n, DIFFOUT_B6n, DQ1B)</div><div>IO, PR_ERROR, (DIFFIO_RX_B7p, DIFFOUT_B7p)</div><div>IO, PR_DONE, (DIFFIO_RX_B7n, DIFFOUT_B7n)</div><div>IO, (DIFFIO_TX_B8p, DIFFOUT_B8p, DQ1B)</div><div>IO, PR_READY, (DIFFIO_TX_B8n, DIFFOUT_B8n, DQ1B)</div></div><div><div>P4</div><div>N4</div><div>P1</div><div>N1</div><div>L7</div><div>M7</div><div>P2</div><div>R1</div><div>N3</div><div>P3</div><div>R2</div><div>T2</div><div>P7</div><div>R6</div><div>R4</div><div>T3</div></div><div><div>P4</div><div>N4</div><div>P1</div><div>N1</div><div>L7</div><div>M7</div><div>P2</div><div>R1</div><div>N3</div><div>P3</div><div>R2</div><div>T2</div><div>P7</div><div>R6</div><div>R4</div><div>T3</div></div></div></div> <div>5CEBA4F17C8N</div>			B
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File:	C:\Users\...\mpga_bank3a.SchDoc	Drawn By:

Title		
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Date:	4/6/2015	Sheet of
File:	C:\Users\...\fpga_bank3a.SchDoc	Drawn By:

**BANK 3B**

5CEBA4F17C8N

IO, (DIFFIO\_TX\_B17p, DIFFOUT\_B17p, DQ2B)  
IO, (DIFFIO\_TX\_B17n, DIFFOUT\_B17n)  
IO, (DIFFIO\_RX\_B18p, DIFFOUT\_B18p, DQ2B)  
IO, (DIFFIO\_RX\_B18n, DIFFOUT\_B18n, DQ2B)  
IO, (DIFFIO\_RX\_B19p, DIFFOUT\_B19p, DQS2B)  
IO, (DIFFIO\_RX\_B19n, DIFFOUT\_B19n, DQSn2B)  
IO, (DIFFIO\_TX\_B20p, DIFFOUT\_B20p)  
IO, (DIFFIO\_TX\_B20n, DIFFOUT\_B20n, DQ2B)  
IO, (DIFFIO\_TX\_B21p, DIFFOUT\_B21p, DQ2B)  
IO, (DIFFIO\_TX\_B21n, DIFFOUT\_B21n, DQ2B)  
IO, (DIFFIO\_RX\_B22p, DIFFOUT\_B22p, DQ2B)  
IO, (DIFFIO\_RX\_B22n, DIFFOUT\_B22n, DQ2B)  
IO, CLK1p, (DIFFIO\_RX\_B23p, DIFFOUT\_B23p)  
IO, CLK1n, (DIFFIO\_RX\_B23n, DIFFOUT\_B23n)  
IO, (DIFFIO\_TX\_B24p, DIFFOUT\_B24p, DQ2B)  
IO, (DIFFIO\_TX\_B24n, DIFFOUT\_B24n, DQ2B)

Pin	Function
1	T4
2	T5
3	P8
4	R7
5	L9
6	M8
7	T8
8	T7
9	R12
10	R11
11	CLKOUT0
12	R11
13	T13
14	T12
15	P9
16	R9
17	CLK1p
18	R10
19	R10
20	T10

Title		
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Date:	4/6/2015	Sheet of
File:	C:\Users\j\mfga_bank3b.SchDoc	Drawn By:



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A							A
B	<div><div>UID</div><div><div>BANK 4A</div><div><div>IO, (DIFFIO_TX_B25p, DIFFOUT_B25p, DQ3B) &lt;P16</div><div>IO, RZQ_0, (DIFFIO_TX_B25n, DIFFOUT_B25n) &lt;R15</div><div>IO, (DIFFIO_RX_B26p, DIFFOUT_B26p, DQ3B) &lt;R16</div><div>IO, (DIFFIO_RX_B26n, DIFFOUT_B26n, DQ3B) &lt;T15</div><div>IO, (DIFFIO_RX_B27p, DIFFOUT_B27p, DQS3B) &lt;L10</div><div>IO, (DIFFIO_RX_B27n, DIFFOUT_B27n, DQSn3B) &lt;M10</div><div>IO, (DIFFIO_TX_B28p, DIFFOUT_B28p) &lt;N14</div><div>IO, (DIFFIO_TX_B28n, DIFFOUT_B28n, DQ3B) &lt;M13</div><div>IO, (DIFFIO_TX_B29p, DIFFOUT_B29p, DQ3B) &lt;P13</div><div>IO, (DIFFIO_TX_B29n, DIFFOUT_B29n, DQ3B) &lt;P14</div><div>IO, (DIFFIO_RX_B30p, DIFFOUT_B30p, DQ3B) &lt;M11</div><div>IO, (DIFFIO_RX_B30n, DIFFOUT_B30n, DQ3B) &lt;M12</div><div>IO, CLK2p, (DIFFIO_RX_B31p, DIFFOUT_B31p) &lt;N11</div><div>IO, CLK2n, (DIFFIO_RX_B31n, DIFFOUT_B31n) &lt;P11</div><div>IO, (DIFFIO_TX_B32p, DIFFOUT_B32p, DQ3B) &lt;R14</div><div>IO, (DIFFIO_TX_B32n, DIFFOUT_B32n, DQ3B) &lt;T14</div></div></div><div><div>P16</div><div>R15</div><div>R16</div><div>T15</div><div>L10</div><div>M10</div><div>N14</div><div>M13</div><div>P13</div><div>P14</div><div>M11</div><div>M12</div><div>N11 CLK2p</div><div>P11</div><div>R14</div><div>T14</div></div></div> <div>5CEBA4F17C8N</div>						B
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D	<div><div>Title</div><div><div>Size</div><div>Number</div><div>Revision</div></div><div><div>Date:</div><div>4/6/2015</div><div>Sheet of</div></div><div><div>File:</div><div>C:\Users\...\fpga_bank4a.SchDoc</div><div>Drawn By:</div></div></div>						D
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<div><div><div>U1F</div><div><div>BANK 5B</div><div>IO, CLK6p, (DIFFIO_RX_R9p, DIFFOUT_R9p) IO, CLK6n, (DIFFIO_RX_R9n, DIFFOUT_R9n) IO, (DIFFIO_TX_R10p, DIFFOUT_R10p, DQ2R) IO, (DIFFIO_TX_R10n, DIFFOUT_R10n, DQ2R) IO, (DIFFIO_RX_R11p, DIFFOUT_R11p, DQ2R) IO, (DIFFIO_RX_R11n, DIFFOUT_R11n, DQ2R) IO, FPLL_BR_CLKOUT0, FPLL_BR_CLKOUTp, FPLL_BR_FB, (DIFFIO_TX_R12p, DIFFOUT_R12p, DQ2R) IO, FPLL_BR_CLKOUT1, FPLL_BR_CLKOUTn, (DIFFIO_TX_R12n, DIFFOUT_R12n, DQ2R) IO, (DIFFIO_RX_R13p, DIFFOUT_R13p, DQS2R) IO, (DIFFIO_RX_R13n, DIFFOUT_R13n, DQSn2R) IO, (DIFFIO_TX_R14p, DIFFOUT_R14p) IO, (DIFFIO_TX_R14n, DIFFOUT_R14n, DQ2R) IO, (DIFFIO_RX_R15p, DIFFOUT_R15p, DQ2R) IO, (DIFFIO_RX_R15n, DIFFOUT_R15n, DQ2R) IO, (DIFFIO_TX_R16p, DIFFOUT_R16p, DQ2R) IO, (DIFFIO_TX_R16n, DIFFOUT_R16n)</div></div><div><div>F12 G12 E16 D16 E12 D13 B16 C16 H13 G13 B15 C15 F14 F15 D14 E15</div><div>F12 CLK6p G12 E16 D16 E12 D13 B16 CLKOUT0 C16 CLKOUT1 H13 G13 B15 C15 F14 F15 D14 E15</div></div></div><div>5CEBA4F17C8N</div></div>							
<div><div><div>Title</div><div><div>Size A</div><div>Number</div><div>Revision</div></div><div><div>Date: File:</div><div>4/6/2015 C:\Users\...\fpga_bank5b.SchDoc</div><div>Sheet of Drawn By:</div></div></div></div>							
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1		2		3		4	
A							A
B							B
C							C
D							D

U1G

BANK 7A

IO, CLK10p, (DIFFIO\_RX\_T17p, DIFFOUT\_T17p)  
IO, CLK10n, (DIFFIO\_RX\_T17n, DIFFOUT\_T17n)  
IO, (DIFFIO\_TX\_T18p, DIFFOUT\_T18p, DQ1T)  
IO, (DIFFIO\_TX\_T18n, DIFFOUT\_T18n, DQ1T)  
IO, (DIFFIO\_RX\_T19p, DIFFOUT\_T19p, DQ1T)  
IO, (DIFFIO\_RX\_T19n, DIFFOUT\_T19n, DQ1T)  
IO, (DIFFIO\_TX\_T20p, DIFFOUT\_T20p, DQ1T)  
IO, (DIFFIO\_TX\_T20n, DIFFOUT\_T20n, DQ1T)  
IO, (DIFFIO\_RX\_T21p, DIFFOUT\_T21p, DQS1T)  
IO, (DIFFIO\_RX\_T21n, DIFFOUT\_T21n, DQSn1T)  
IO, (DIFFIO\_TX\_T22p, DIFFOUT\_T22p)  
IO, (DIFFIO\_TX\_T22n, DIFFOUT\_T22n, DQ1T)  
IO, (DIFFIO\_RX\_T23p, DIFFOUT\_T23p, DQ1T)  
IO, (DIFFIO\_RX\_T23n, DIFFOUT\_T23n, DQ1T)  
IO, (DIFFIO\_TX\_T24p, DIFFOUT\_T24p, DQ1T)  
IO, RZQ\_2, (DIFFIO\_TX\_T24n, DIFFOUT\_T24n)

F11

F10

A15

A14

D11

C11

A13

A12

E10

E9

B12

B11

C10

C9

B10

A10

F11 CLK10p

F10

A15

A14

D11

C11

A13

A12

E10

E9

B12

B11

C10

C9

B10

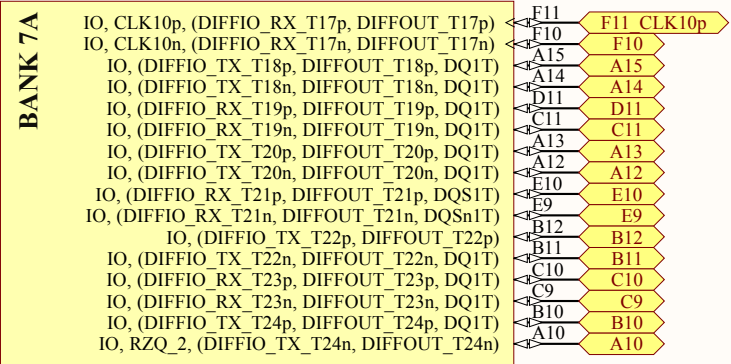
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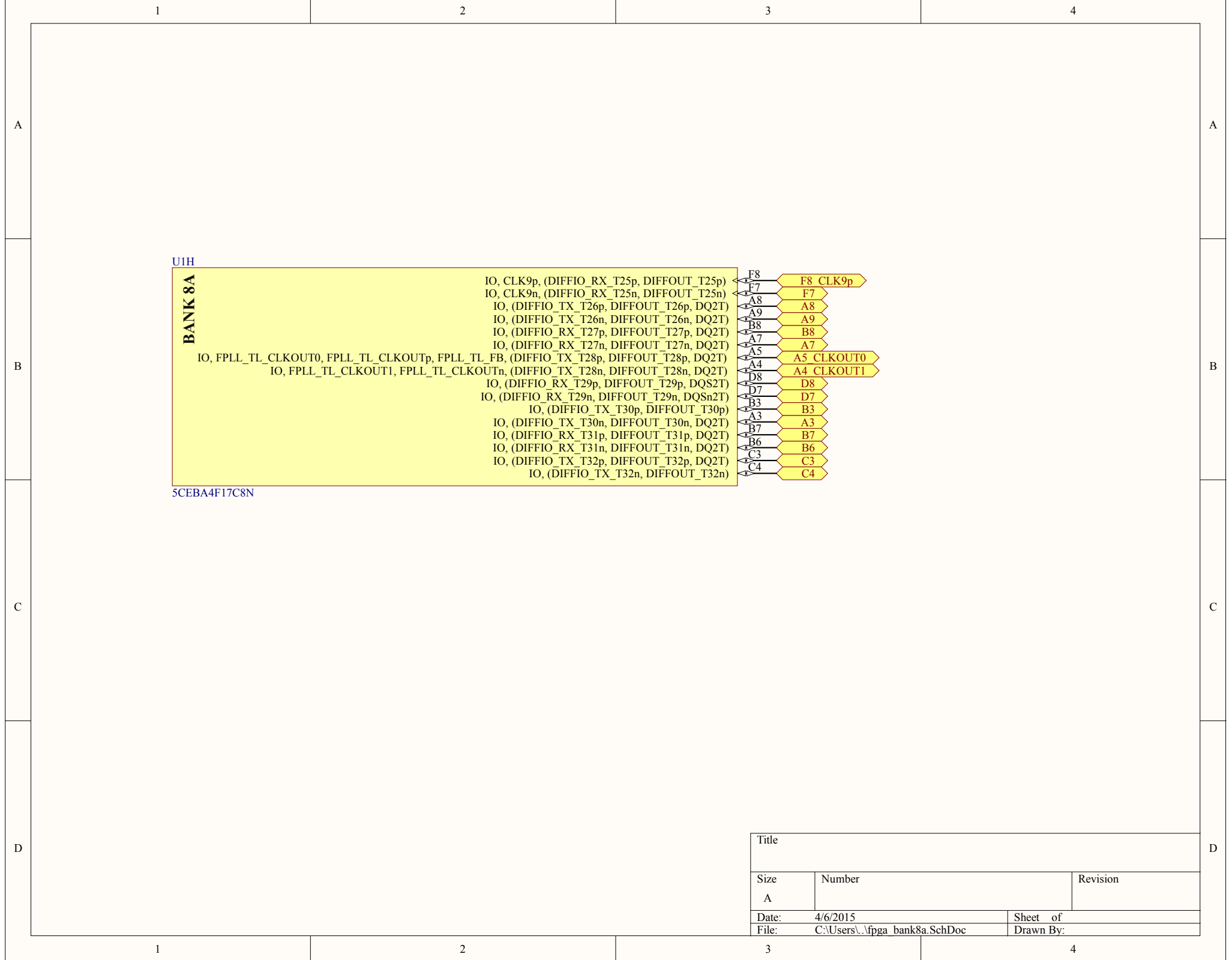
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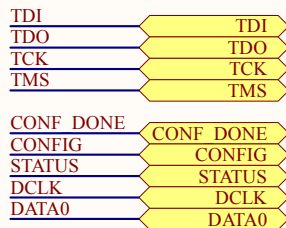
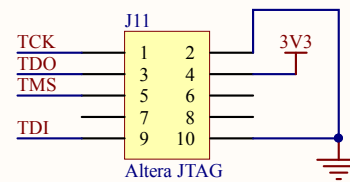
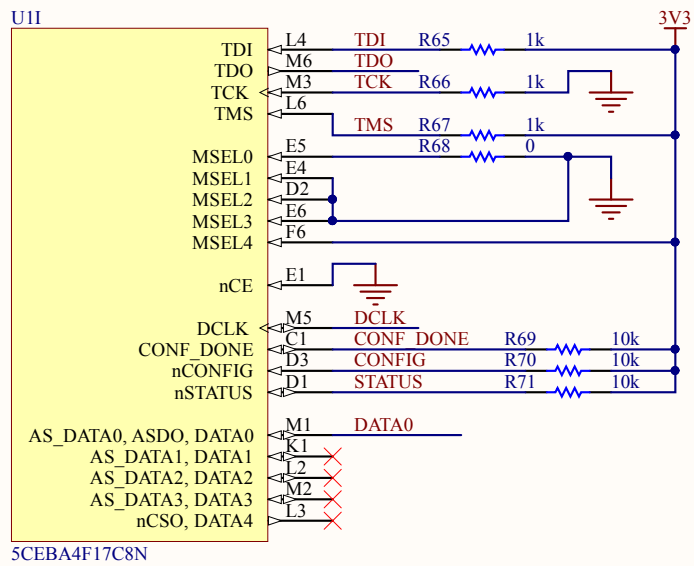
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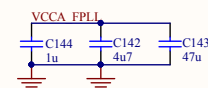
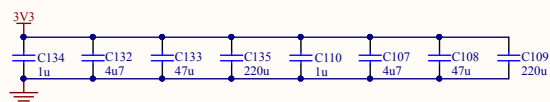
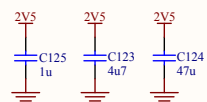
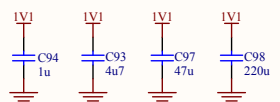
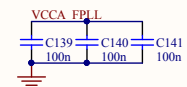
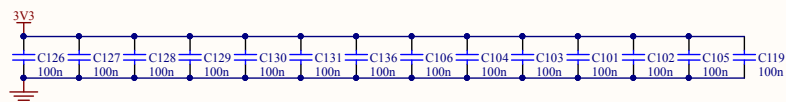
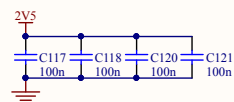
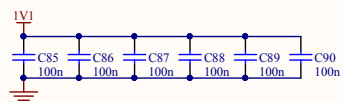
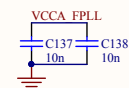
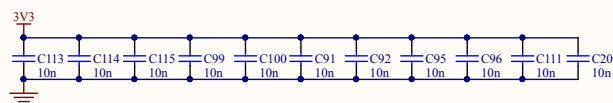
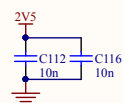
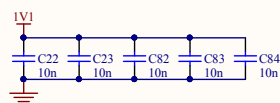
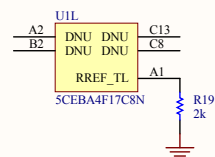
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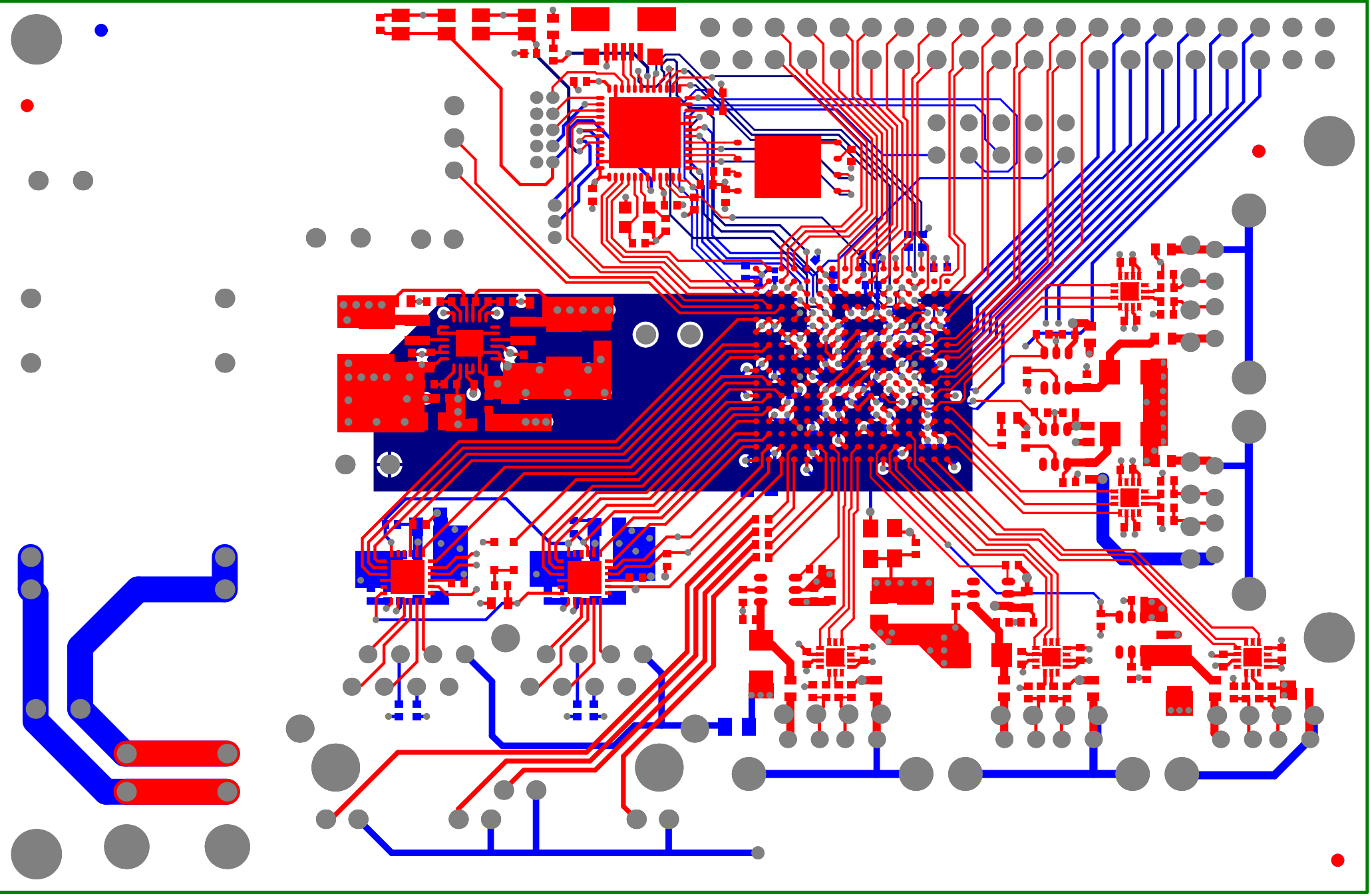
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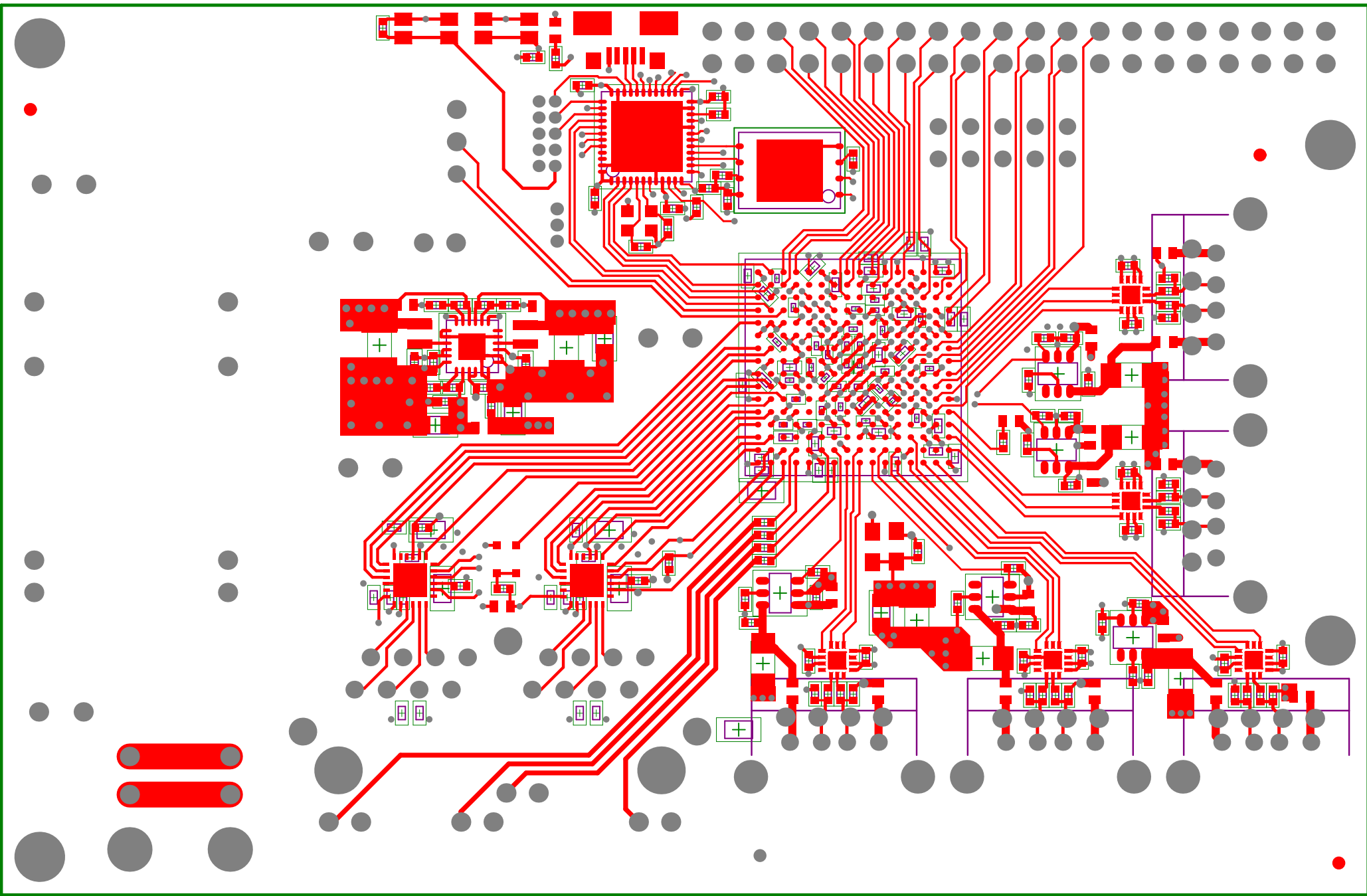


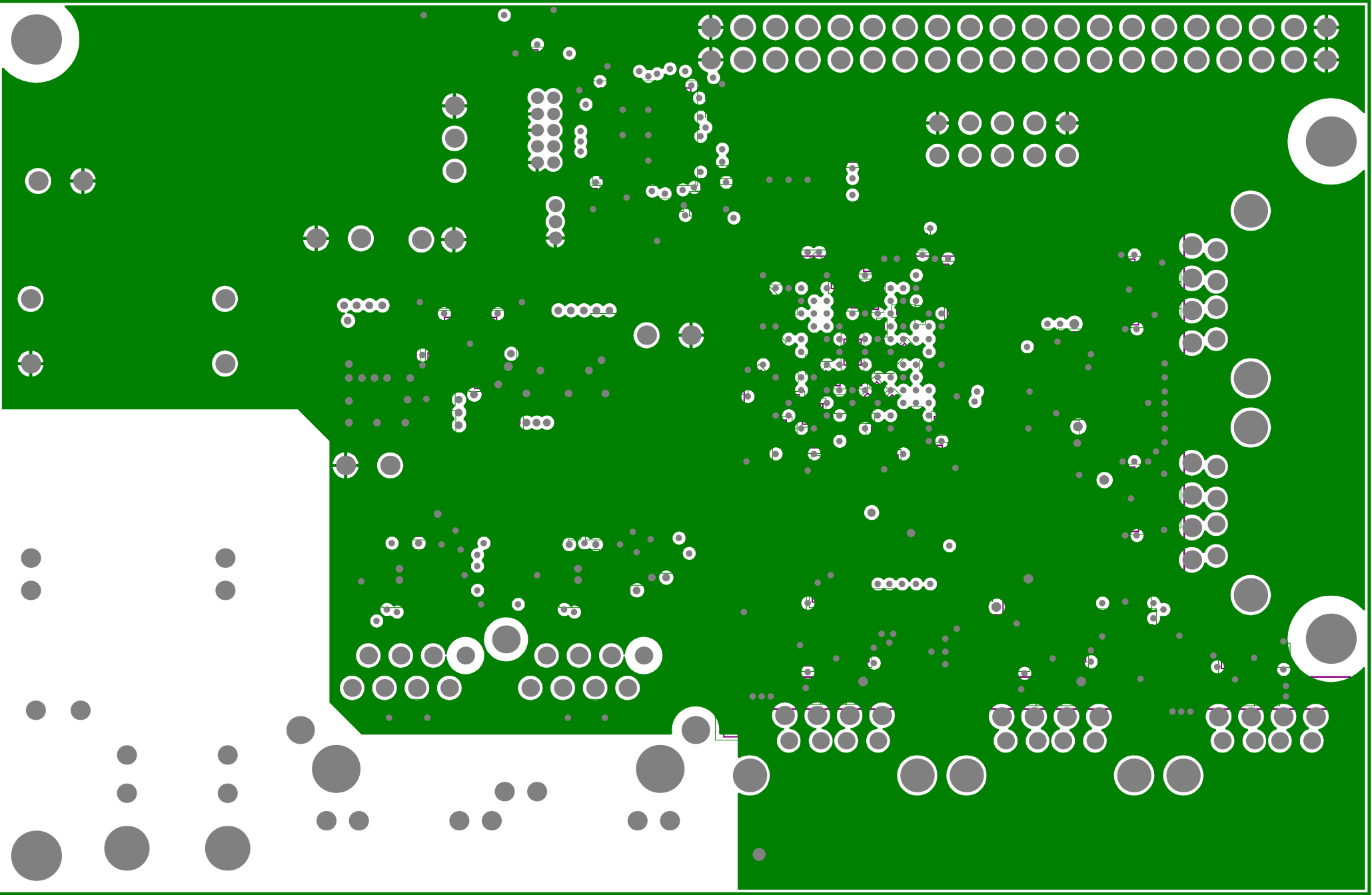
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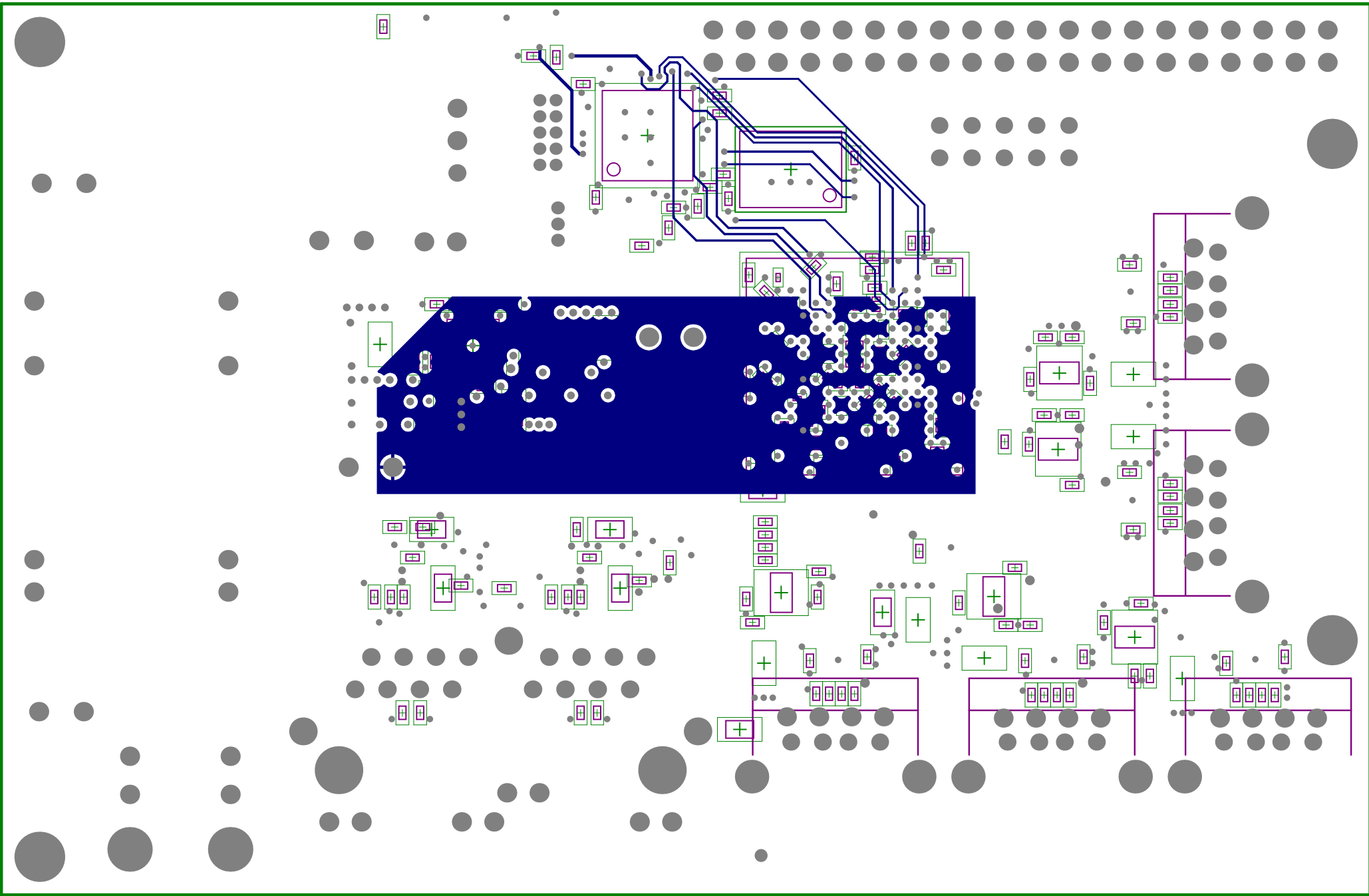


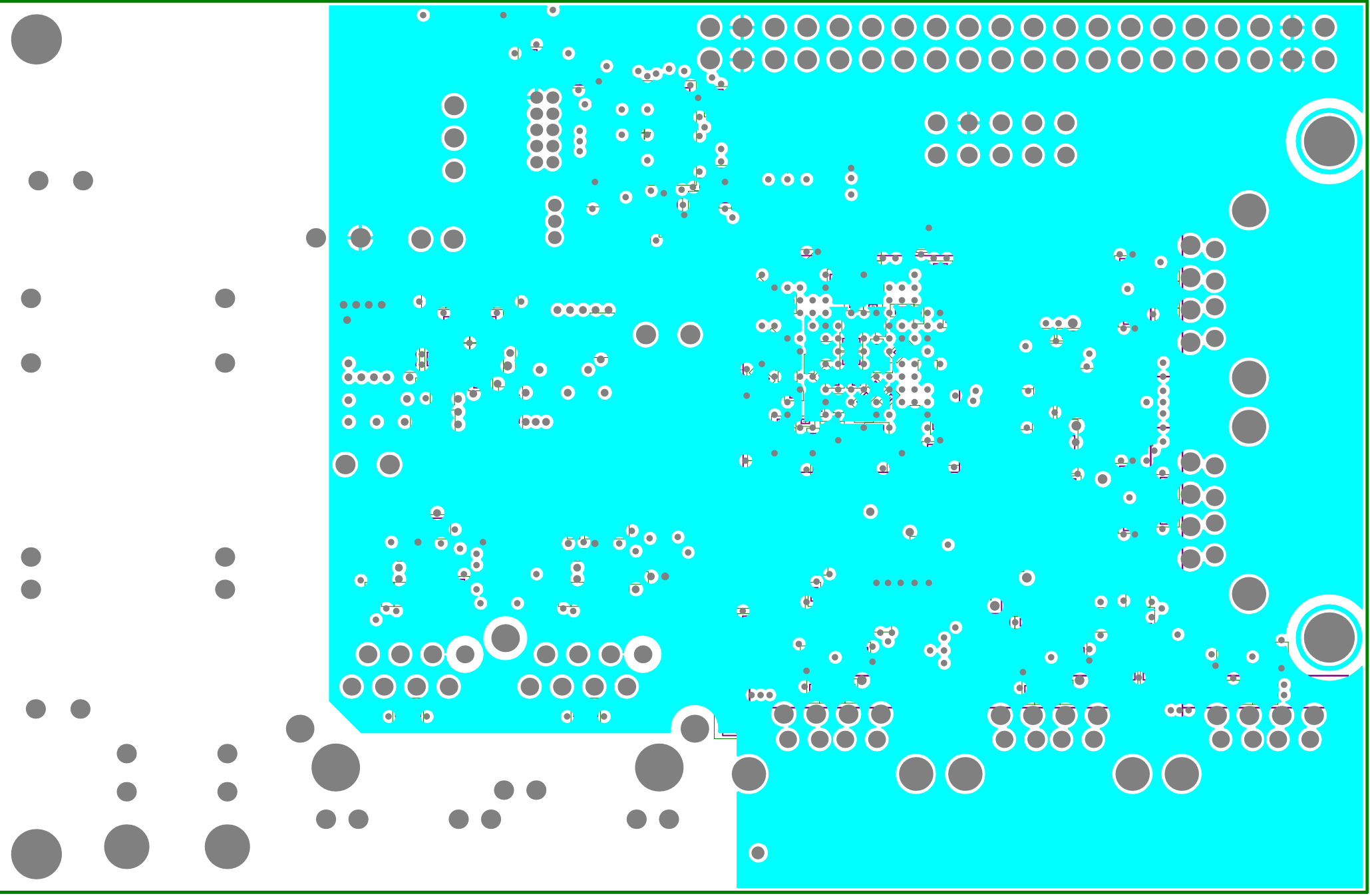


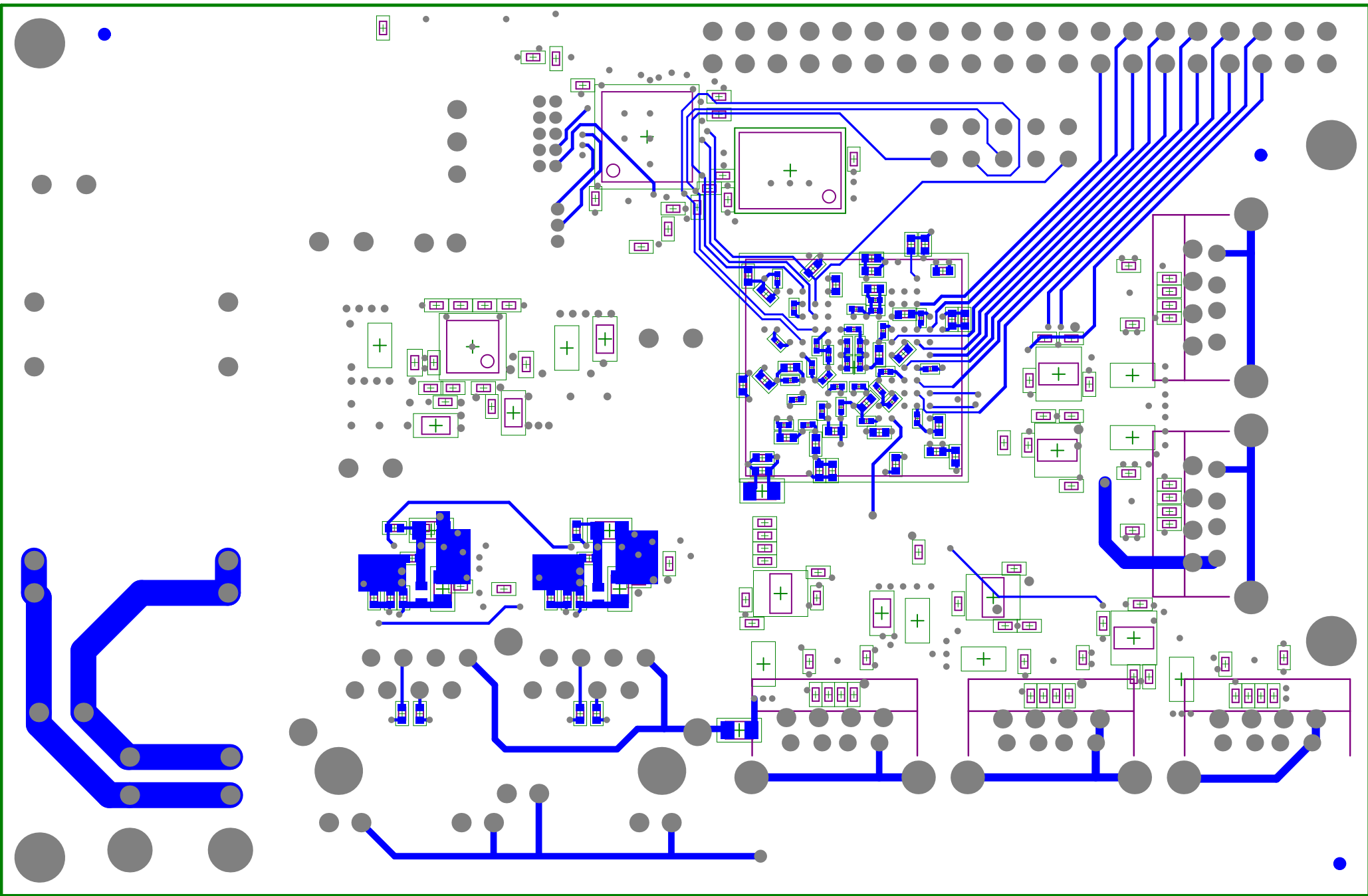














F1

Open Source Robotics Foundation  
MEGACHAIN  
REV. C

C27

U6

C26

C31

C16

J8

J12

J1

S1

GND

AUX0

AUX1

5V

J13

GND

S2

R21

R22

D5

C80

J5

RX

TX

GND

J6

C77

X1

C17

C18

R70

C47

C55

C19

R48

R67

C78

C79

R47

U20

J4

GND

3V3

J11

FPGA

JTAG

F3

J9

3V3

GND

F1

C27

U6

C26

C31

C16

J8

J12

J1

S1

GND

AUX0

AUX1

5V

GND

J13

S2

R21

R22

D5

C80

J5

RX

TX

GND

J6

C77

X1

C17

C18

R70

C47

C55

C19

R48

R67

C78

C79

R47

U20

J4

GND

3V3

J11

FPGA

JTAG

F3

J9

3V3

GND

F1

C27

U6

C26

C31

C16

J8

J12

J1

S1

GND

AUX0

AUX1

5V

GND

J13

S2

R21

R22

D5

C80

J5

RX

TX

GND

J6

C77

X1

C17

C18

R70

C47

C55

C19

R48

R67

C78

C79

R47

U20

J4

GND

3V3

J11

FPGA

JTAG

F3

J9

3V3

GND

F1

C27

U6

C26

C31

C16

J8

J12

J1

S1

GND

AUX0

AUX1

5V

GND

J13

S2

R21

R22

D5

C80

J5

RX

TX

GND

J6

C77

X1

C17

C18

R70

C47

C55

C19

R48

R67

C78

C79

R47

U20

J4

GND

3V3

J11

FPGA

JTAG

F3

J9

3V3

GND

F1

C27

U6

C26

C31

C16

J8

J12

J1

S1

GND

AUX0

AUX1

5V

GND

J13

S2

R21

R22

D5

C80

J5

RX

TX

GND

J6

C77

X1

C17

C18

R70

C47

C55

C19

R48

R67

C78

C79

R47

U20

J4

GND

3V3

J11

FPGA

JTAG

F3

J9

3V3

GND

F1

C27

U6

C26

C31

C16

J8

J12

J1

S1

GND

AUX0

AUX1

5V

GND

J13

S2

R21

R22

D5

C80

J5

RX

TX

GND

J6

C77

X1

C17

C18

R70

C47

C55

C19

R48

R67

C78

C79

R47

U20

J4

GND

3V3

J11

FPGA

JTAG

F3

J9

3V3

GND

F1

C27

U6

C26

C31

C16

J8

J12

J1

S1

GND

AUX0

AUX1

5V

GND

J13

S2

R21

R22

D5

C80

J5

RX

TX

GND

J6

C77

X1

C17

C18

R70

C47

C55

C19

R48

R67

C78

C79

R47

U20

J4

GND

3V3

J11

FPGA

JTAG

F3

J9

3V3

GND

F1

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C26

C31

C16

J8

J12

J1

S1

GND

AUX0

AUX1

5V

GND

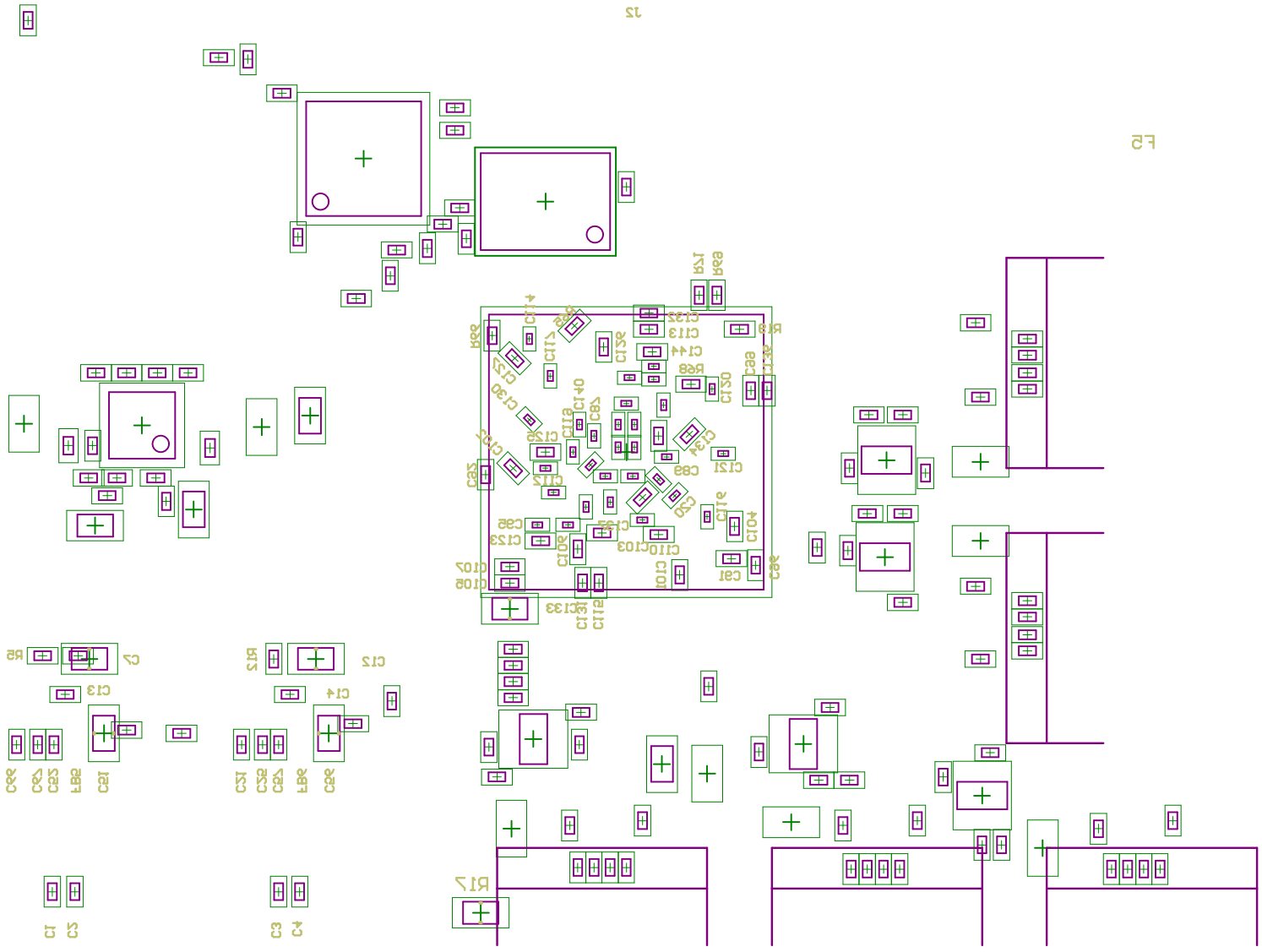
J13

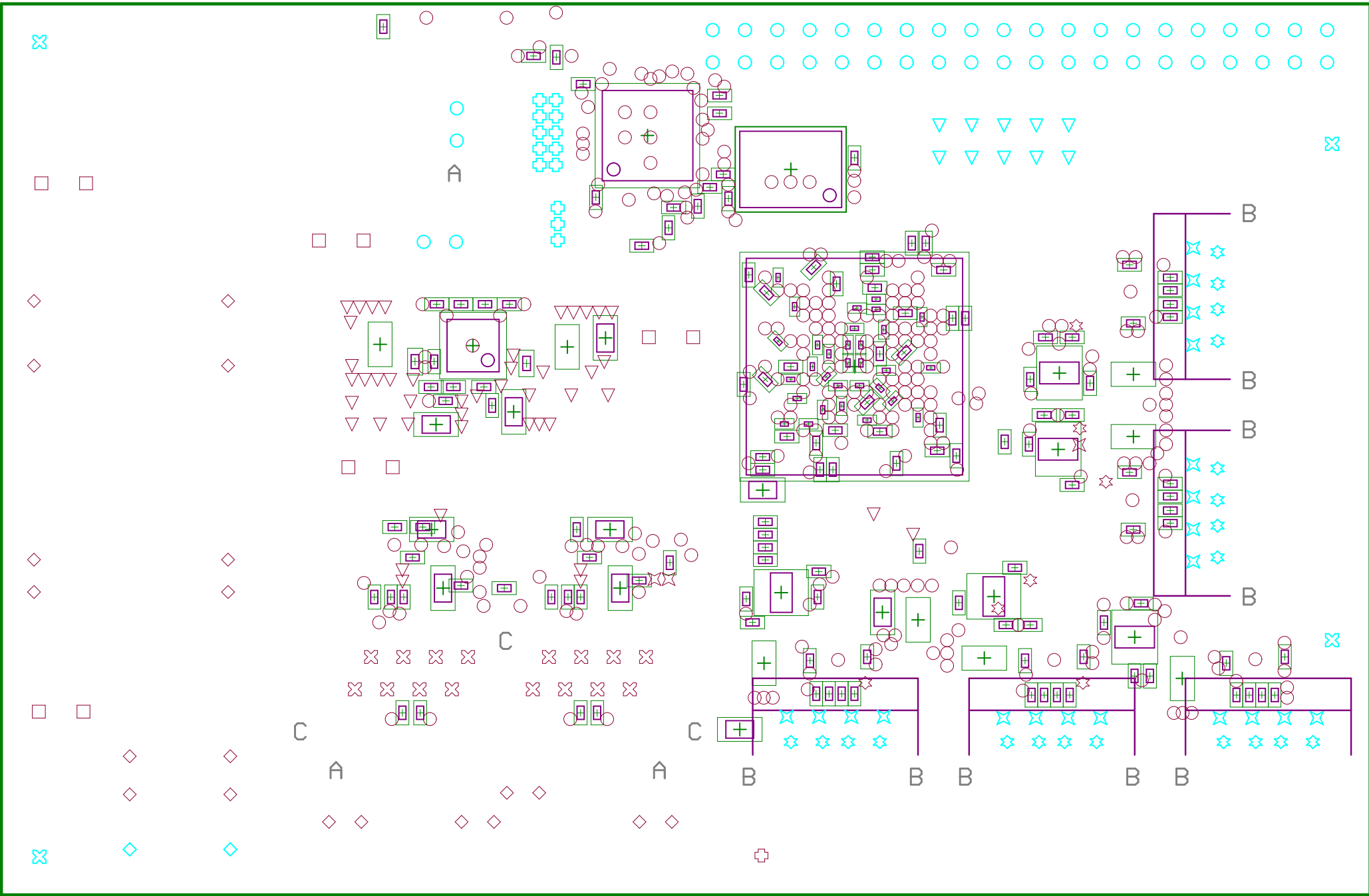
S2

R21

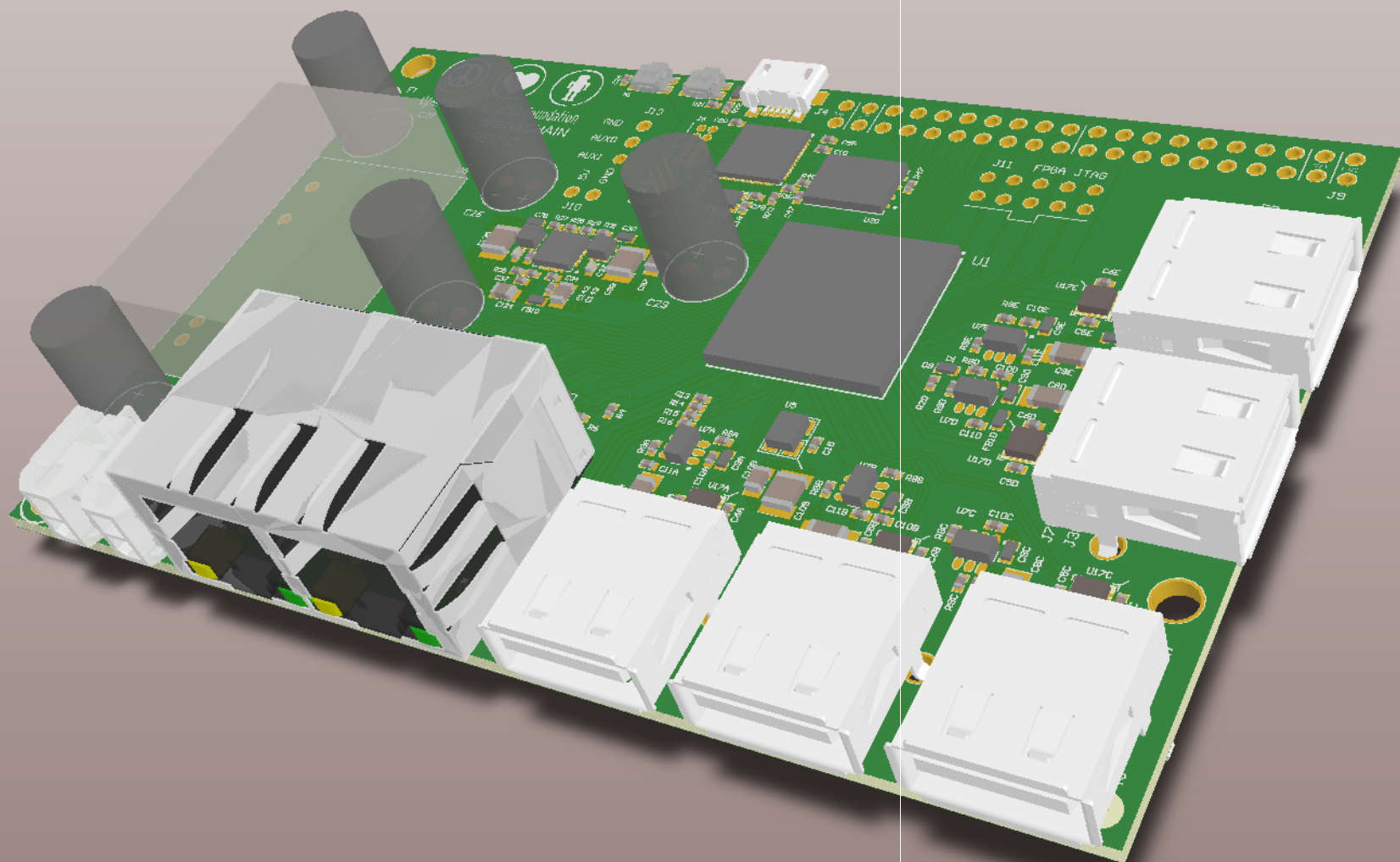
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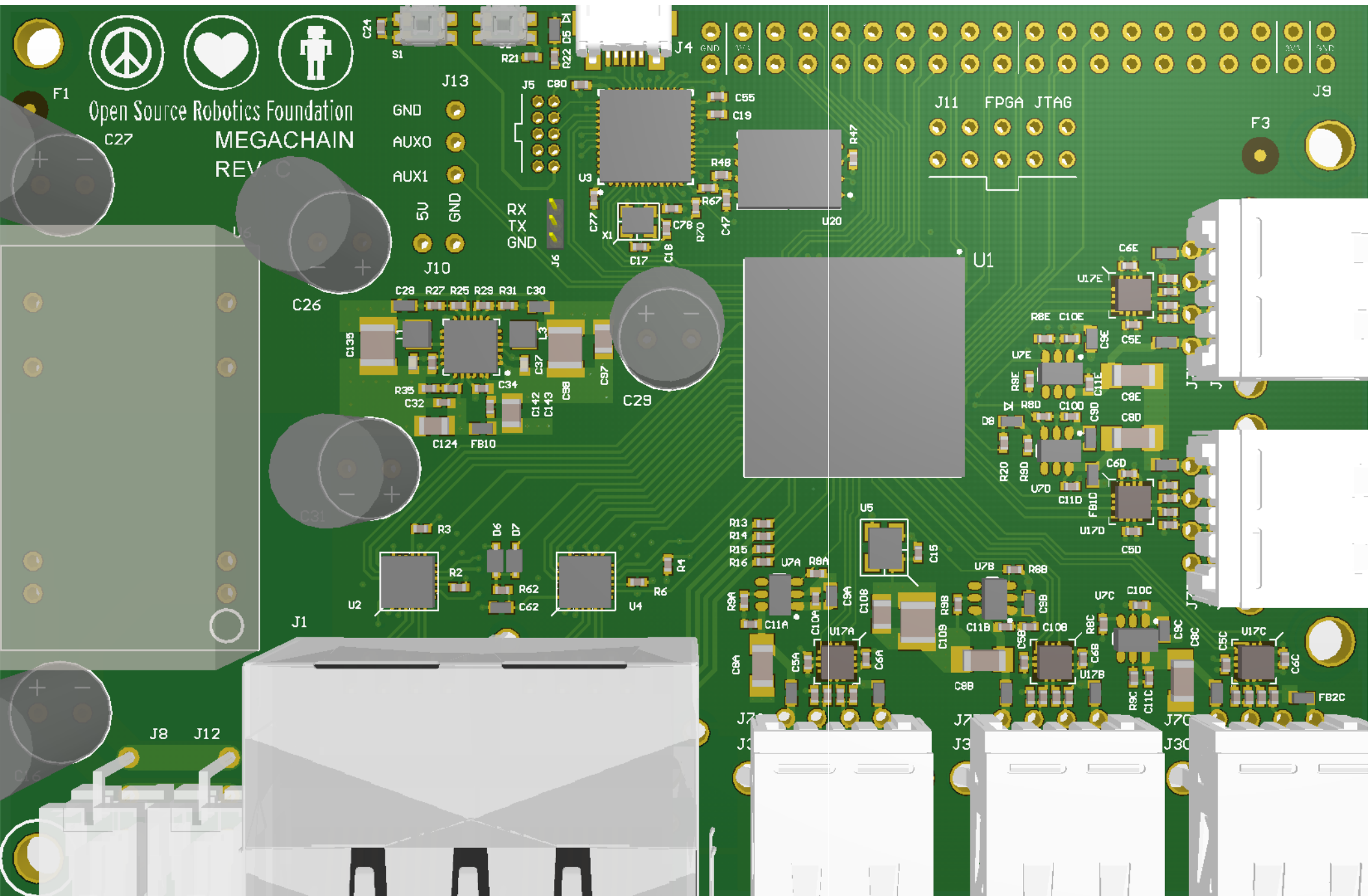
D5

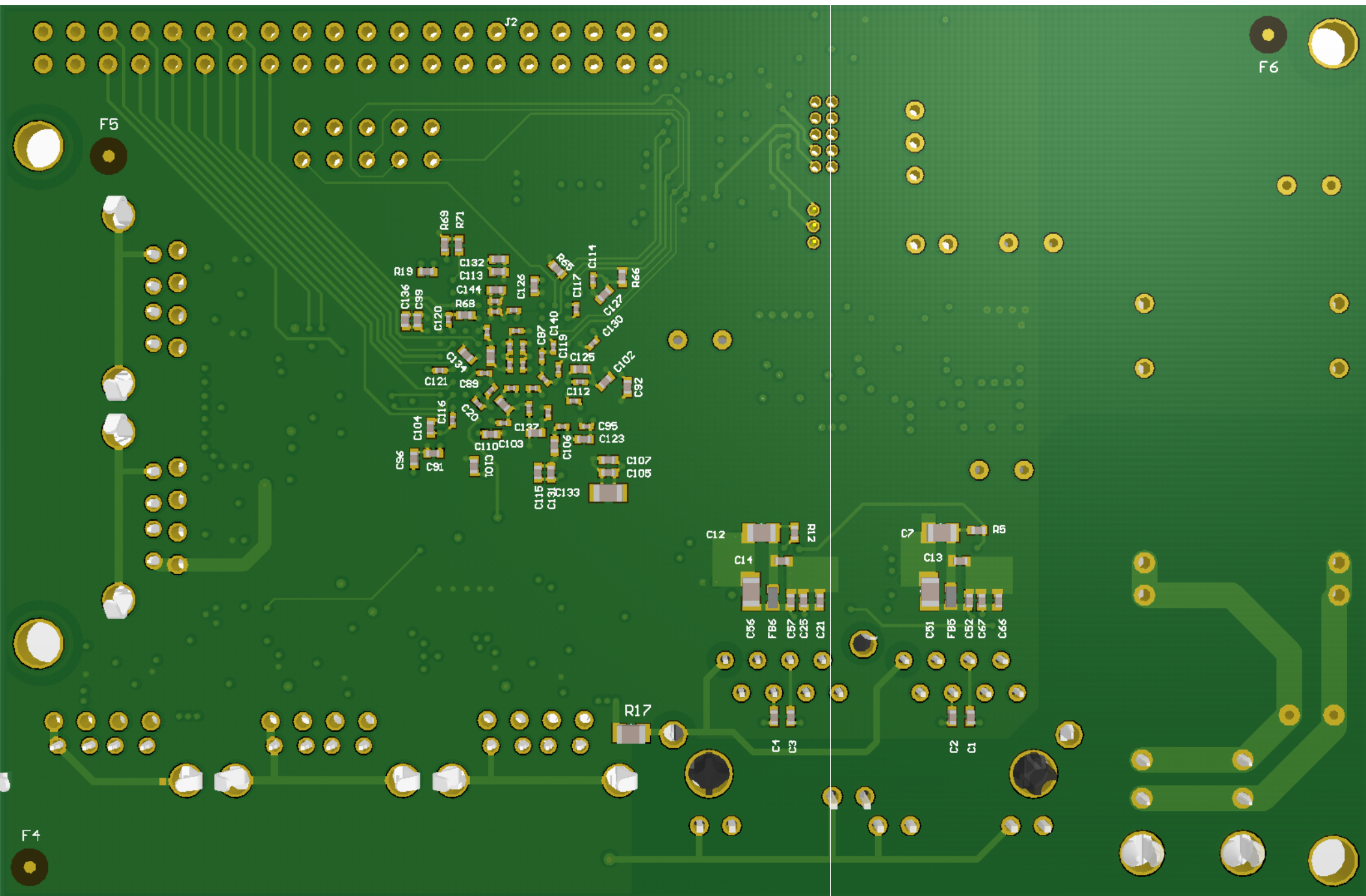












Bill of Materials

Bill of Materials For Project [megachain.PrjPC

Board: Bill of Materials For Project [megachain.PrjPCB] (No PCB Doc

Morgan Quigley, Open Source Robotics Foundation

[morgan@osrfoundation.org](mailto:morgan@osrfoundation.org)

650-796-4881

Designator	Quantity	Value	Footprint	digikey	Mouser	Manufacturer	Manufacturer Part Number
C1, C2, C3, C4, C5A, C58, C5C, C5D, C5E, C6A, C6B, C6C, C6D, C6E, C10A, C10B, C10C, C10D, C10E, C11A, C11B, C11C, C11D, C11E, C13, C14, C15, C24, C25, C35, C47, C52, C57, C67, C77, C78, C80, C101, C102, C103, C104, C105, C106, C126, C127, C131, C136							
C7, C12, C51, C56	47	100n	GENERIC_0402	445-7348		TDK	C1005X7R1E104K050B8
C8A, C8B, C8C, C8D, C8E	4	22u	GENERIC_0805	445-6797		TDK	C2012X5R1C226K125AC
C9A, C9B, C9C, C9D, C9E, C28, C30, C62	5	100u	GENERIC_1206	445-6007		TDK	C3216X5R1A107M160AC
	8	10u	GENERIC_0603	445-6853		TDK	C1608X5R1A106M080AC
C16	1	100u	electrolytic_8mm_th	DNP		DNP	DNP
C17, C18	2	12p	GENERIC_0402	445-1236		TDK	C1005COG1H120J050BA
C19, C55, C93, C107, C123, C132, C142	7	4u7	GENERIC_0402	445-8023		TDK	C1005X5R1A475M050BC
C20, C22, C23, C82, C83, C84, C95, C100, C111, C112, C114, C116, C137, C138	14	10n	GENERIC_0201	445-6843		TDK	C0603X7R1A103K030BA
C21, C66	2	2u2	GENERIC_0402	445-8023		TDK	C1005X5R1A475M050BC
C26, C27, C29, C31	4	680u	electrolytic_8mm_th	DNP		DNP	DNP
C32, C34, C94, C110, C125, C134, C144	7	1u	GENERIC_0402	445-4978		TDK	C1005X5R1C105K050BC
C36, C37	2	4u7	CAPCO402(1005)60_N	445-8023		TDK	C1005X5R1A475M050BC
C85, C86, C87, C88, C89, C90, C117, C118, C119, C120, C121, C128, C129, C130, C139, C140, C141	17	100n	GENERIC_0201	445-7313		TDK	C0603X5R1C104K030BC
C91, C92, C96, C99, C113, C115	6	10n	GENERIC_0402	445-1260		TDK	C1005X7R1E103K050B8
C97, C108, C124, C133, C143	5	47u	GENERIC_0805	445-8239		TDK	C2012X5R1A476M125AC
C98, C109, C135	3	220u	GENERIC_1210	1276-3375		Samsung	CL32A227MQVNNNE
D5, D8	2		GENERIC_0603	160-1183		Lite-On	LTST-C190GKT
D6, D7	2		SOD323F	568-4138		NXP	PMEG6010CEJ,115
F1, F2, F3, F4, F5, F6	6		fiducial_circle				
FB1A, FB1B, FB1C, FB1D, FB1E, FB2A, FB2B, FB2C, FB2D, FB2E, FB5, FB6, FB10	13	220	GENERIC_0603	445-1565		TDK	MPZ1608S221ATA00
J1	1		stewart_SI-60159-F	DNP		DNP	DNP
J2, J9	2		HDR2X10	DNP		DNP	DNP
J3A, J3B, J3C, J3D, J3E	5		usb_ra_th_molex_676430910	DNP		DNP	DNP
J4	1		JAE_DX4R005HJ5R2000	670-2674	656-DX4R005HJ5R2000	JAE	DX4R005HJ5R2000
J5	1		50MIL_TH_VERT_5X2	DNP		DNP	DNP
J6	1		50MIL_TH_VERT_3P_OS	DNP		DNP	DNP
J7A, J7B, J7C, J7D, J7E	5		100mil_th_ra_4x1_s_hrouded_justholes	DNP		DNP	DNP
J8, J12	2		MICROFIT_TH_RA_2_POS_FLAG	DNP		DNP	DNP
J10	1		HDR1X2	DNP		DNP	DNP
J11	1		HDR2X5	DNP		DNP	DNP
J13	1		HDR1X3	DNP		DNP	DNP
L1, L3	2	1uH	NRS2012	587-3448		Taiyo Yuden	NRS2012T1RONGJ
R2, R6	2	6k49	GENERIC_0402	541-6.49KL		Vishay	CRCW04026K49FKED
R3, R4, R5, R65, R66, R67	6	1k	GENERIC_0402	541-1.00KL		Vishay	CRCW04021K00FKED
R7A, R7B, R7C, R7D, R7E, R10A, R10B, R10C, R10D, R10E	10	27	GENERIC_0402	541-27.0L		Vishay	CRCW040227R0FKED
R8A, R8B, R8C, R8D, R8E, R9A, R9B, R9C, R9D, R9E, R21, R62, R69, R70, R71	15	10k	GENERIC_0402	541-10.0KL		Vishay	CRCW040210K0FKED
R11A, R11B, R11C, R11D, R11E, R37A, R37B, R37C, R37D, R37E	10	15k	GENERIC_0402	541-15.0KL		Vishay	CRCW040215K0FKED
R12, R47, R48	3	4k7	GENERIC_0402	541-4.70KL		Vishay	CRCW04024K70FKED
R13, R14, R15, R16, R20, R22	6	220	GENERIC_0402	541-220L		Vishay	CRCW0402220RFKED
R17	1	11M	GENERIC_0805	541-1.00MC		Vishay	CRCW08051M00FKEA
R19	1	2k	GENERIC_0402	541-2.00KL		Vishay	CRCW04022K00FKED
R25, R29, R33	3	150k	GENERIC_0402	541-150KL		Vishay	CRCW0402150KFKED
R27	1	26k7	GENERIC_0402	541-26.7KL		Vishay	CRCW040226K7FKED
R31	1	124k	GENERIC_0402	541-124KL		Vishay	CRCW0402124KFKED
R35	1	37k4	GENERIC_0402	541-37.4KL		Vishay	CRCW040237K4FKED
R68	1	0	GENERIC_0402	541-0.0J		Vishay	CRCW04023000Z0ED
S1, S2	2		EVQ-P7A01P_button_smt_ra	P16763		Panasonic	EVQ-P7A01P
U1	1		ALTR-FBGA256_A-155	544-3001		Altera	5CEBA4F17C8N
U2, U4	2		KSZ8081RNX	576-4177		Micrel	KSZ8081RNDCA
U3	1		stm32f411xy	497-14907		ST Micro	STM32F411CEU6
U5	1		OSCILLATOR_3.2x2.5	535-12039		Abracon	ASTX-H11-25.000MHZ-T
U6	1		artesy_nasa	DNP		DNP	DNP
U7A, U7B, U7C, U7D, U7E	5		ap255x	AP2553W6-7DI		Diodes Inc	AP2553W6-7
U15	1		ADP5023	ADP5023ACPZ-R7		Analog Devices	ADP5023ACPZ-R7
U17A, U17B, U17C, U17D, U17E	5		usb1t1103_mlp14	USB1T1103MPX		Fairchild	USB1T1103MPX
U20	1		N25Q_6x8mm	557-1561		Micron	N25Q128A13EF840E
X1	1		CRYSTAL_2_2.5	535-10923		Abracon	ABM10-16.000MHZ-D30-T3