ECE 342 Final Project

PCB Artifacts

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Contents

1 Schematic

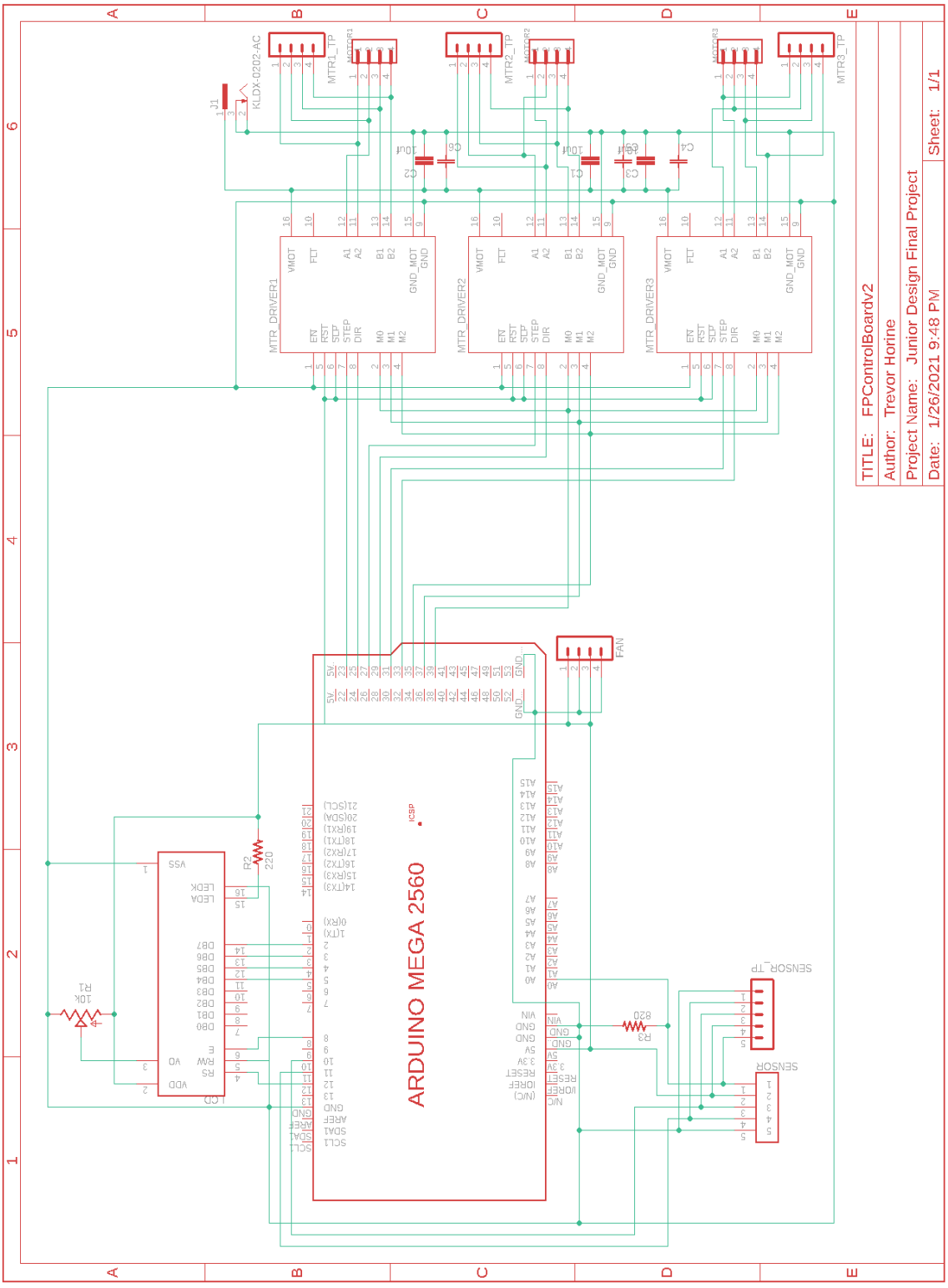

Figure 1: Detailed schematic control board, used for design layout of the PCB, which is designed as a breakout for an Arduino MEGA 2560 R3.

2 Block Diagram

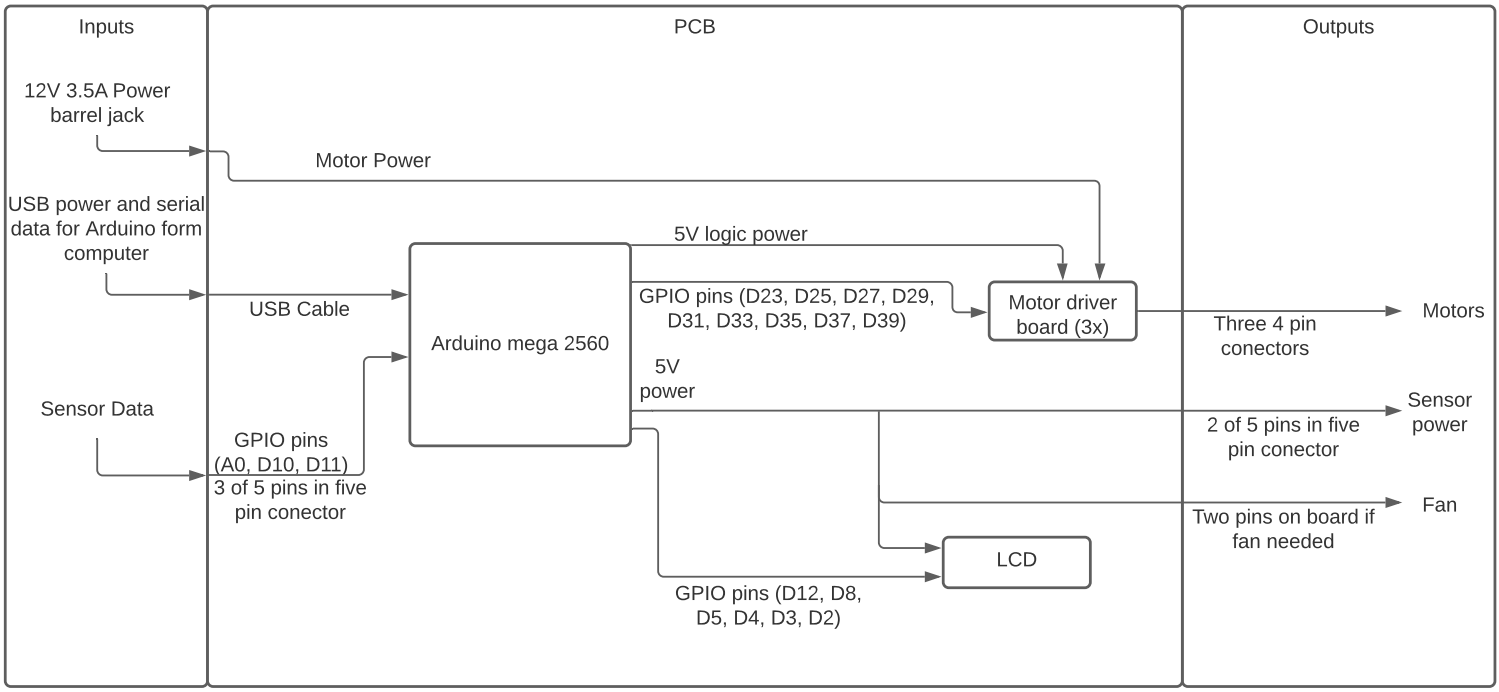

Figure 2: Block Diagram of the PCB with inputs in the inputs box on the left, outputs in the output box on the right and the blocks that make up the PCB in the middle section labeled PCB.

3 Interfaces

Interface table	
Interface	Properties
Inputs	
USB	Supplies 5V power to Arduino. Also used a serial comunication between computer and Arduino
12V Power	12V, 3.5 A power supplied to board via a barrel jack for the motor drivers.
Sensor Inputs	Three of the five pins in the 5 pin sensor conector. The light sensor goes to GPIO pin A0, and RFID goes to GPIO pins D10 and D11.
Outputs	
Motors	Three 4 pin conectors that conect the motors to the PCB. Each of these conectors is attached to a different motor controler
Fan Power	These are a few pins on the board that are connected to 5V and GND so a fan could be added to help with cooling if needed.
Sensor Power	The remaing two pins in the 5 pin sensor conector to carry 5V and ground to the sensors on the payload.
LCD	16 pin 2x16LCD attaced to GPIO pins D12, D8, D5, D4, D3, D2, 5V and GND. This will be used for debugging. (displaying corrdinates, or sensor values.)

Figure 3: list of input and outputs, as well as some of their properties or what they will be used for.

4 PCB Layout

4.1 Eagle Layout and Board Dimensions

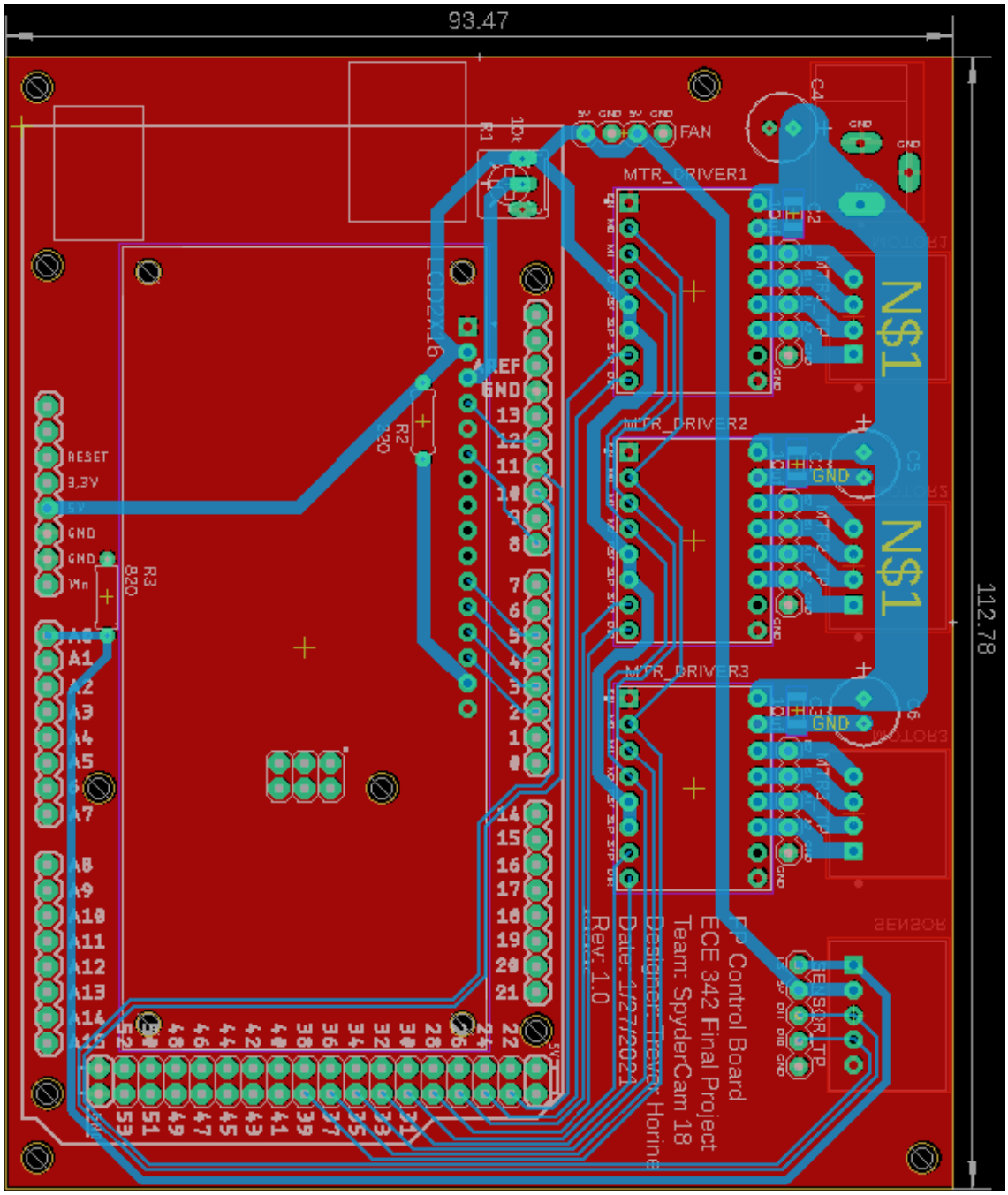

Figure 4: Layout of the PCB board built form the schematic in Figure 1, red is the bottom layer and a ground plain, blue is the top layer with traces for signals.

4.2 Board Profile

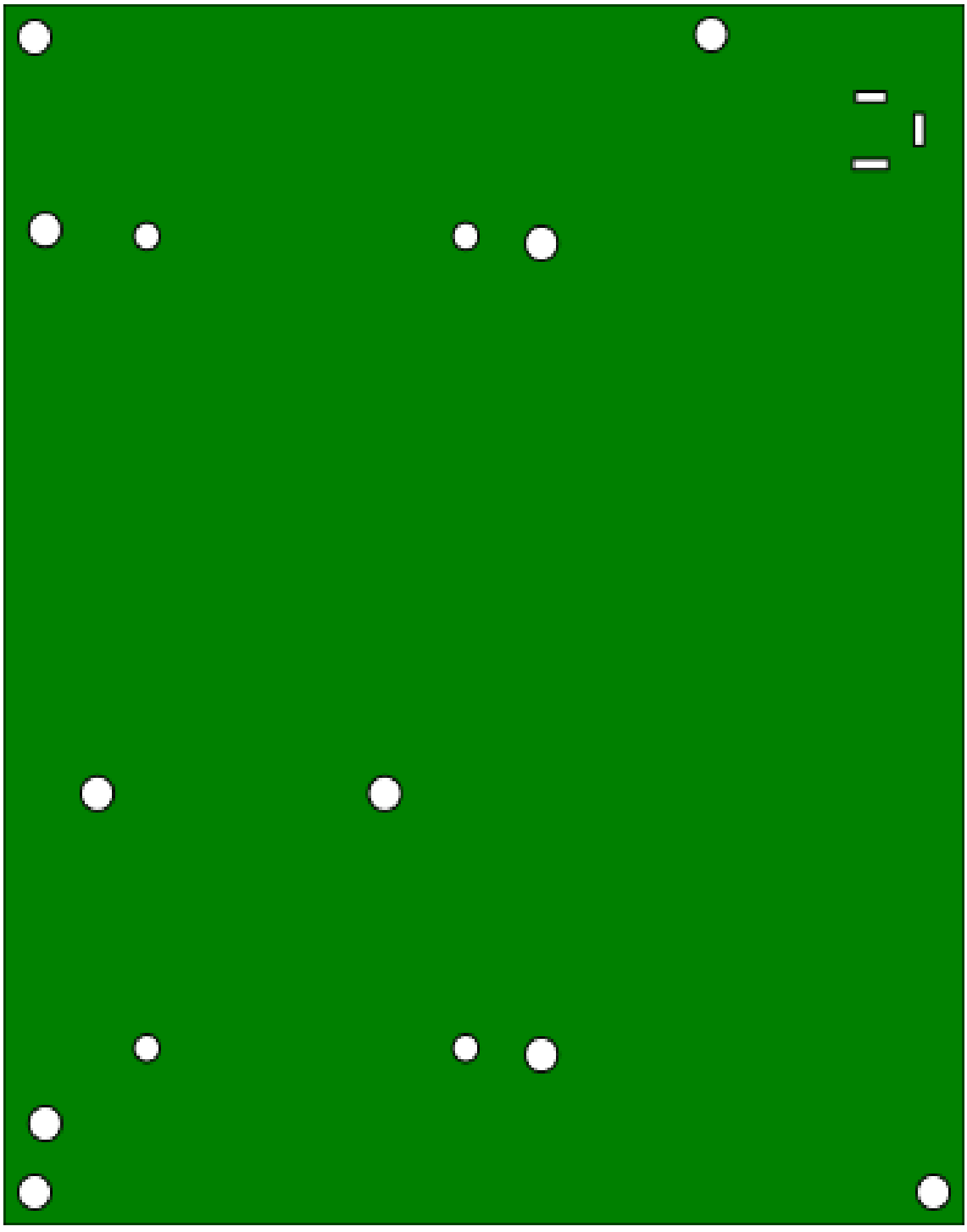

Figure 5: This is a rendering of the board profile. This image was generated from the gerber files.

4.3 Top Silkscreen

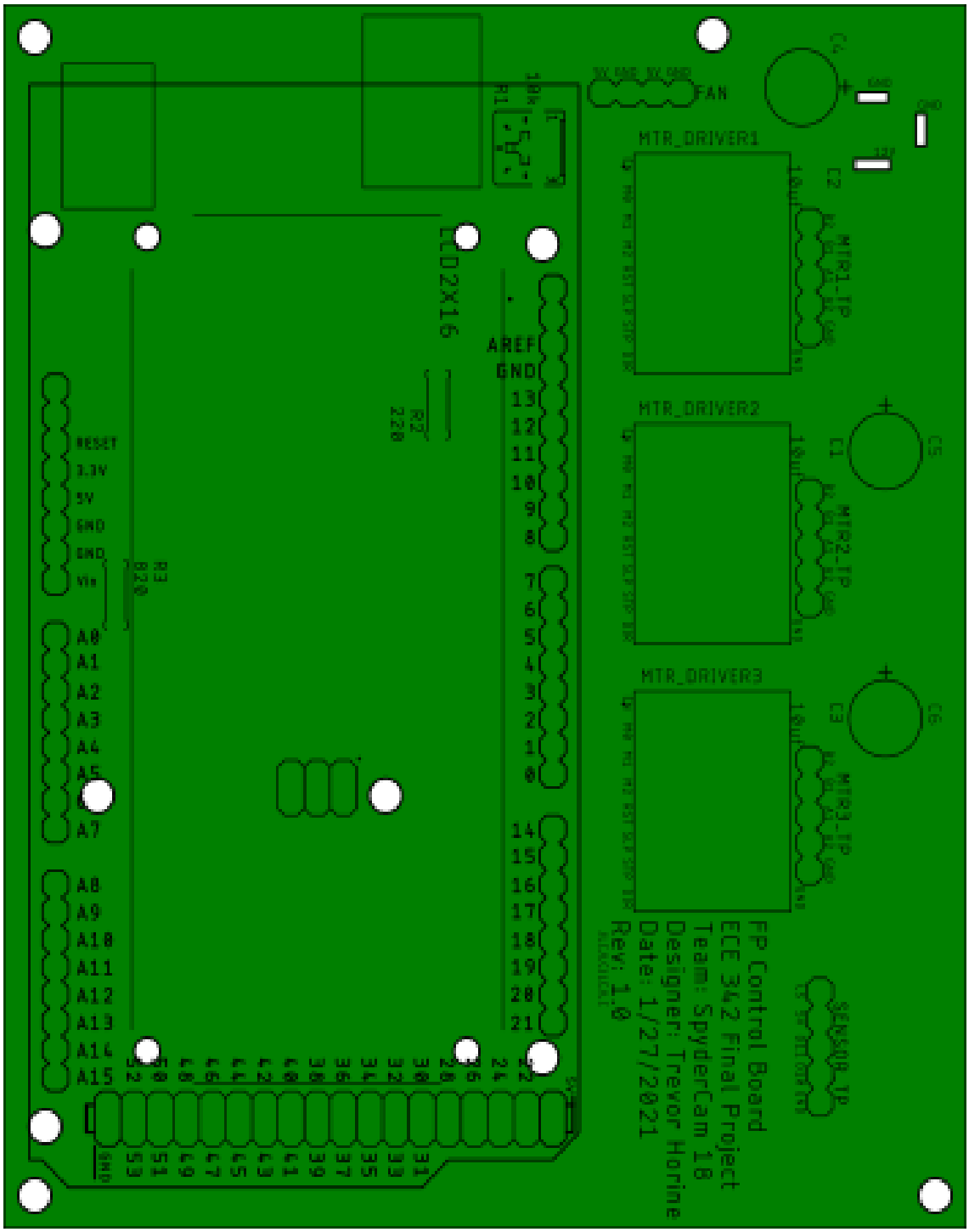

Figure 6: This is a rendering of the top silkscreen layer on top of the board profile. This image was generated from the gerber files.

4.4 Top Copper

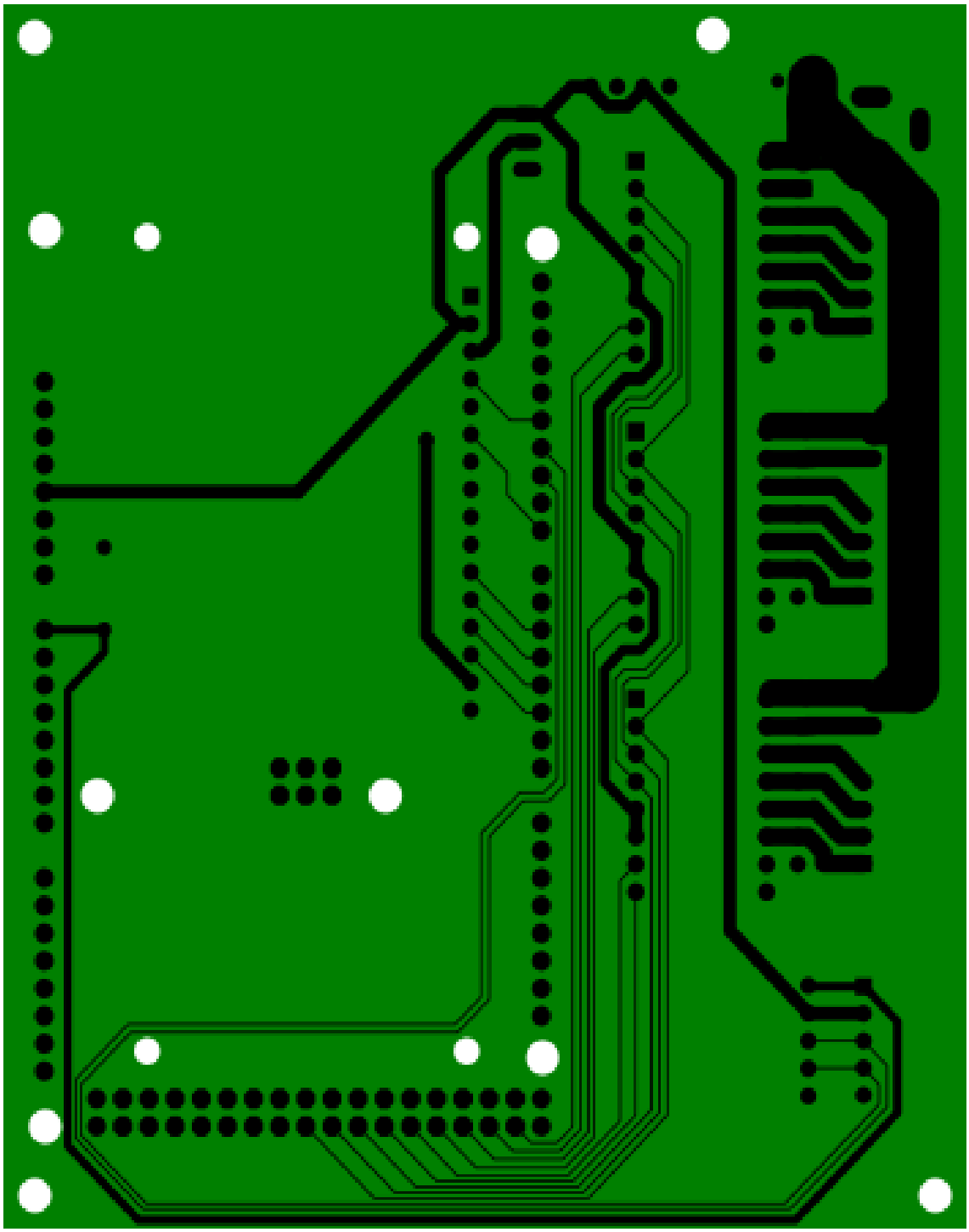

Figure 7: This is a rendering of the top copper layer on top of the board profile. This image was generated from the gerber files.

4.5 Top Soldermask

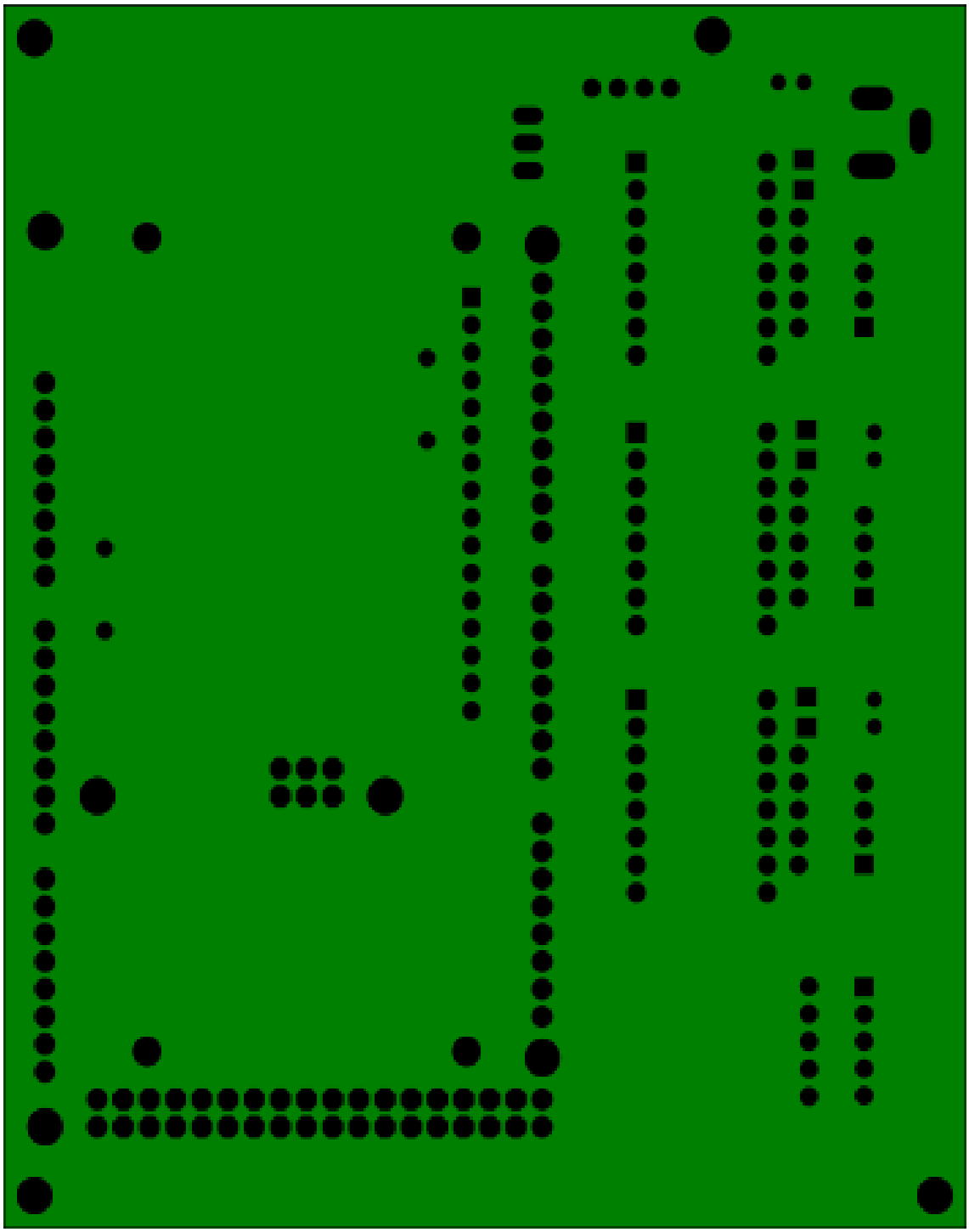

Figure 8: This is a rendering of the top soldermask layer on top of the board profile. This image was generated from the gerber files.

4.6 Top Soldermask And Silkscreen

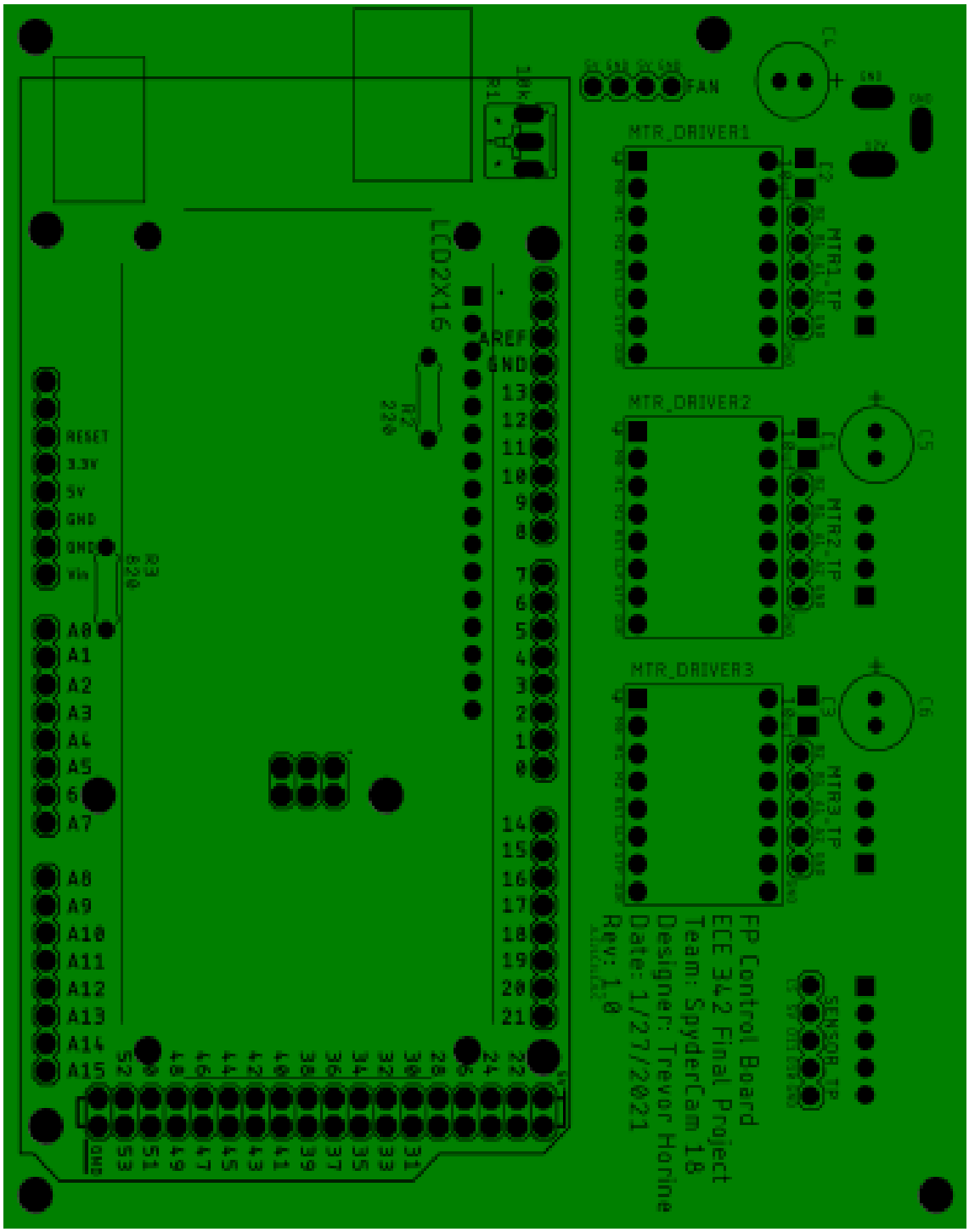

Figure 9: This is a rendering of the top soldermask layer and the top silkscreen layer on top of the board profile. This image was generated from the gerber files.

4.7 Bottom Silkscreen

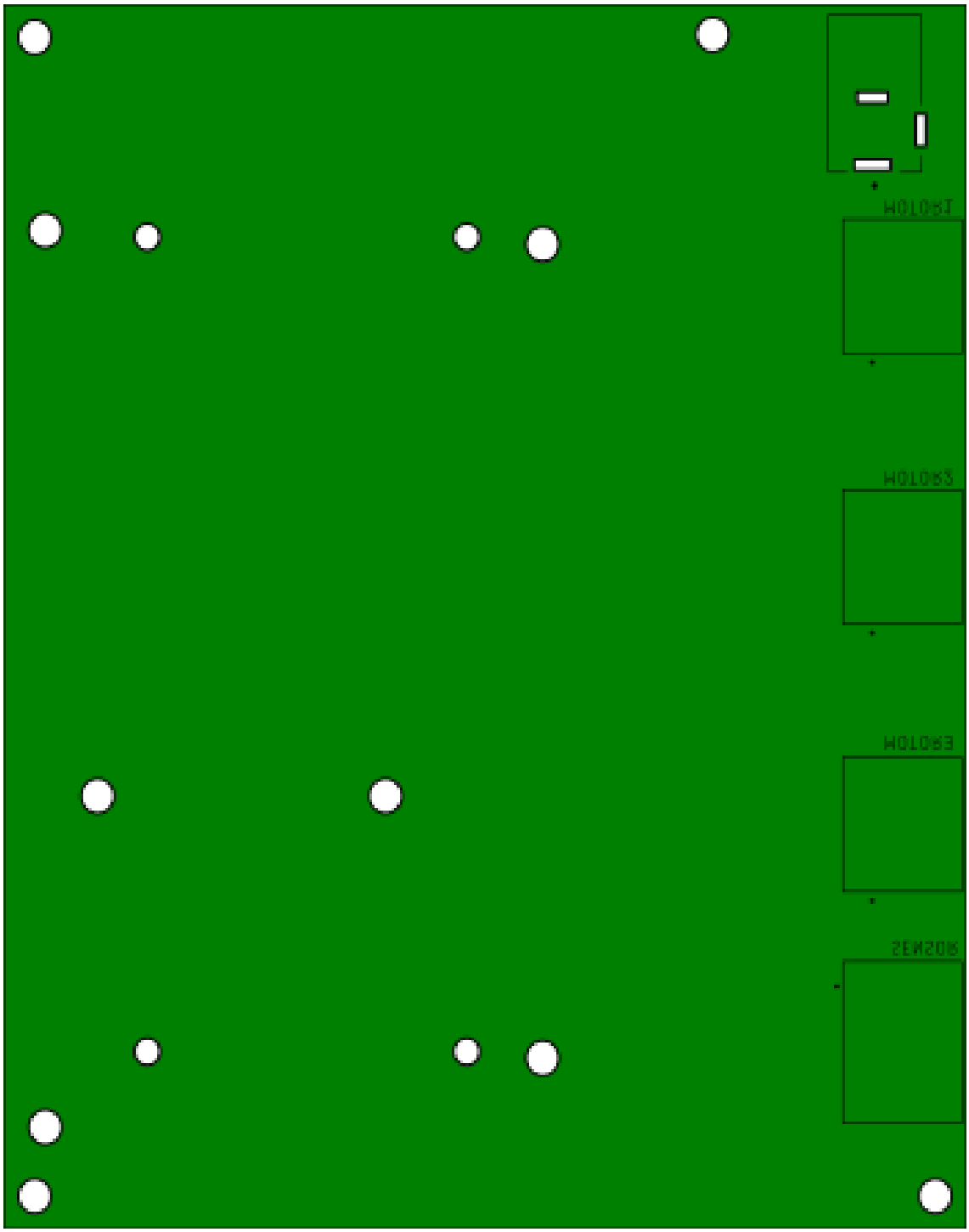

Figure 10: This is a rendering of the bottom silkscreen layer on top of the board profile. This image was generated from the gerber files.

4.8 Bottom Copper

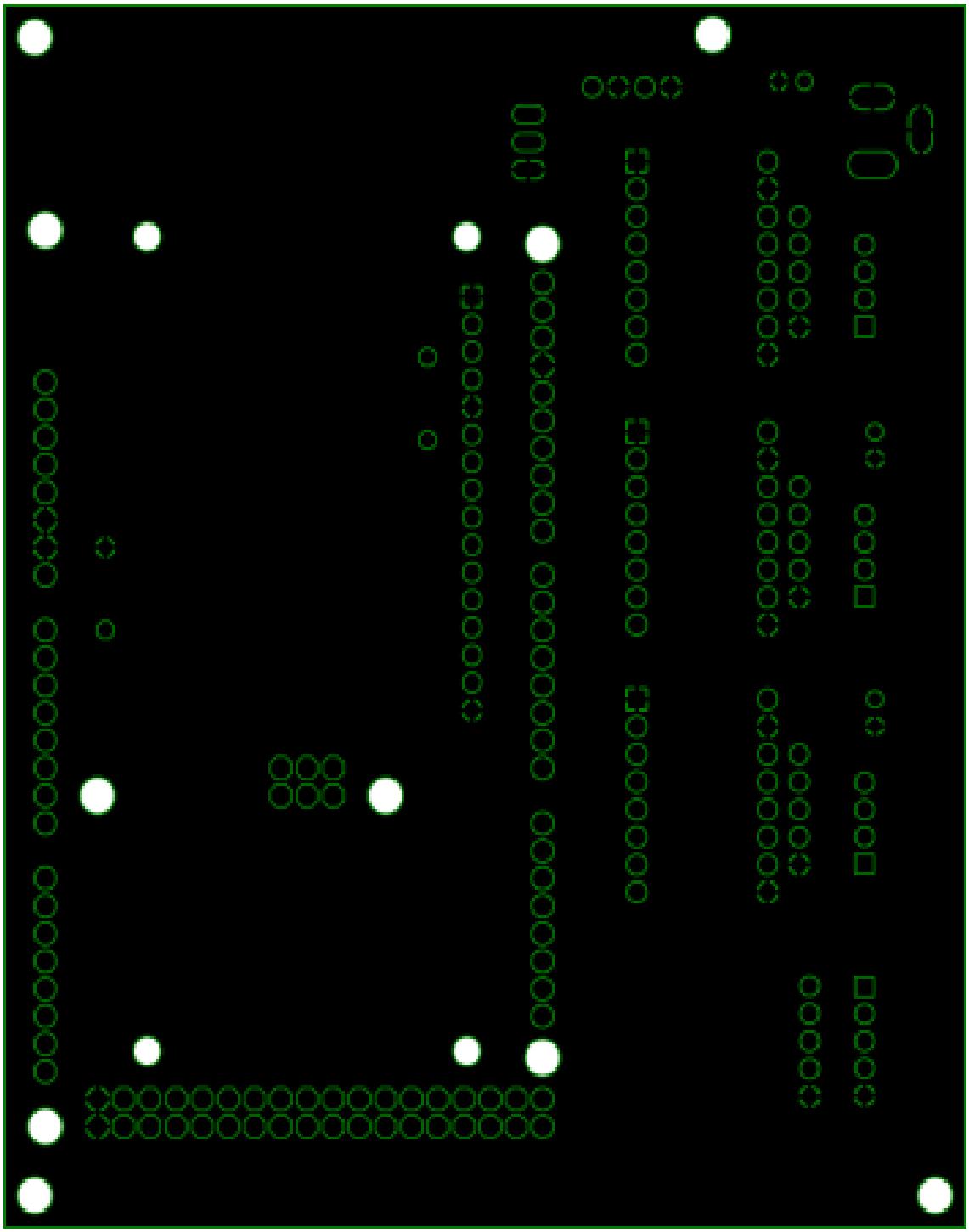

Figure 11: This is a rendering of the bottom copper layer on top of the board profile. This image was generated from the gerber files.

4.9 Bottom Soldermask

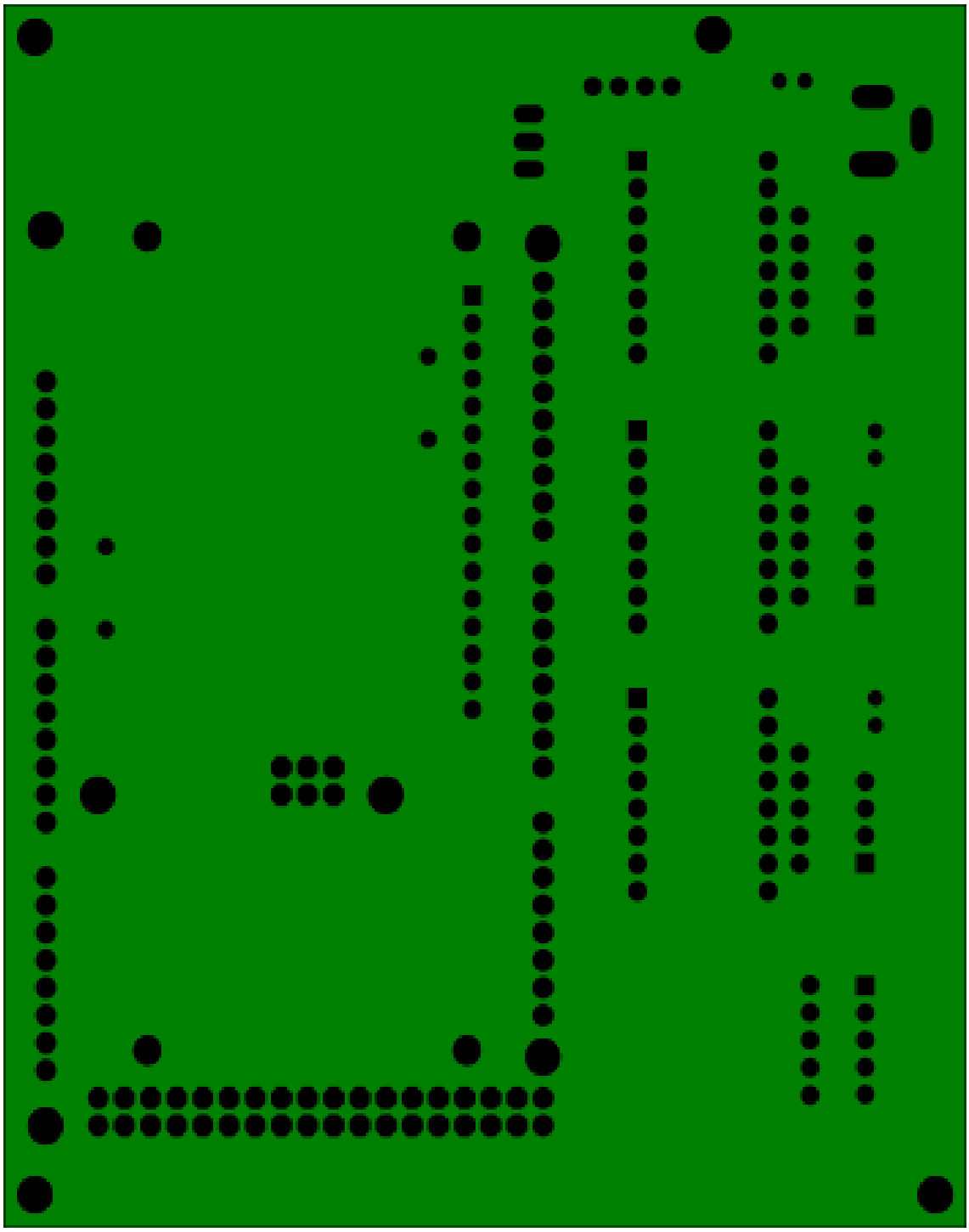

Figure 12: This is a rendering of the bottom soldermask layer on top of the board profile. This image was generated from the gerber files.

4.10 Bottom Soldermask and Silkscreen

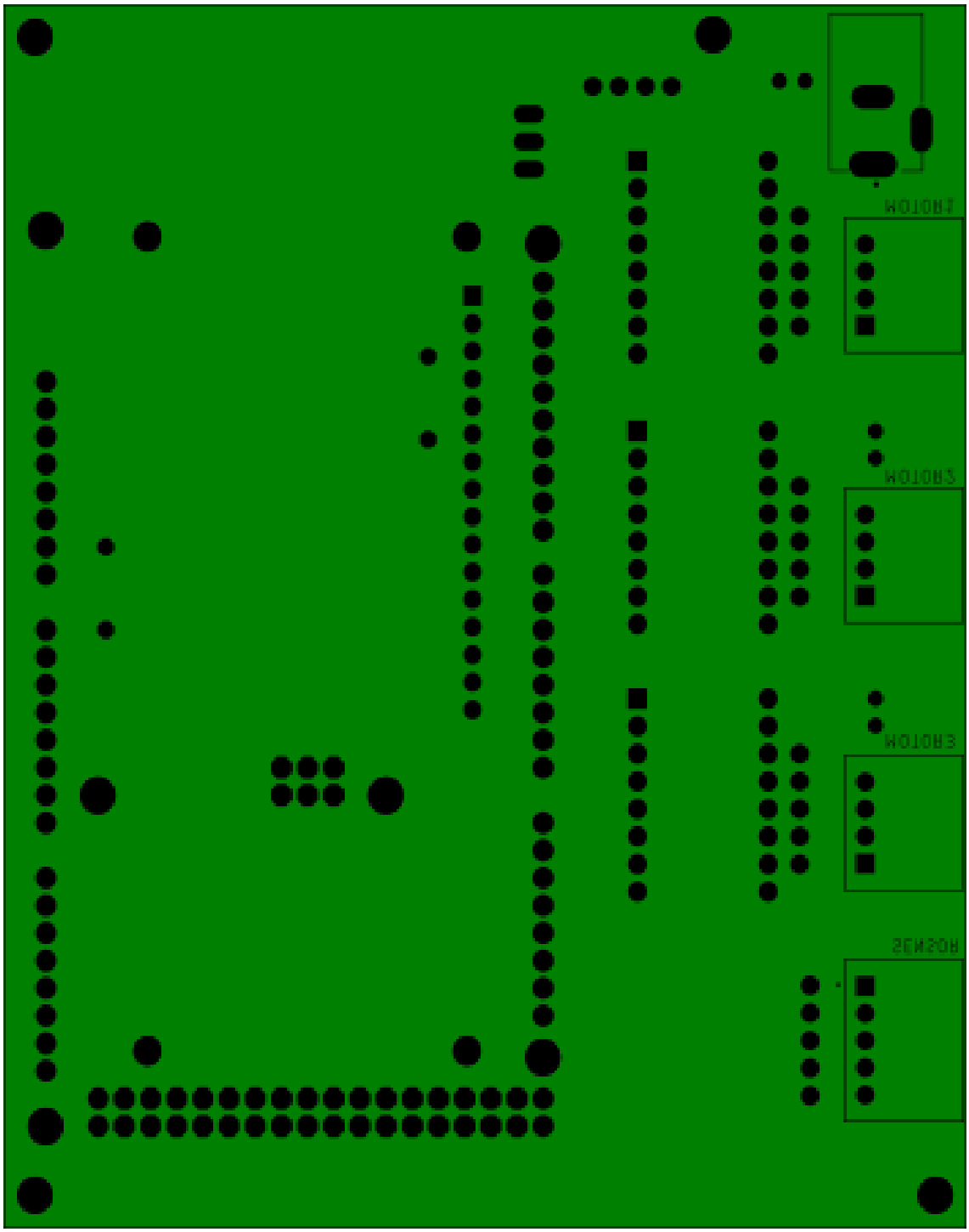

Figure 13: This is a rendering of the bottom soldermask and silkscreen layers on top of the board profile. This image was generated from the gerber files.

4.11 Top Gerbers

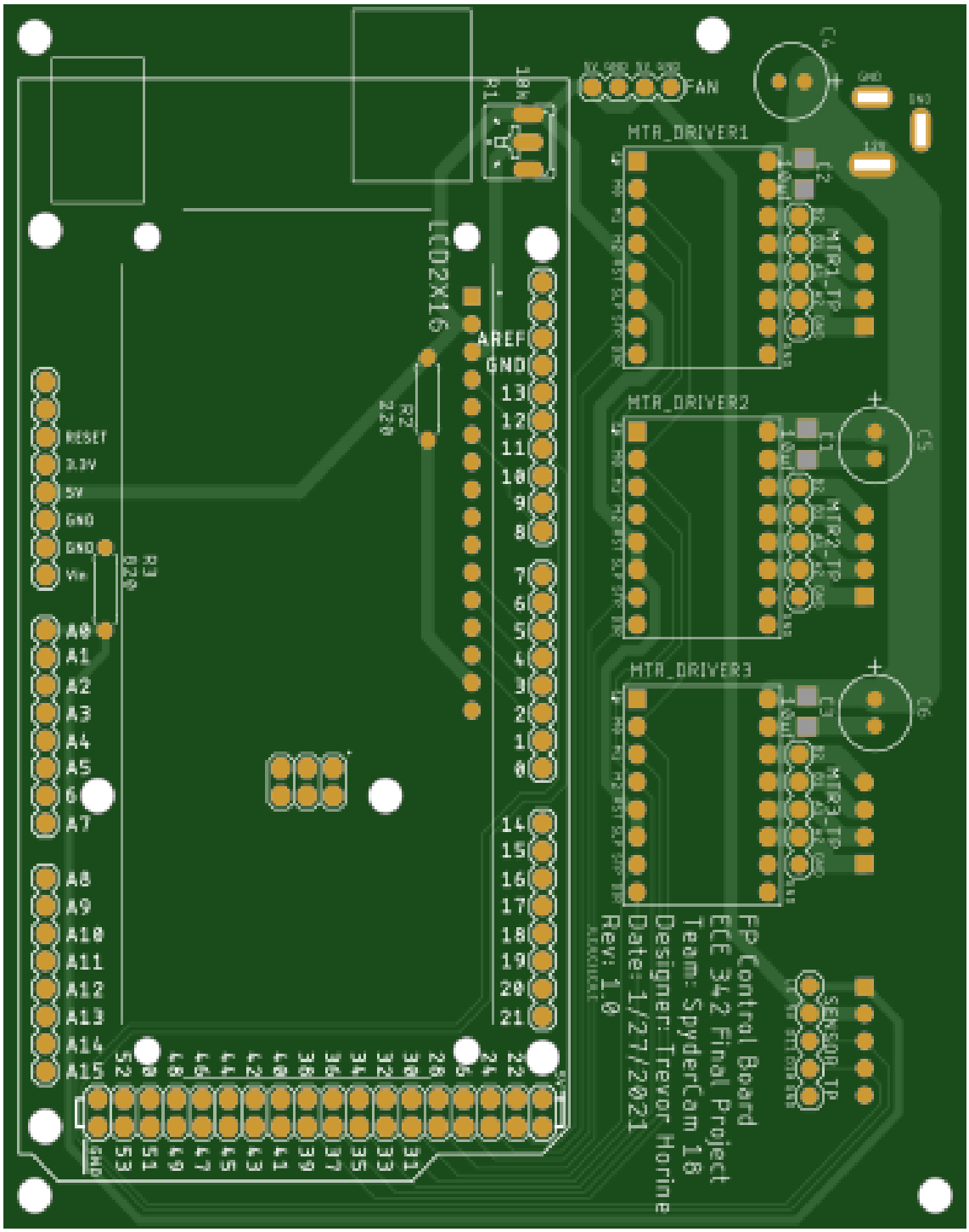

Figure 14: This is a rendering of the top layer gerber files placed on top of each other. The white is the text and lines are the silkscreen, the gold is the soldermask, light green is the copper traces, and gray is the solderpast. All of this is on top of the profile of the board or the darker green area, the black holes are holes in the board.

4.12 Bottom Gerbers

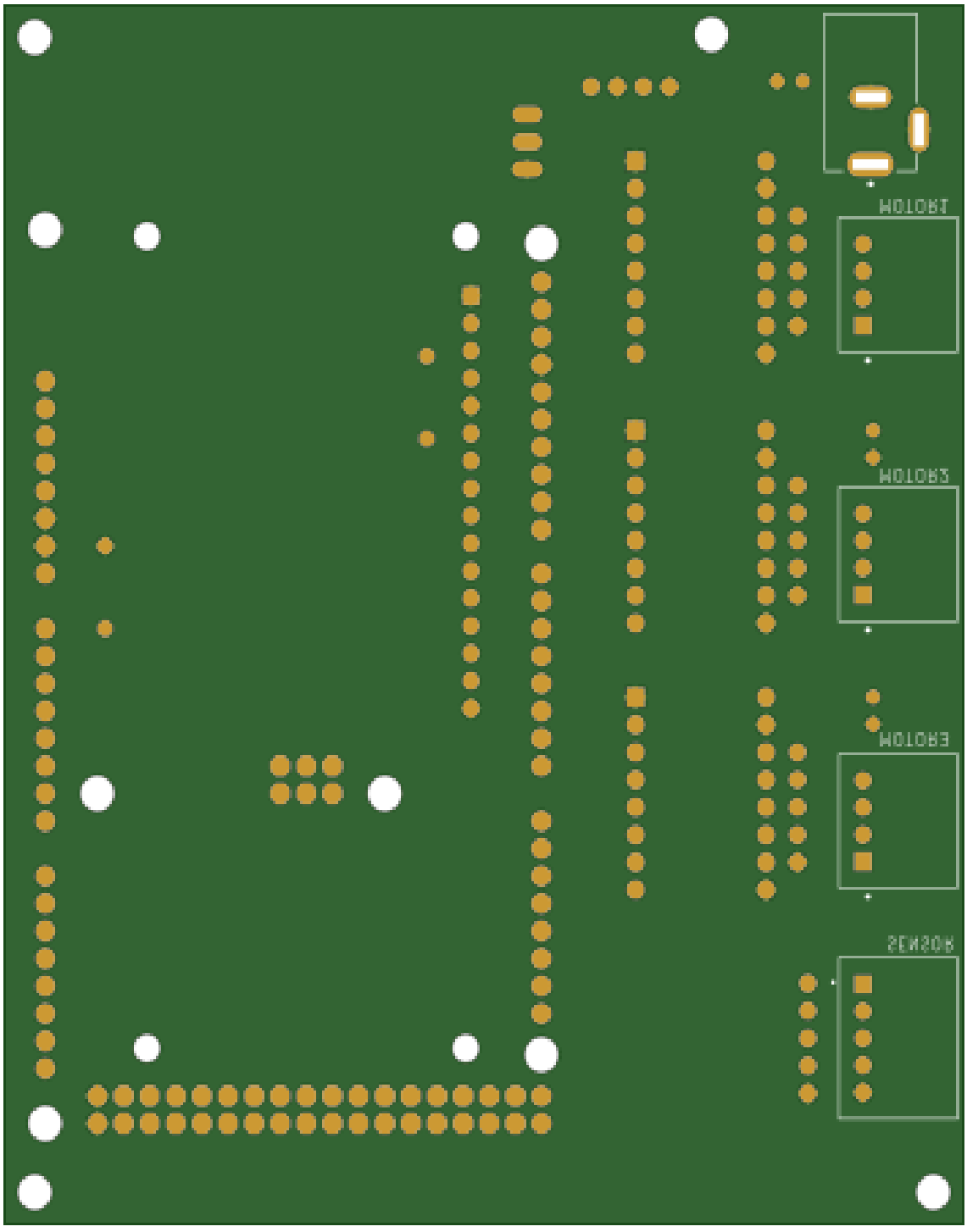

Figure 15: This is a rendering of the bottom layer gerber files placed on top of each other. This layer has no white silkscreen, the gold is the soldermask, light green is the copper traces, and there is no gray solderpast on this layer. All of this is placed on the profile of the board or the darker green area, the black holes are holes in the board. It may be hard to tell but the is only a little dark green around the soldermask and the edges of the board and holes because the bottom of this board is a copper ground plane.

4.13 3D Model

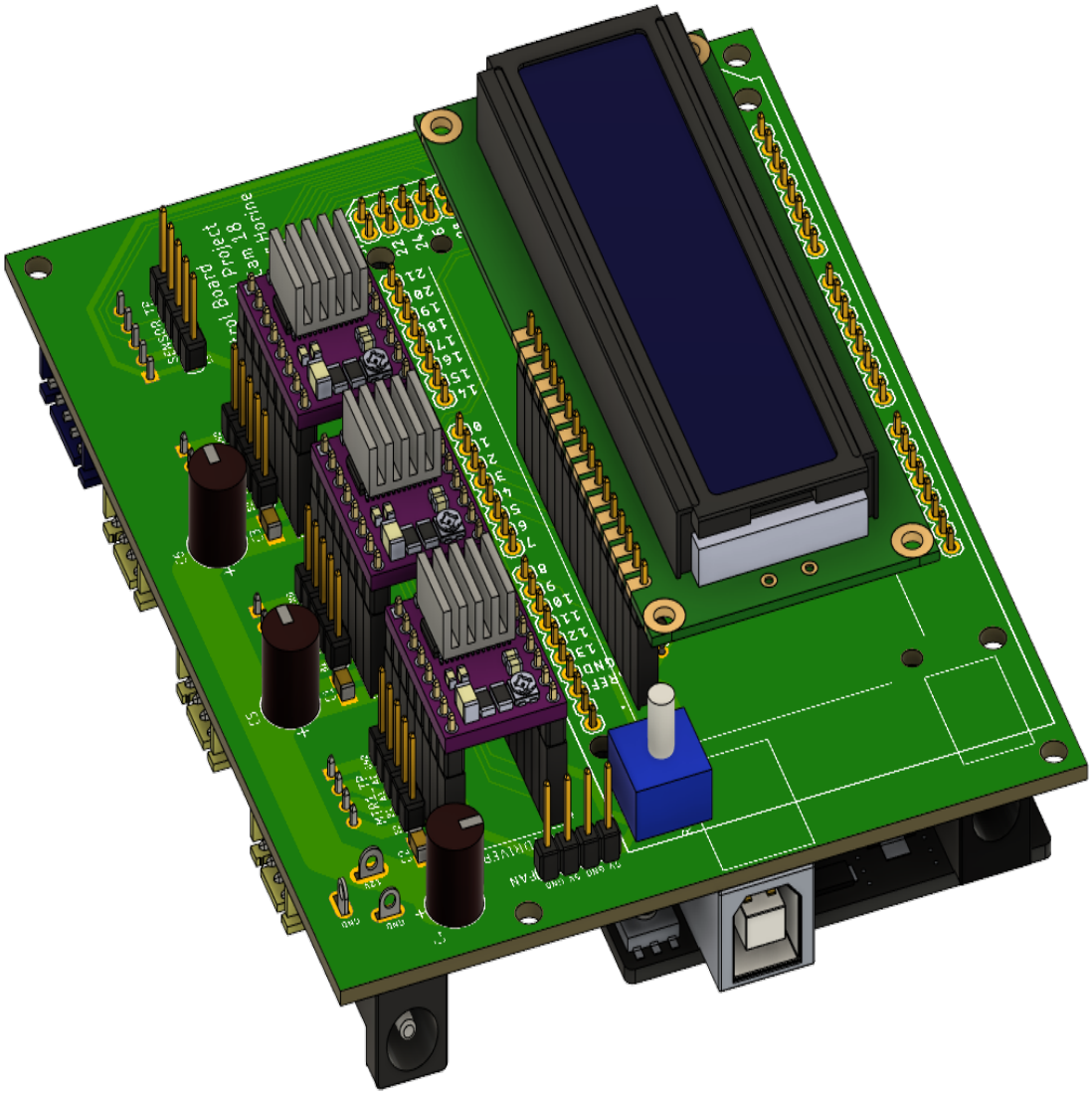

Figure 16: This is a rendering of the 3D model produced form the board designed with components added to give an idea of what the board will look like assembled. It will also be used to design the enclosure.

4.14 Assembled Board

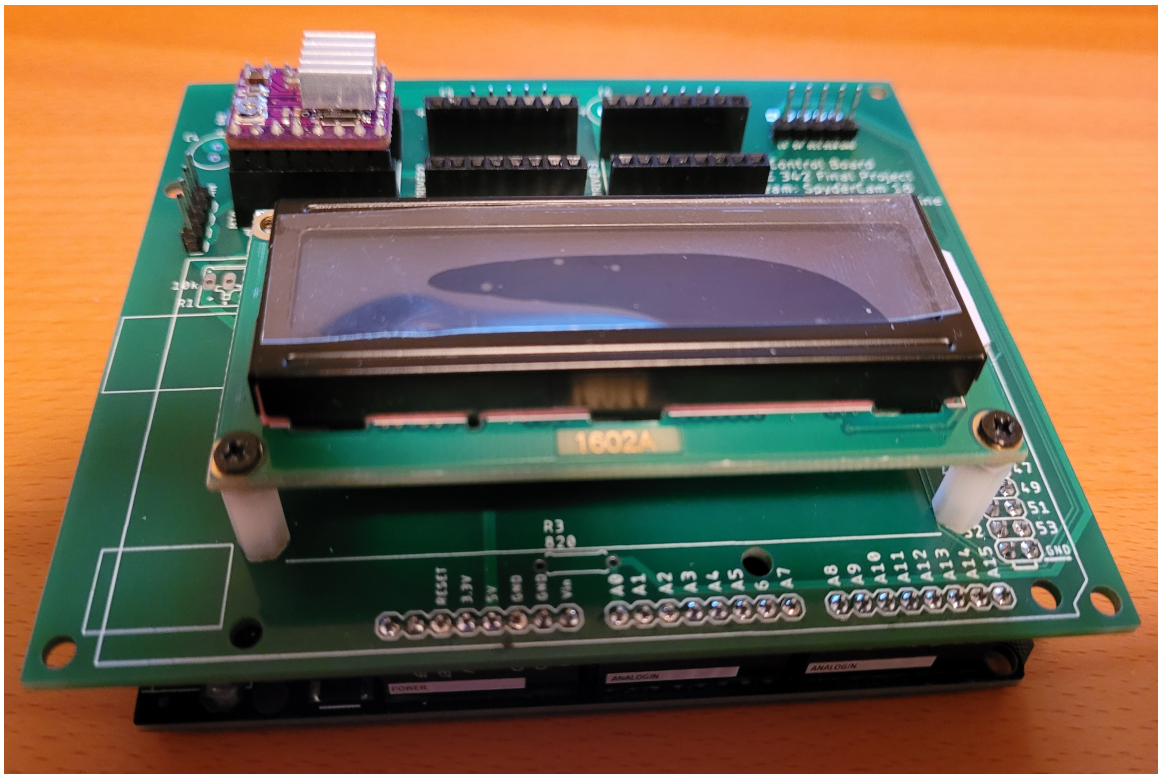

Figure 17: This is the board with some of the components added to it.

5 Block Bill of Materials

Part	Value and units	Board Name	Quaintity	Price per unit	Price	Datasheet	URL	Notes
PCBs								Boards have to be ordered in incriments of 5.
Stepper drivers		MTR_DRIVER1, MTR_DRIVER2, MTR_DRIVER3	3	1.998	5.994	https://reprapwor	https://www.ama	Datasheet was found for a board that appears to be same as there was not a datasheet on the amazon page. DRV8825 Chip data sheet
Pin Headers			150	0	0			Will use pin headers from previous classes 64 female, 86 male
Barrel Jack		J1	1	0.53	0.53	http://www.kycon	https://www.digil	Used to conect wall wart to board
LCD		LCD	1	3.25	3.25		https://www.ama	Used for debug and display
S5B-XH(LF)(SN)	Conector	Sensor	1	0.31	0.31	http://www.jst-mf	https://www.digil	Conector to attach light sensor and RFID 5 pin right angle conector
S4B-XH-A(LF)(SN)	Conector	MOTOR1, MOTOR2, MOTOR3	3	0.27	0.81	https://www.jst-m	https://www.digil	Conectors to attach motors to board each one is a 4 pin right angle conector
Arduino Mega 2560	Arduino		1	16.99	16.99		https://www.ama	Arduino, this is the brain
POTENTIOMETER	10k	R1	1	2.9	2.9	https://www.bour	https://www.digil	Used for contrast on LCD
Resistor	220	R2	1		0			Resistor for LCD
Resistor	820	R3	1		0			Resistor for voltage divider with photocell to measure light level
Capacitor	100µ	C4, C5, C6	3	0.23	0.69	http://www.rubyc	https://www.digil	Used on the 12 volt power source before the motor drivers to help with current draw
Capacitor	10µ	C1, C2,C3	3	0.22	0.66	https://media.digi	https://www.digil	Used on the 12 volt power source before the motor drivers to help with current draw. These may not be needed but pads were added so they could be added later if needed.
Fan	Fan	Fan	1	4	4		https://www.ama	40mmx40mmx10mm fan should it be needed to keep motor drivers from heating up to much.
					Total			
					36.134			

Figure 18: This is the bill of materials for the PCB, with links to datasheets, product pages. The bill of materials also lists component's values, name on board, quantities, costs, and other notes on each item. Bill of materials does not include cost of board production, but should be around 8 dollars and some shipping for 5 boards