

# **Electronics Online Challenge**

Raider Robotics - MSOE1  
Submission Date: 12/7/2020

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Ref #	Chip Identifier	Description	Documentation	Quantity
1	16126797 AU195 02		Not Found	1
2	24C04WQ K525W	I2C Bus EEPROM	Actual	2
3	37021 58M C66L		Not Found	1
4	37021 58MCD29		Not Found	2
5	431AV PAHF		Not Found	1
6	55 84 K0		Not Found	1
7	56A504M HCT04	Hex Inverter	Similar	2
8	56A5NLM HCT4051M	Demultiplexer	Actual	3
9	59A2VHM TLC2254	Op Amp	Actual	2
10	66C1HCM HCT4053M	Multiplexer	Similar	1
11	7438 543C G68V		Not Found	1
12	8L05A POIB8	Positive Voltage Regulator	Similar	2
13	A 7840 0611	Isolation Amplifier	Similar	4
14	A82C250 4R4T0 n5064		Not Found	1
15	BL05A POIB8		Not Found	2
16	CHAQ LMC64 82AIM	Operational Amplifier	Actual	1
17	CRLNLMG1 32B1M		Not Found	3
18	IR 2136S 0515	Three-phase MOSFET Driver	Actual	2
19	IRFP250N G3 DB	N-Channel Power MOSFET	Actual	12
20	K0204 FQA 70N15	N-Channel QFET MOSFET	Actual	1
21	K537 TOP414G 35721A	DC/DC PWM Switch	Actual	1
22	P185B MM74HCT 244WM	Octal 3-State Buffer	Actual	1
23	P56AB 98752		Not Found	1
24	PVI 1050 NS 0538I4N	Photovoltaic Isolator	Actual	1
25	TMS 320LF2406APZA	DSP Controller	Not Found	1

## 1. Introduction

For this challenge, we chose to disassemble a Segway i2 SE PT. One of our teammates obtained the Segway in non-working condition and is currently trying to rebuild the electronics to add features to the device. We decided that this challenge would provide an excellent opportunity for us to gain a much better understanding to the proprietary systems inside of the device, and understand the engineering that makes the devices as robust as they are.

## 2. Component Summary

## 3. Findings

The Segway contains two main processing boards, which are identical mirrors. The processing board was originally covered in a waterproof conformal coating to protect the electronics,

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which we removed selectively. We found an array of chips and other components, and will attempt to classify them according to documentation for the component, or similar components with the same package type and similar IDs.

While there is little documentation about the internals and processing systems of the Segway device, we found groupings of similar components around specific parts of the board.

Talk about the importance of the components in the system.

### 3.1. Battery Connector Proximity

Signal processing components were found surrounding the battery connector on the bottom of the board. There are three demultiplexer chips (Ref # 8) surrounding the connector, which has four primary power pins and eight signal pins (staggered pattern above and below). We have found some documentation for handling the I2C communications being sent from the batteries, and we assume these demultiplexers are used to decode this data for use on the board.

## 4. Conclusion

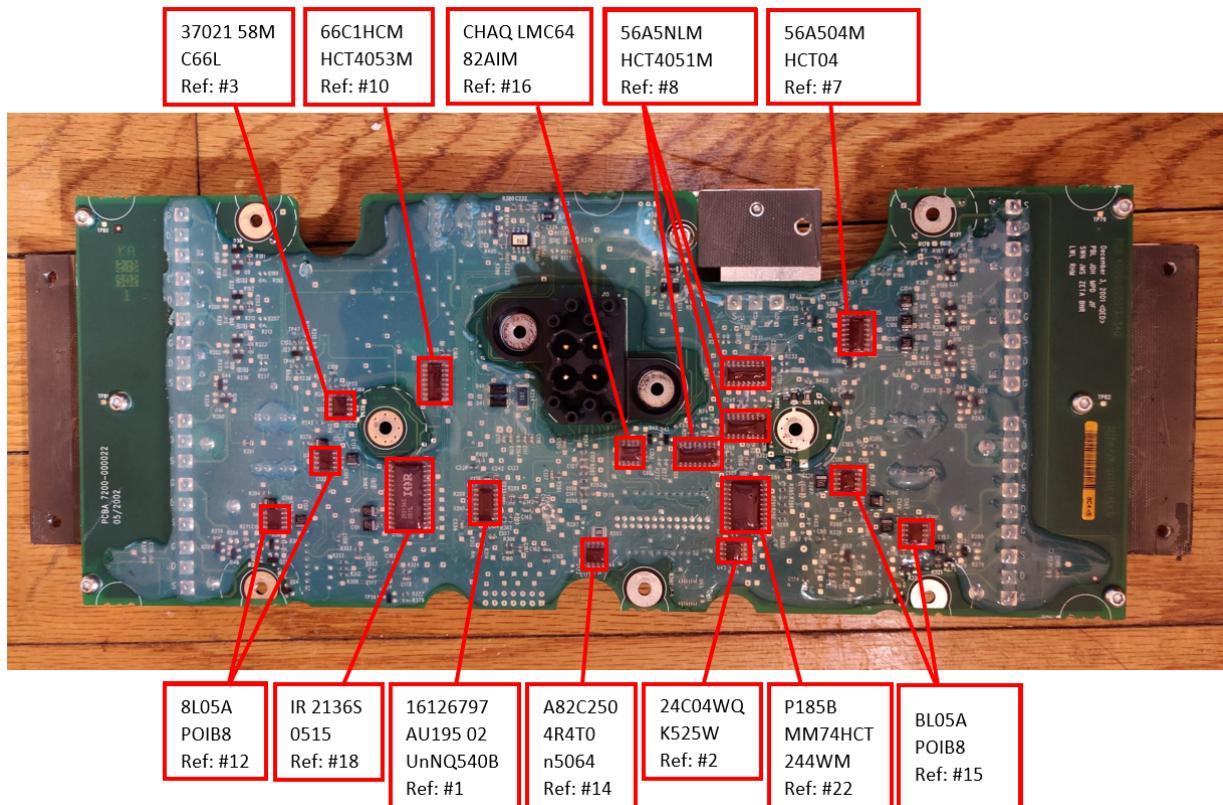


Figure 1: caption

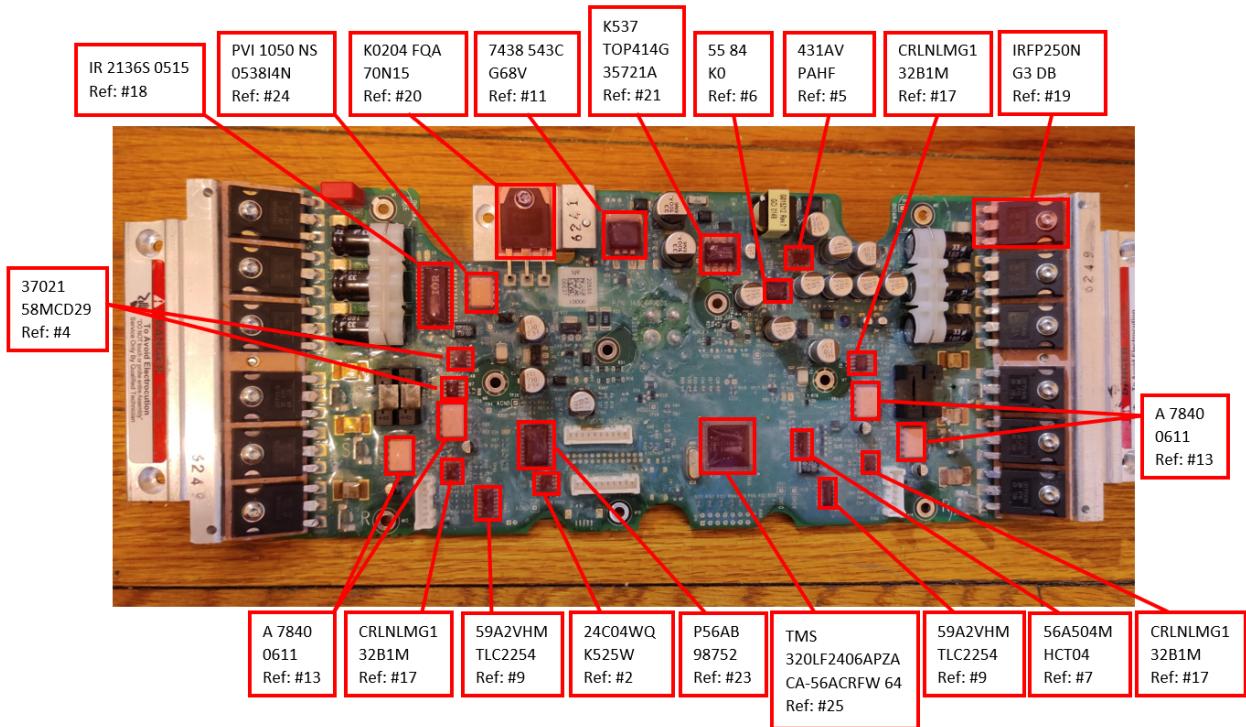


Figure 2: caption



Figure 3: caption

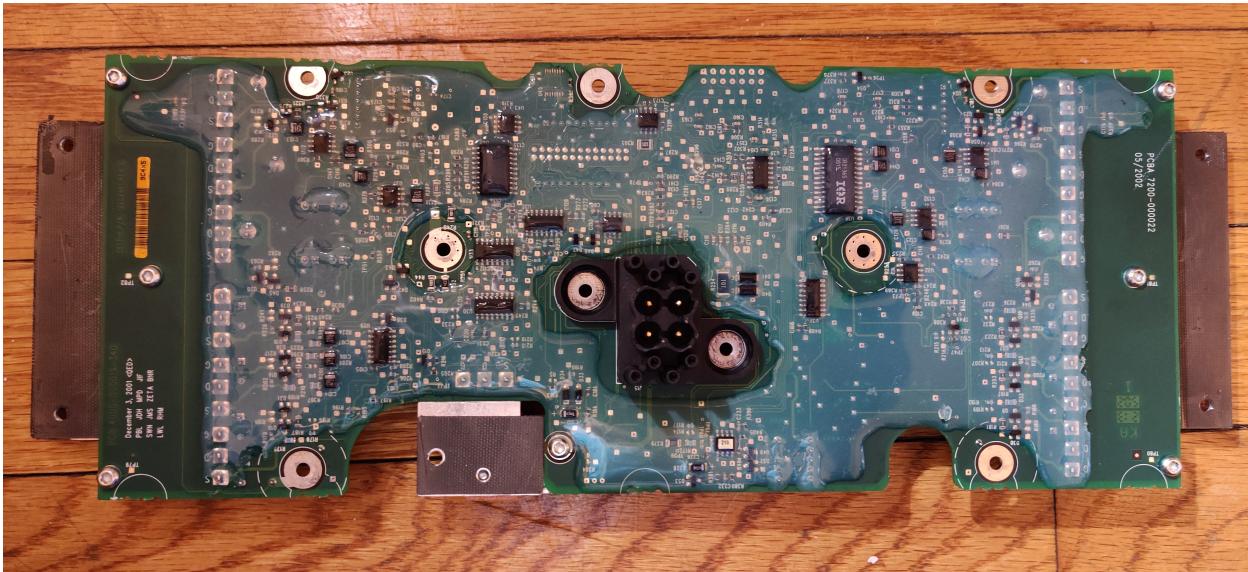


Figure 4: caption

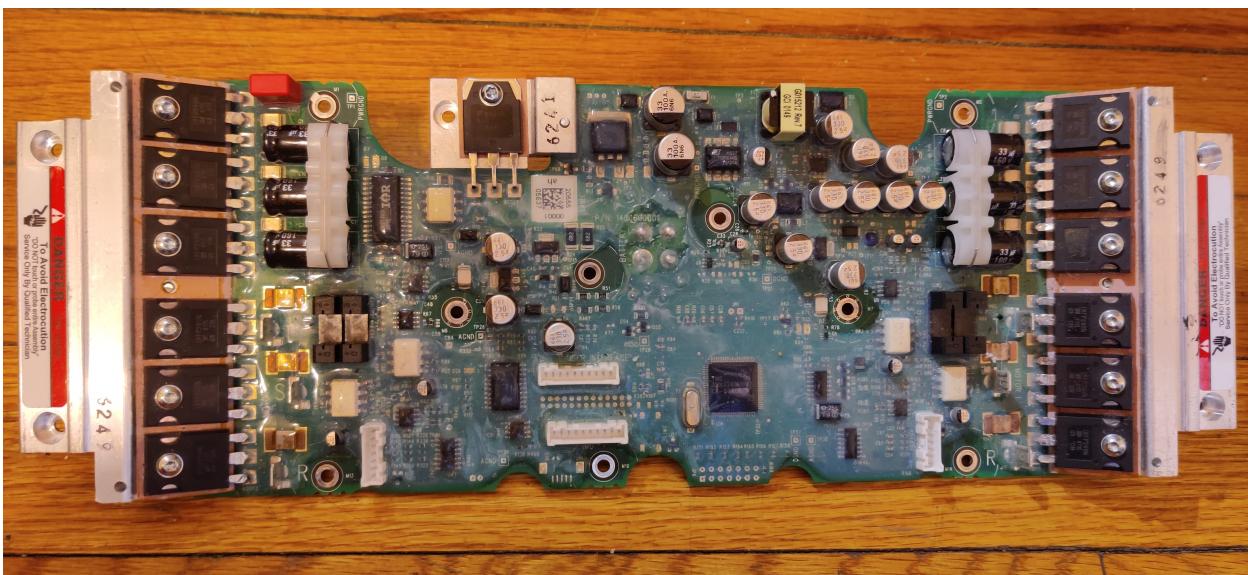


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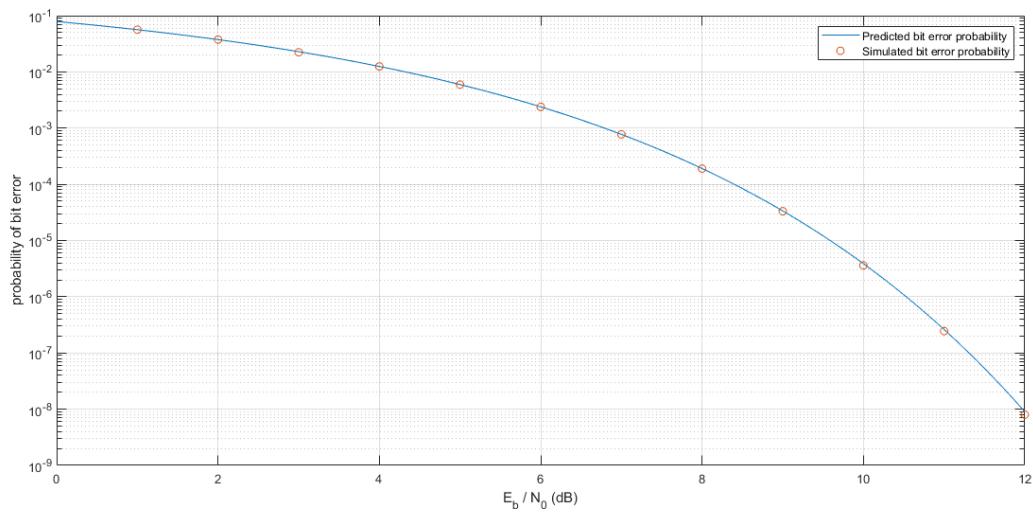


Figure 6: caption



Figure 7: caption



Figure 8: caption

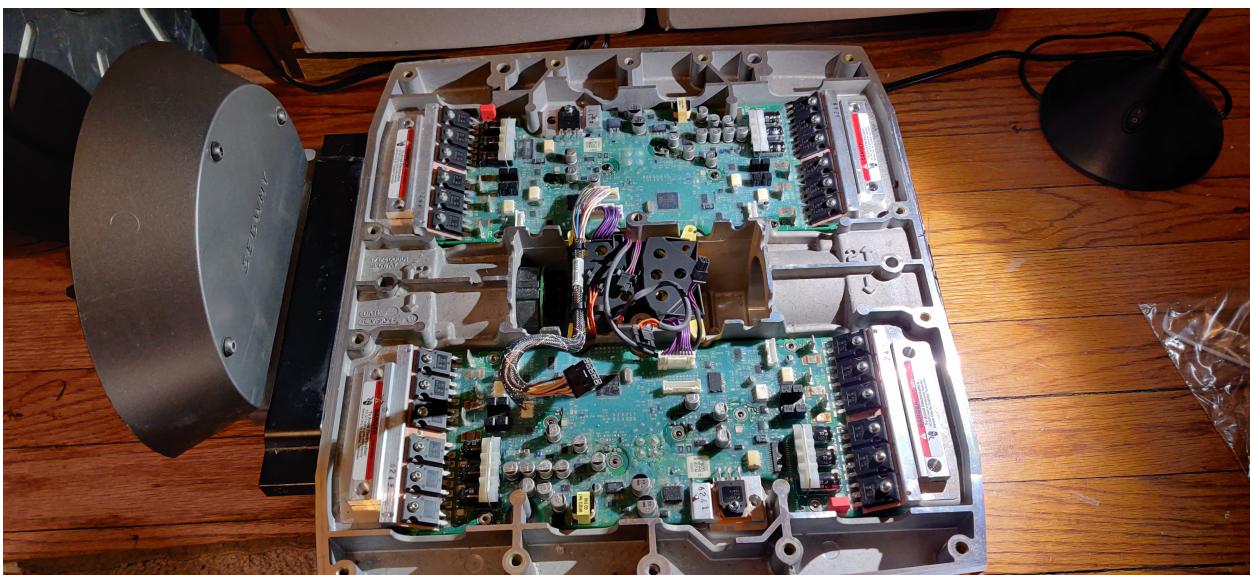


Figure 9: caption

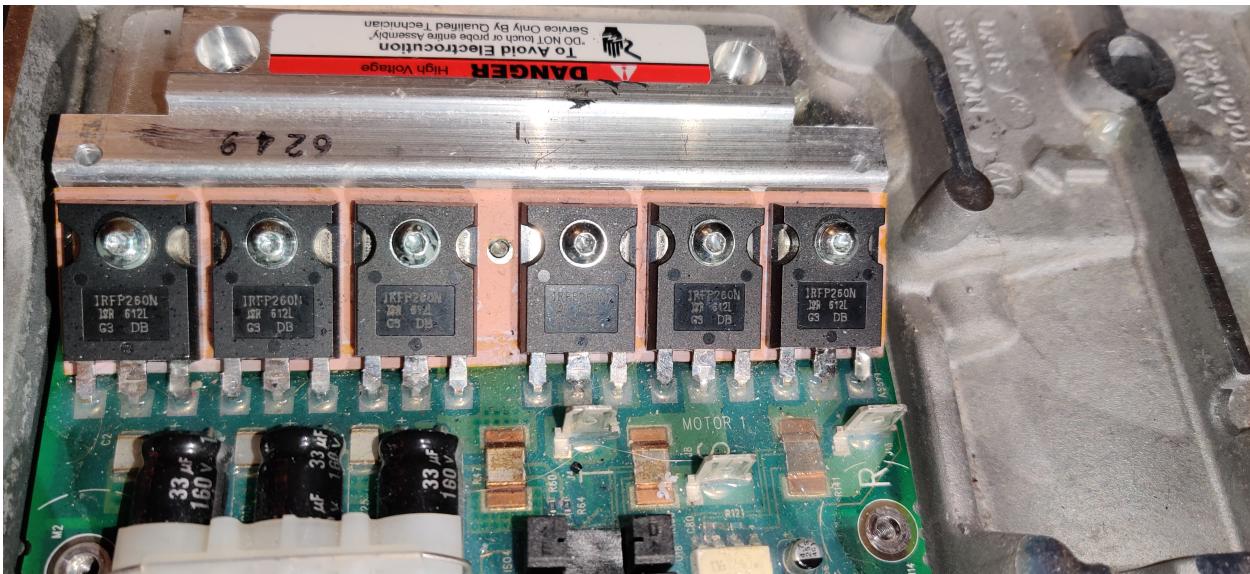


Figure 10: caption

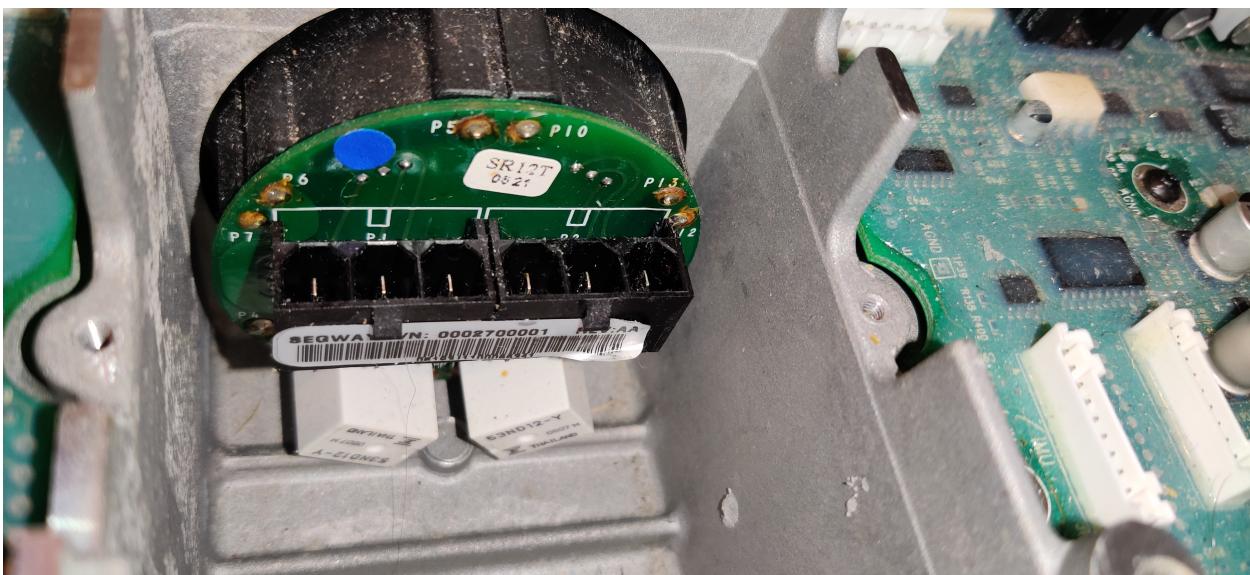


Figure 11: caption

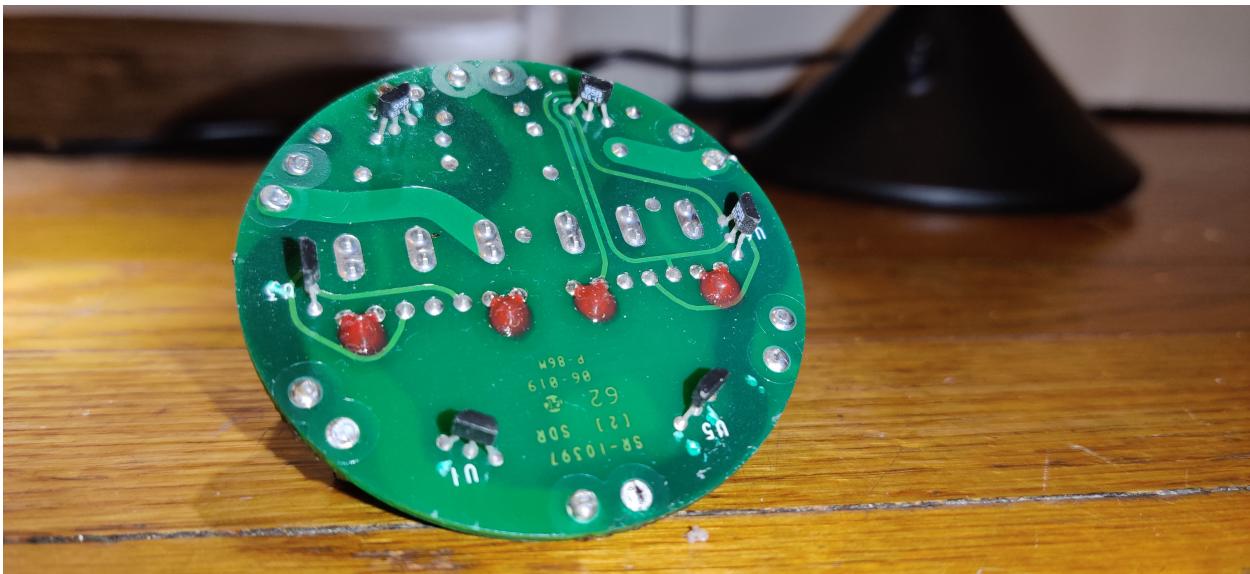


Figure 12: caption



Figure 13: caption



Figure 14: caption



Figure 15: caption