**Electronics I Lab Couse Project**

**Keegan** **Smith**

**Electronics** 1 Lab

**EECE.3110**

**Date submitte**d 04/25/2022

**Due date** 04/25/2022

**Components**

|  |  |  |
| --- | --- | --- |
| **Component Type** | **Quantity** | **Details** |
| Transistor | 2 | 2N7000 |
| Operational Amplifier | 1 | LF353 |
| Zener Diode | 1 | 1N4733 |
| LED | 1 | Red |
| Resistor | 1 | 5k |
| Resistor | 1 | 15k |
| Resistor | 1 | 20k |
| Resistor | 1 | 50k |

**Schematic**

**Chart

Description automatically generated**

**Circuit Description**

This circuit uses at least one of the three major components that have been covered in class, the MOSFET, Op-amp, and diodes. The circuit uses the MOSFETs like a key, both need to be turned on for the higher voltage to pass through to the rest of the circuit. Following the FETs trace, a Zener diode is placed in reverse biased. The Zener voltage of this particular diode is 5.1 volts, only allowing around 2.5 volts to pass through to the LED, protecting it from the larger voltage. The FETs are controlled by the two operational amplifiers set up as comparators. The input voltage of each travel from a voltage divider between the two input resistors of the op-amp. Each amp has different comparing voltages, 1.4 and 1.2 volts as seen on the schematic. The issue with this design lies within the comparators and the voltage dividers. The “key” to this “code checker” is that the voltage dividers create a ratio (eq 1) so, as long as the output from the divider is greater than 1.4v on the left, and 1.2v on the right, the op-amps will turn on the transistors and light the LED (see the comparator table for more details).

Vout = V1 (eq. 1)

Comparator Table U1 (VS + = 14v, VS - = -1)

|  |  |  |  |
| --- | --- | --- | --- |
| Vin + | | Vin - | Vout |
| Vin + | > | 1.4 | 14 |
| Vin + | < | 1.4 | -1v |
| Vin + | = | 1.4 | 0\*\* |

\*\* Not actually possible because the voltages are never equal in a practical application

**References/Datasheets**

1. Diodes inc. (1n4742a-t) zener diode do-41 1w 12v rohs. Retrieved from <https://www.jameco.com/jameco/products/prodds/1538081.pdf>
2. Wide bandwidth dual JFET operational amplifiers. ST Electronics. Retrieved from https://www.st.com/content/ccc/resource/technical/document/datasheet/34/f6/2b/8b/3e/cf/44/b8/CD00000454.pdf/files/CD00000454.pdf/jcr:content/translations/en.CD00000454.pdf