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**Declaration**

I declare that all material in this assessment is my own work except where there is clear acknowledgment and appropriate reference to the work of others.

Signed: Abdulbasit

Date: 07/03/2022

**Introduction**

The aim of this project is to create a fluid sensor with a couple of components neatly soldiered on a stripboard and test it by putting the sensor probes in water.

**Components**

* 10kΩ resistor
* 10MΩ resistor
* 220Ω resistor
* Stripboard
* 22.2nF capacitor
* 3.3nF capacitor x2
* Diode x2
* Led red
* Nand chip/ trigger

**Building Process**

I started by simulating the circuit on ISIS proteus using animated capacitors to see how the capacitor charges and discharges when the sensor probes senses fluid

Chart, box and whisker chart

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Figure 1. ISIS proteus simulation of the sensor probes being disconnected

Chart, box and whisker chart

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Figure 2, ISIS proteus simulation of the sensor probes sensing fluid

As seen in Figure 1 while the fluid sensor is waiting to sense water, capacitors C2 and C3 are all charged up and the LED is off and as the sensor probe senses fluid as seen in figure 2, the capacitors C2 and C3 are immediately discharged, and the trigger immediately switches on the LED.

After understanding how the circuit works I went ahead to design the circuit on a stripboard using the DIY layout tool.

Diagram

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Figure 3. A stripboard design of the fluid sensor circuit

Figure 3 shows the stripboard design for the fluid sensor I made sure there was space for the 4093 IC not to be overcrowded at the same time ensuring minimum use of space keeping it simple and compact, I then used the pinout diagram in Figure 4 to assign legs to the triggers.

Graphical user interface, application

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Figure 4. Pinout diagram for the 4093 IC

After designing the stripboard layout, I went on to set up the circuit on a breadboard and made sure everything worked well as shown in Figure 5 and when I was satisfied with the result I started soldering the components onto a stripboard following the design exactly how it is in Figure 3. The Soldered circuit can be seen in Figure 6.

Diagram

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Figure 5. The fluid sensor built on a breadboard

A picture containing basket, container

Description automatically generated A circuit board with wires

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Figure 6. Back view of the stripboard Figure 7. Front view of the stripboard

**Test and Result**

After building the circuit, I performed two tests on it. Firstly, by using my hands, I touched one of the probes with my right hand and the other with my left, and the light turned on every time I put both hands on the probes and off every time I release any of the probes or both of them.

The second test was performed by putting the probes in a bowl of water. The LED came on every time both probes were in the water and off otherwise. I then tried to check if the distance between the probes is a factor that affects it but that wasn’t the case, the fluid sensor worked perfectly while the probes were at any distance between them in the water.

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Figure 8, Testing the circuit with water Figure 9. Removing the probes from water

**Conclusion**

After building and testing the circuit, I found out that the fluid sensor is a capacitive fluid sensor which means the fluid sensor is based on the principle of a capacitor using the best characteristic of a capacitor, that is the quick charge and quick discharge attribute of a capacitor. When the current passes through the capacitor at each probe the capacitors stores the charges and wait for the probes to sense fluid, then discharge quickly as soon as the fluid is sensed the capacitors discharge and the trigger acts as an instantaneous switch turning on the LED.

**References**

* "File:4093 Pinout.svg - Wikimedia Commons." 15 Dec. 2020, <https://commons.wikimedia.org/wiki/File:4093_Pinout.svg>.
* "Capacitive Fluid Level Sensor - Instructables." <https://www.instructables.com/Capacitive-Fluid-Level-Sensor/>.