KEC-554

MINOR PROJECT REPORT

On
COMPONENT TESTER

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In

Electronics and Communication Engineering

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CERTIFICATE

Certified that Mohit Tiwari, Kartik Gour, Mohit Singh have carried out the Minor project work presented in this report entitled "COMPONENT TESTER" for the award of Batchlor of Technology in Electronics and Communication Engineering during the Academic session of 2023-24 from Dr. A.P.J. Abdul Kalam Technical University (Formerly U.P.T.U), Lucknow on subject of Minor Project (KEC-554). The project embodies result of the work and studies carried out by Student himself and the contents of the report do not form the basis for the award of any other degree to the candidate or to anybody else.

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LIST OF SYMBOLS, ABBREVIATION

A	Ampere
Ω	Ohm
V	Voltage
L.E.D	Light emitting diode

ABSTRACT

The component tester used to check if electronic components used in projects are functional or not.

This project used small and low-cost components to build a system that detects the defected components in laboratories and electronics shops. It consists of PC application, USB Cable, Arduino Mega 2560, sockets and PCB board.

The component tester is built by connecting Arduino Mega microcontroller with components sockets, each component has a special socket to test it on board, the PC application is connected to Arduino Mega via USB cable to make it work as the interface allowing user to choose specific component and show the user the steps to connect a component to the tester and show the result of testing.

At the end of the project, it has achieved all its objectives and implement components tester based on Arduino Mega, using PC application as interfaces to provide the easiest environment for the user and giving the opportunity to choose specific components to test, also it is expected to produce a business product that can be supplied to electronic stores and electrical/electronic labs in universities.

CHAPTER-1

INTRODUCTION

1.1 OVERVIEW

Electronic components /modules are used in almost all electronic projects, which are used today. Projects can contain different types of components on it like (display units, input units, sensors, motors and jumper wires). Before implementing a design and connecting electronic components to any designed systems itis a must to ensure that these components are functional and because most of the components in the market are not guaranteed or may be damaged after using it. There must be a device to verify these components easily, in addition some components need a special testing circuit and to write a program and upload it to a microcontroller to check whether it works or not. That makes us think deeply to work on this idea which can solve all these problems using low cost and obtainable

elements.

1.2 Basics of all-in-one tester

An all-in-one component tester is a versatile device designed to test and identify various electronic components quickly. These testers are handy for electronics enthusiasts, hobbyists, and professionals working with electronic circuits. They typically provide a straightforward way to check the functionality and characteristics of components like resistors, capacitors, and transistors. Here's an overview of the key features and functionalities of an all-in-one component tester. Capable of testing a variety of components, including resistors, capacitors, inductors, diodes, transistors, and more.

CHAPTER – 2

CIRCUIT DIAGRAM AND WORKING

2.1 Introduction

The A component tester is a device used to test electronics component such as resistors, capacitors and transistors. It helps identify faults or out-of-spec components in a circuit. Creating an all-in-one component tester with the help of a transistor is a classic approach. One popular design is the "Curve Tracer," which utilizes a transistor (often a NPN like 2N3904) to generate characteristic curves for different electronic components such as resistors, capacitors, and transistors. This kind of tester is useful for both testing and visualizing the characteristics of components.

2.2 Circuit Diagram

Here is the circuit diagram of all-in-one tester using transistor bc547

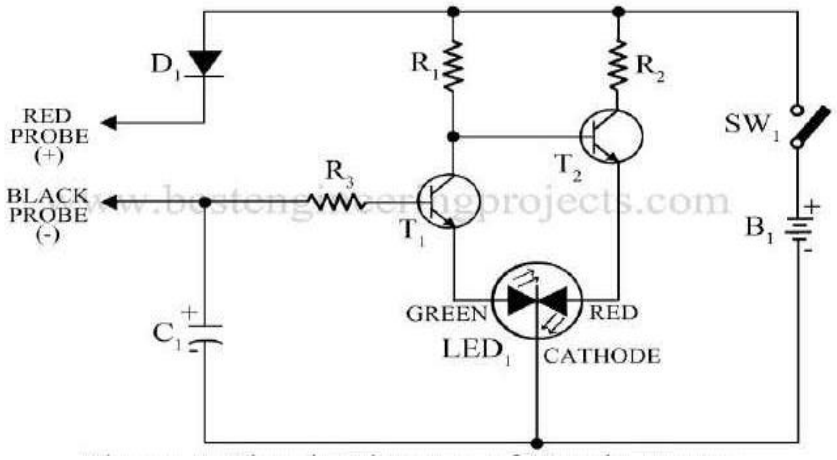

fig 2.4 All in one tester circuit

2.3 Construction of the circuit:

In the diagram Q1, Q2... are transistors with an arrow showing emitter All the emitters are connected to -ve terminal of the battery and all the collectors are connected to LED (except 4th which is connected to the buzzer) via 220Ω resistor. The base of all the transistors is dipped into the water via a 220Ω resistor. The 4th transistor is used to power the buzzer when the water level rises to its sensor.

2.4 Working of All-in-one Tester:

The NPN transistor is used as a variable current source. The operational amplifier is used to generate a stable voltage reference. By connecting different components to the test points, you can observe the characteristic curves on an oscilloscope or visualize them using an LED indicator.

Variable Current Source (Transistor): A transistor (often a NPN transistor like 2N3904) is configured as a variable current source in a common collector configuration. The base of the transistor is connected to a potentiometer (R1), allowing adjustment of the base current. The tester provides test points where various electronic components (resistors, capacitors, etc.) can be connected. Adjustable Current Through Transistor: Adjusting the potentiometer (R1) changes the base current of the transistor, resulting in a variable current through the test component. Measurement and Visualization: The characteristics of the component under test (such as voltage across it and current through it) can be visualized using an oscilloscope or other measurement devices. For example, connecting a resistor will display a linear relationship between voltage and current, while a capacitor may show a charging or discharging curve. Indicator (LED): An LED may be used as an indicator to show whether the component is

connected correctly or if there's an issue with the test. Components and Adjustments: Potentiometer (R1): Adjusting R1 controls the base current of the transistor, allowing the user to set the desired test current. Operational Amplifier (Op-Amp): Provides a stable voltage reference, ensuring accurate and consistent measurements. Transistor (NPN): Acts as a variable current source for testing components. LED Indicator: Helps visually confirm the correct connection of the component and may indicate when the test is ongoing.

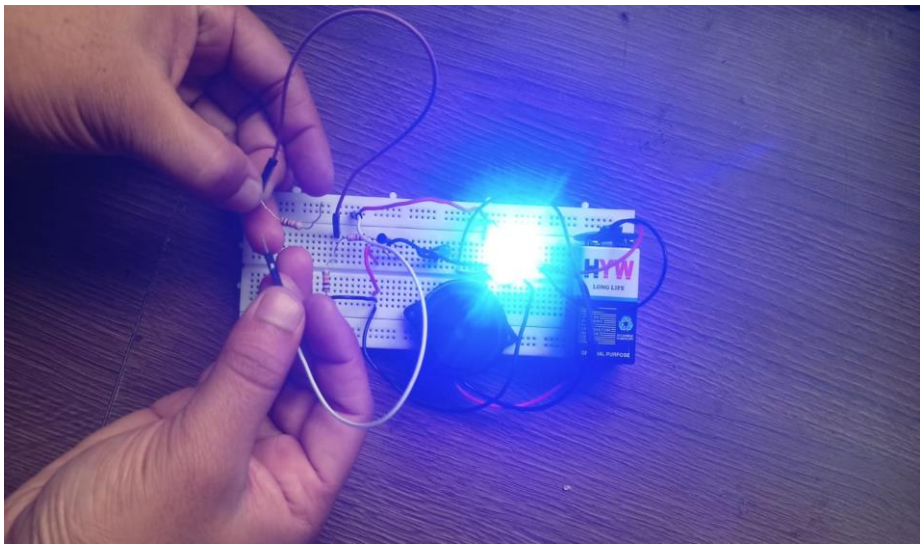

Fig 2.5 Working of Component Tester

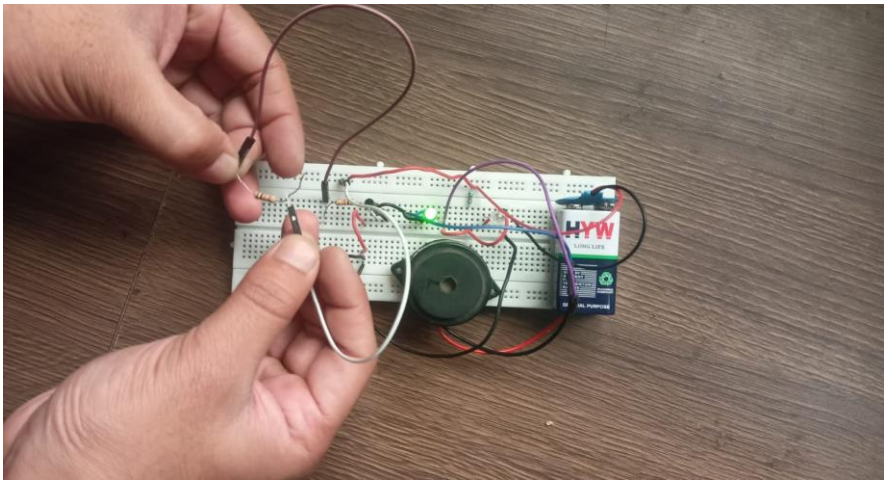

Fig 2.5 Working of Component Tester

CHAPTER – 3

DESIGN SPECIFICATIONS AND COMPONENT DESCRIPTION

3.1 Components Required for Water Level Indicator Circuit

1– Buzzer

2- Color LEDs - red, green, and

3 -PCB (Printed circuit board)

4 - BC547 transistors

5- 9v battery + battery clip

6- 220-ohm resistors

7 – Single stranded wires

3.2 Description of components

3.2.1 Resistor

Figure 3.1 Three Resistors

A resistor is a two-terminal electronic component that produces a voltage across its terminals that is proportional to the electric current through it in accordance with Ohm's law: V = IR

Resistors are elements of electrical networks and electronic circuits and are ubiquitous in most electronic equipment. Practical resistors can be made of various compounds and films, as well as resistance wire (wire made of a high-resistivity alloy, such as nickel/chrome). The primary characteristics of a resistor are the resistance, the tolerance, maximum working voltage and the power rating. Other characteristics include temperature coefficient, noise, and inductance. Less well-known is critical resistance, the value below which power dissipation limits the maximum permitted current flow, and above which the limit is applied voltage. Critical resistance depends upon the materials constituting the resistor as well as its physical dimensions; it's determined by design. Resistors can be integrated into hybrid and printed circuits, as well as integrated circuits. Size and position of leads (or terminals) are relevant to equipment designers; resistors must be physically large enough not to overheat when dissipating their power.

3.2.2 Battery

Batteries are chemical devices that convert stored chemical energy into useful electrical energy.

Fig 3.2 Battery

3.2.3 PCB (printed circuit board):

What is PCB?

A printed circuit board (PCB) mechanically supports and electrically connects electronic components using conductive tracks, pads and other features etched from copper sheets laminated onto a non-conductive substrate.

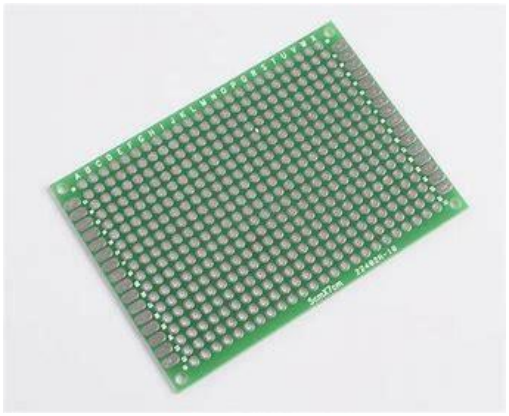

Fig 3.3 PCB Printed Circuit Board

3.2.4 Transistor

Transistor is a device which is used for amplification or switching of electrical signals.

Here we are using an NPN bipolar junction transistor (BJT) bc547. It has three terminals,

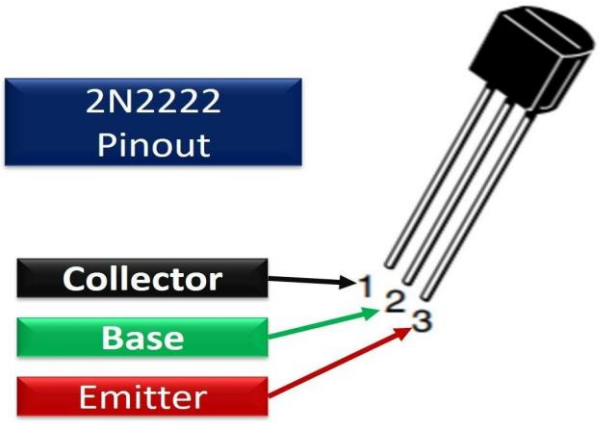

Fig 3.4: Transistor

1 - Emitter

2 - Base

3-Collector

When we connect emitter and collector of a BJT transistor to negative potential (-) and apply a positive potential to base, current starts flowing from collector to emitter via base if we remove the positive potential from the base then current also stops flowing.

So, when a signal is applied at the base the transistor acts as a closed switch and when no signal is applied it acts as an open switch. Here a fraction of current (<2% of total current) must flow through the base if it does not then it will not work.

Due to some dissolved mineral and impurities water has some conductivity due to which a very small amount of current (in micro-Amperes) flows through it.

To start with your water level indicator mini project, you should have the following components and tools.

3.2.5 Breadboard

A breadboard is used to make up temporary circuits for testing or to try out an idea. No soldering is required so it is easy to change connections and replace components. Parts are not damaged and can be re-used afterwards.

Almost all the Electronics Club website projects started life on a breadboard to check that the circuit worked as intended. The photograph shows a typical small breadboard which is suitable for beginners building simple circuits with one or two ICs (chips).

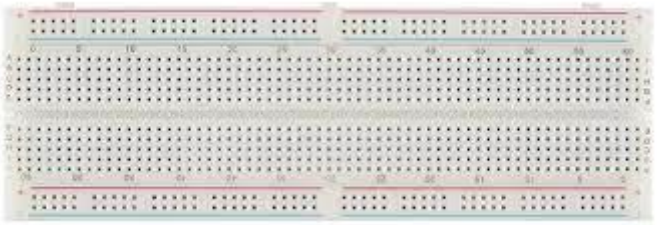

Fig 3.5: Breadboard

CHAPTER-4

Schematic Diagram

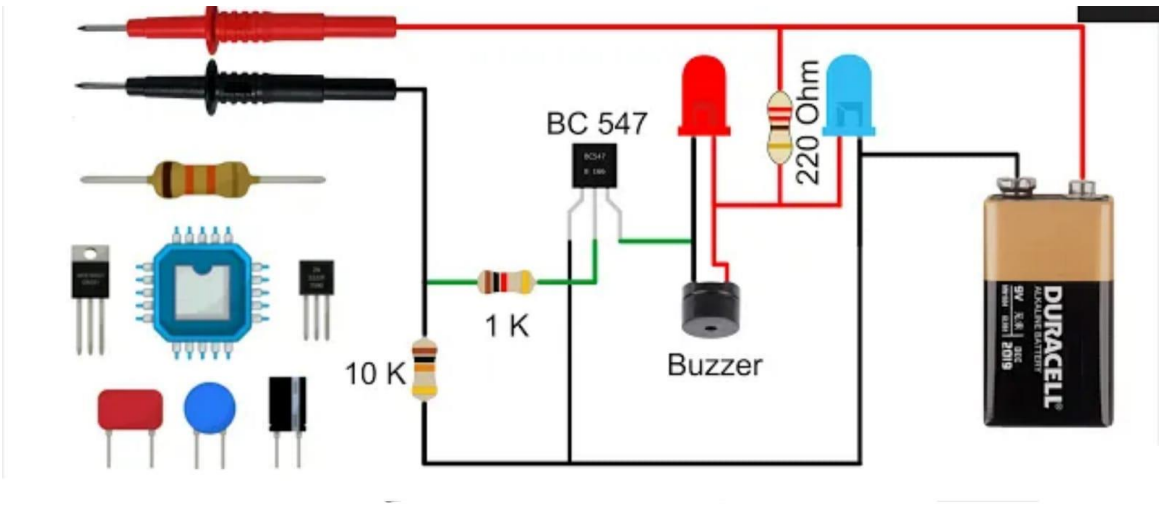

Fig 4.1: Schematic Diagram

The circuit is powered by a 9V battery, and the power LED indicates when the circuit is ON. The red LED indicates ON status, and when it's ON, the other LED is OFF. When the probes are connected, there is a short circuit and the current reaches the base, causing the LED to turn on. The short circuit allows the current to flow through the LED, turning it on as it reaches the ground. Explains the working of the circuit with the BC547 transistor and LED. Lists the components required for the circuit including resistors, LEDs, and a 9V battery.

CHAPTER-5

RESULTS AND DISCUSSIONS

RESULT:

The result of an "all-in-one tester project" is a functional electronic testing device that can identify and measure various electronic components accurately. The tester is capable of testing a wide range of electronic components, including resistors, capacitors, inductors, diodes, transistors, and more. The device automatically identifies the type of component connected to the tester, providing information about its characteristics. Accurate measurement of key component properties, such as resistance, capacitance, inductance, voltage, and current. The success of the project depends on the accuracy of the measurements, the reliability of the automatic identification algorithms, and the overall usability of the device.

CONCLUSION

Project represents a comprehensive and versatile electronic testing device capable of evaluating a variety of electronic components. The completion of such a project yields a tool that offers convenience and efficiency in the testing. It also has potential scope for future research and development by making modifications in this project which could lead to diverse usage of the design.

REFERENCES

[1]. Earl Boysen and Nancy Muir “Electric projects for DUMMIES” Publication date: July 12,2012

[2]. Charles Platt “Make: Electronics” Publication date: November 15,2019

[3] WHAT IS A PRINTED CIRCUIT BOARD? MAKE CIRCUITS BY CONNECTING COMPONENTS
Available at: https://www.altium.com/solution/what-is-a-pcb