Light Activated Siren

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Abstract – Light Activated Siren as the name indicates does the job of sensing the light and indicating an alarm to the user. The principle is based on use of LDR component with a combination of transistors and Resistors for biasing.

Index Terms – Introduction, Working Principle .Block Diagram, Circuit Diagram, Circuit Explanation, Features, Advantages, Disadvantages, Conclusion.

I. INTRODUCTION

This light activated siren could make an unknowing "victim" wet his pants when turning on the lights in a dark room. This thing is LOUD! Power into the mobuzzer is 3W and produces a 123db sound level from its 50mm diameter diaphragm. It wavers between 2 kHz and 4 kHz. An LDR senses ambient light level and switches on the power to the buzzer via a transistor comparator and a Darlington driver.

The schematic of this mini project is as shown below:

This circuit consists of following components:

1. LDR
2. 6 Resistors
3. 1 POT
4. 2 Transistors BC327
5. 1 Transistor 2N3904
6. LED
7. Buzzer
8. Zener Diode

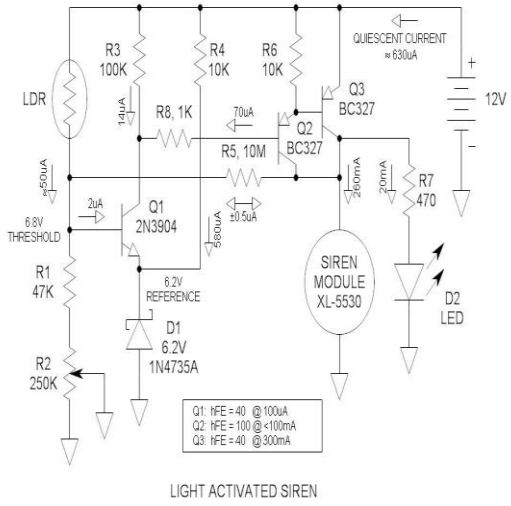


Fig a. courtesy Electro Schematics...

II. Circuit Explanation

The circuit shown in fig. is explained as follows showing the operation of each component:

Input divider

The LDR and R1 & R2 form a voltage divider whose output voltage is light dependent. As the light level increases, the junction of the LDR and R1 increases. When it reaches 6.8V, Q1 turns on and subsequently triggers the alarm. Pot R2 calibrates the divider for the required light level threshold. The voltage out of the divider may be measured with a voltmeter so you can see what is happening as you debug the circuit.

Transistor comparator

Q1 is an NPN transistor applied as a comparator. Never heard of a transistor comparator before—well now you have—not exactly high performance with limited gain and 600mV offset, but fully functional and perfect for this application. Q1 has a minimum current gain (hFE) of 40 at low current levels. When the LDR is fully off, the Vbe of Q1 is -6.2V. Most transistors are rated for 6 to 7V reverse bias on the base to emitter junction.

Voltage reference

D1 is a 6.2V zener diode that is used as a voltage reference. R4 provides the required bias current. The cathode of the zener is a low impedance node for the emitter of Q1 to work into.

Darlington driver

Q2 & 3 is discrete high current TO-92 PNP transistors wired in the Darlington configuration. In this configuration, the hFE is essentially squared so that it provides adequate current gain to easily drive the 280mA load.

Positive feedback

R5 provides about 1% positive feedback to insure positive switching as soon as the threshold is exceeded. This is also called hysteresis. R5 may be adjusted for best performance...

III. Block diagram

The operation of the entire circuit can be shown as follows in the form of following block diagram:

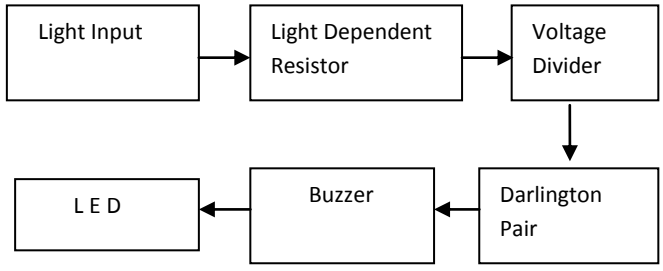


Fig b. Block Diagram

1. **Light input:**

   This is not included in the circuit but is taken as the input from the outer world.

   Whenever external light will fall on this circuit the following operation will be proceeded till then it will have no effect.

2. **LDR**:

This is the first come and most important block of the circuit. When the light falls on the LDR it generates a particular voltage drop due to its internal operating principle.

3. Voltage Divider:

This voltage passes through the n/w of voltage divider that is connected to a zener diode

When the voltage leads the zener cut-off the circuit is turned on by the first transistor.

4. Darlington Pair :

Simple back to back transistors are used to perform an operation that leads to turning ON the buzzer.

5. Buzzer AND Led

As soon as buzzer turns ON sounds an alarm as well as LED glows.

IV. Working Of Circuit

When light falls on the LDR, its resistance decreases and the voltage at the junction of the LDR and R1 increases. When the voltage exceeds 6.8V, Q1 turns on. The collector current of Q1 is the base current of the Darlington driver and turns it on. This is called a high-side driver because it works against the positive bus. When voltage appears across the siren module, the voltage across and current through R5 reverses polarity and forces the voltage at the input voltage divider slightly higher thus causing it to “snap” on positively. When three transistors are wired like this, the DC gain is so high that a minute amount of leakage can cause circuit malfunction. R3 and R6 provide paths for leakage current thus insuring reliable operation.

V. Applications Of LAS

- Used in various security areas
- Also in Bank Lockers
- In dark SAFE rooms

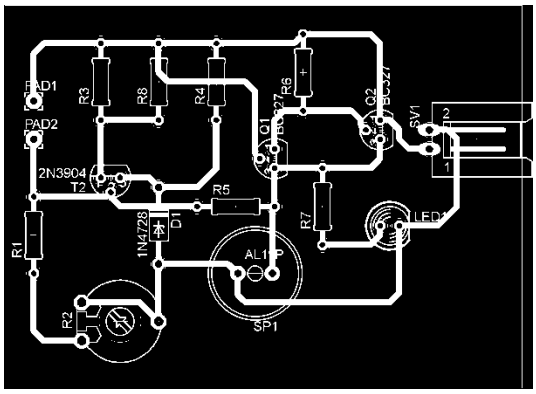
And many more……

VI. Manufacturing Process

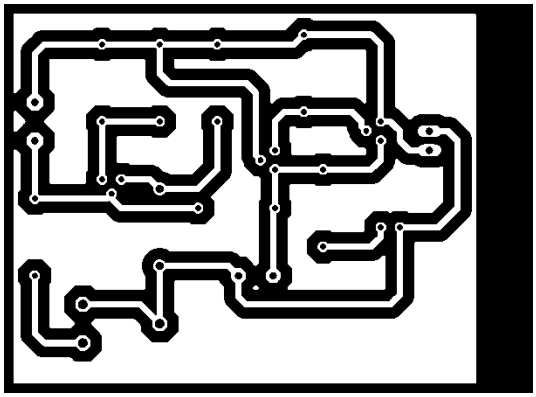
This Circuit was first drawn as schematic using EAGLE software and then the BOARD was also created by using EAGLE.

The images of the schematic and board are as follows;

BOARD with components:



BOARD with Tracks ONLY:



VII. Future Scope

This circuit can be further improved by adding a switch at the output of the Darlington pair.

So, whenever a light falls on LDR the Circuit will operate in such a way that, the Switch will turn off the light which is continuously

VIII. References

The following were some of the websites used to prepare this paper.

1. www.electroschematics.com
2. www.youtube.com
3. www.efy.com
4. Electronic Circuits Analysis and Devices – By Boylstead
5. Practical *Electronic* Fault Finding and *Troubleshooting* – By Robin Pain
6. Electronics Circuit and Theory Nashelsky
7. *PSpice* for Circuit Theory and Electronic Devices By Paul Robin
8. Build Your Own Printed Circuit Board By Al Williams
9. Eagle Software
10. Multisim By National Instruments

IX. CONCLUSION

Thus this paper conveys a small idea of controlling any component on the basis of LIGHT. The circuit was successfully implemented into a PCB and then the components were successfully soldered and a complete MINI Project was demonstrated with the desired working.