



ELECTRONICS AND

DEPARTMENT

COMMUNICATIONS ENGINEERING

FIRE ALARM



NAMES OF CANDIDATES:

- 1) Manepalli Alekhya(21ECB0A34)
- 2) Potnuri Anjali Pravallika(21ECB0A45)
- 3) Chadalavada Geethika(21ECB0A09)

SUBMISSION TO: Dr. J. Ravi Kumar Sir

ABSTRACT:

To detect the fire in the area and give a signal to the user in the form of display and buzzer to be alert.

DESCRIPTION:

This project consists of 3 parts:

- 1) Power supply
- 2) Fire detection
- 3) Seven segment display of "FIRE"
- 4) Buzzer

Components:

Part Name	Number	Cost per piece
1uF capacitor	1	Rs.10
10k Thermistor	1	Rs.30
1k Resistor	9	Rs.1
1N4007 PN-junction diode	5	Rs.5
BC547 transistor	1	Rs.18
Buzzer	1	Rs.30
Transformer 9-0-9	1	Rs.100
Seven segment display	4	Rs.20
LM7809 voltage regulator	1	Rs.13
1000uF capacitor	1	Rs.10
10uf capacitor	1	Rs.20

Details of components:

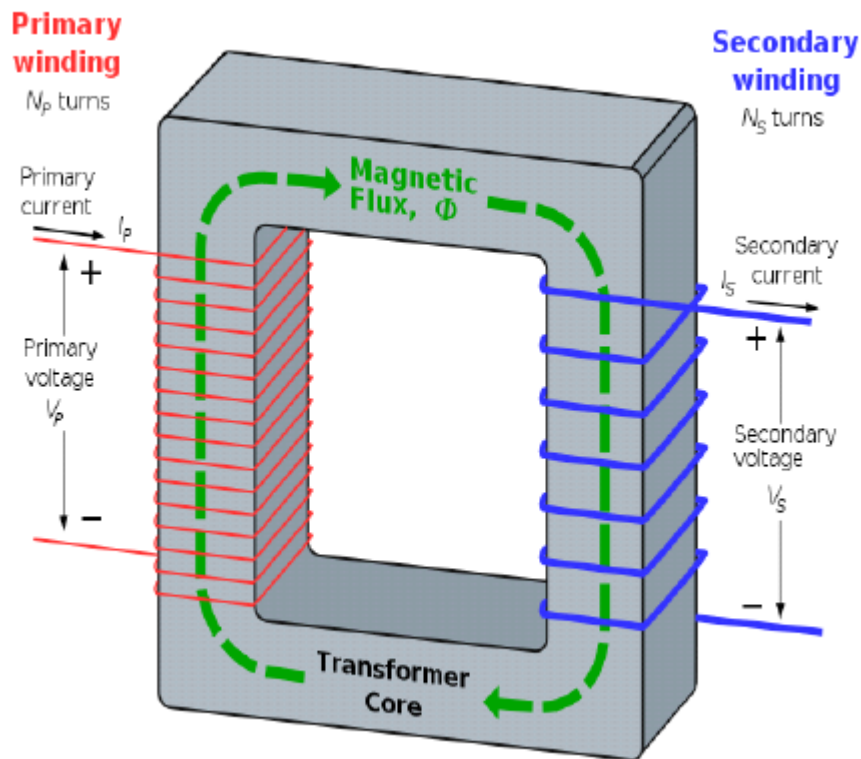
Transformer:

The transformer is a static electrical device that transfers energy by inductive coupling between its winding circuits. A varying current in the primary winding creates a varying magnetic flux in the transformer's core and thus a varying magnetic flux through the secondary winding. This varying magnetic flux induces a varying electromotive force (E.M.F) or voltage in the secondary winding. The transformer has cores made of high permeability silicon steel. The steel has a permeability many times that of free space and the core thus serves to greatly reduce the magnetizing current and confine the flux to a path which closely couples the winding.

Specifications:

- Input voltage: 230V AC

- Output voltage: 9V, 9V or 0V
- Output current: 500mA
- Mounting: Vertical mounting type.



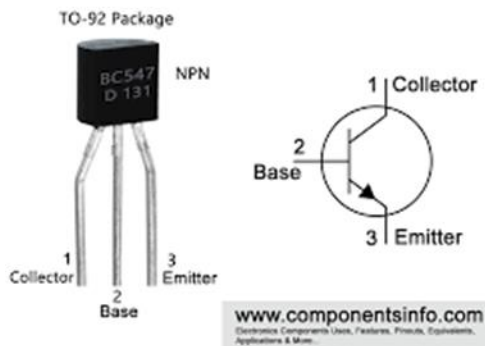
BC547 Bipolar junction transistor:

A transistor is a miniature semiconductor that regulates or controls current or voltage flow in addition amplifying and generating these electrical signals and acting as a switch/gate for them. Typically, transistors consist of three layers, or terminals, of a semiconductor material, each of which can carry a current

Features:

- DC Current Gain (h_{fe}) is 800 maximum
- Continuous Collector current (I_C) is 100mA
- Emitter Base Voltage (V_{BE}) is 6V
- Base Current (I_B) is 5mA maximum
- Available in To-92 Package

BC547 Transistor Pinout

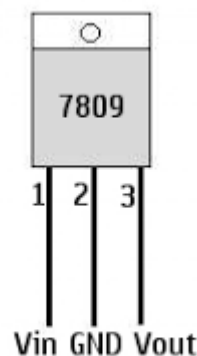


LM7809 Voltage regulator:

LM7809 is a fixed-voltage integrated-circuit voltage regulator designed for a wide range of applications. The L7809 voltage regulator provides 9V Positive voltage as output and can provide local on-card regulation, eliminating the distribution problems associated with single-point regulation. Although designed primarily as a fixed voltage regulator, but it can be used with external components to obtain adjustable voltage.

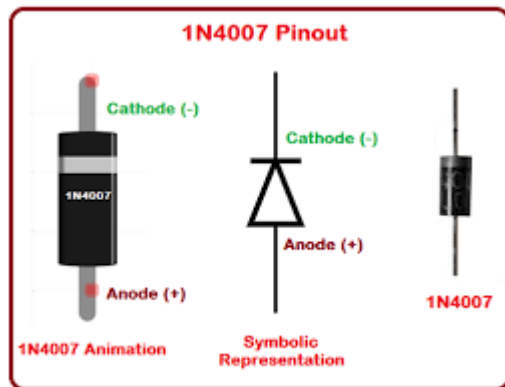
Features:

- 9V Positive Voltage Regulator
- Minimum Input Voltage is 11V
- Maximum Input Voltage is 35V
- Output Current: 1.5 A
- PSRR / Ripple Rejection: 55 dB
- Output Type: Fixed
- Internal Thermal Overload and Short circuit current limiting protection is available.
- Junction Temperature maximum of 125 degree Celsius
- Available in TO-220, TO-3 and KTE package



1N4007 PN-junction diode:

A PN Junction Diode is one of the simplest semiconductor devices around, and which has the electrical characteristic of passing current through itself in one direction only. However, unlike a resistor, a diode does not behave linearly with respect to the applied voltage.



Specifications:

- V_r – Reverse Voltage, 1000 V
- I_f – Forward Current, 1 A
- Type, Standard Recovery Rectifiers
- Configuration, Single
- V_f – Forward Voltage, 1 V
- Max Surge Current, 30 A
- I_r – Reverse Current, 5 μ A
- Minimum Operating Temperature, -65°C
- Maximum Operating Temperature, $+150^\circ\text{C}$
- Diffused Junction
- High Current Capability and Low Forward Voltage Drop
- Surge Overload Rating to 30A Peak
- Low Reverse Leakage Current
- Lead Free Finish, RoHS Compliant

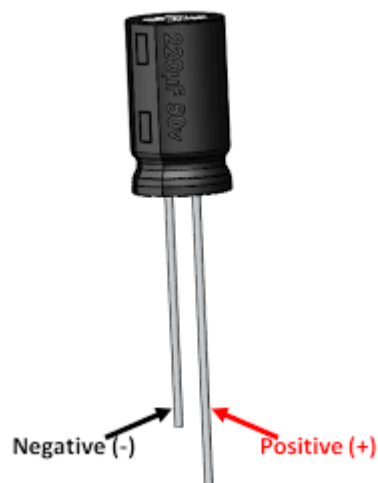
10k Thermistor:

A thermistor is a resistance thermometer, or a resistor whose resistance is dependent on temperature. The term is a combination of “thermal” and “resistor”. It is made of metallic oxides, pressed into a bead, disk, or cylindrical shape and then encapsulated with an impermeable material such as epoxy or glass. There are two types of thermistors: Negative Temperature Coefficient (NTC) and Positive Temperature Coefficient (PTC). With an NTC thermistor, when the temperature increases, resistance decreases. Conversely, when temperature decreases, resistance increases. This type of thermistor is used the most.



Capacitor:

The capacitor is a component which has the ability or “capacity” to store energy in the form of an electrical charge producing a potential difference (*Static Voltage*) across its plates, much like a small rechargeable battery. There are many different kinds of capacitors available from very small capacitor beads used in resonance circuits to large power factor correction capacitors, but they all do the same thing, they store charge. In its basic form, a capacitor consists of two or more parallel conductive (metal) plates which are not connected or touching each other, but are electrically separated either by air or by some form of a good insulating material such as waxed paper, mica, ceramic, plastic or some form of a liquid gel as used in electrolytic capacitors. The insulating layer between a capacitor plates is commonly called the **Dielectric**.



Resistor:

A **resistor** is a passive two terminal electric component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses. High-power resistors that can dissipate many watts of electrical power as heat may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented within integrated circuits.



Buzzer:

A **buzzer** or **beeper** is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (*piezo* for short). Typical uses of buzzers and beepers include alarm devices, timers, train and confirmation of user input such as a mouse click or keystroke.

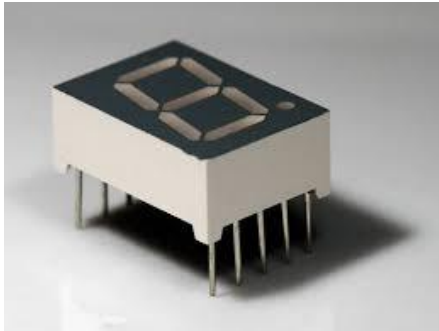


Seven segment display:

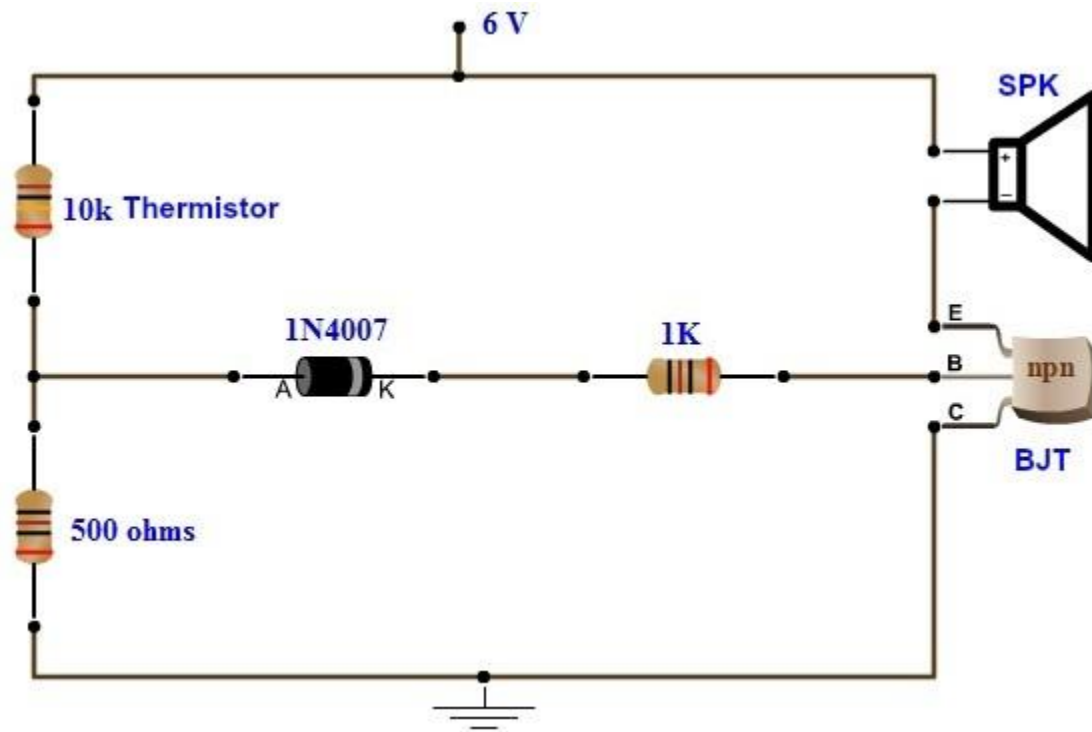
Light Emitting Diode (LED) is the most widely used semiconductor which emits either visible light or invisible infrared light when forward biased. Remote controls generate invisible light. A Light-emitting diode (LED) is optical-electrical energy into light energy when voltage is applied.

Seven segment displays are the output display device that provides a way to display information in the form of images or text or decimal numbers which is an alternative to the more complex dot matrix

displays. It is widely used in digital clocks, basic calculators, electronic meters, and other electronic devices that display numerical information. It consists of seven segments of light-emitting diodes (LEDs) which are assembled like numerical 8.



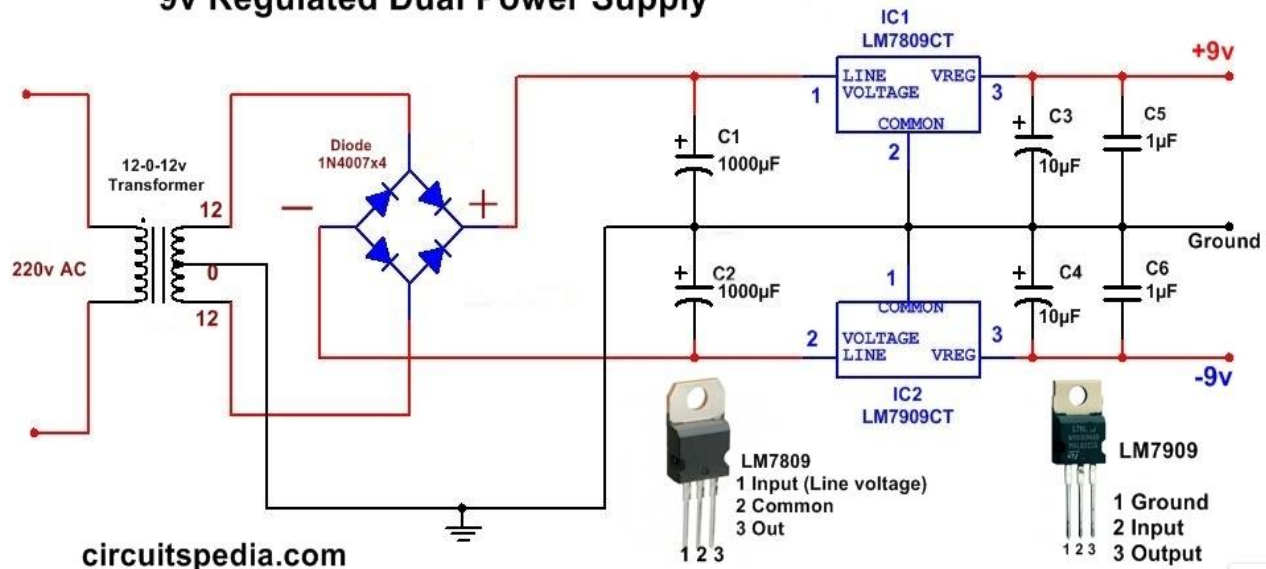
CIRCUIT DIAGRAM: (FIRE ALARM)



WORKING OF POWER CIRCUIT:

Initially stepdown 9-0-9 transformer is connected to 220v AC supply. It converts the AC input into a range of DC voltages by mechanism of electromagnetic induction. These range of voltages are connected to a capacitor and the input of the voltage regulator. The AC components of voltage which are still present in the output of transformer are passed through the capacitor 1000uF and eliminated from the circuit. The present voltage which is connected to the voltage regulator LM7809 still have some AC components of voltage in it. This voltage activates the regulator. The second pin of regulator is connected to ground . The output of voltage regulator is fixed to be 9V by the working of voltage regulator. The output voltage of regulator still may contain some AC components of voltage, to remove these, the output is connected to some more capacitors 10uF, 1uF, as a result we get perfect DC voltage of 9V.

9v Regulated Dual Power Supply



WORKING OF FIRE ALARM:

The initial voltage given to the circuit is provided by the prepared power circuit whose output is 9V. This voltage is given to 10k thermistor and the positive terminal of buzzer, common pin of common anode seven segment displays used. In the circuit 10k thermistor is connected to other resistor to form a voltage divider circuit.

Output of this circuit is taken from emitter of BC547 NPN bipolar junction transistor used. Thermistor is a temperature dependent resistor with negative temperature co-efficient. As the temperature increases the resistance of thermistor decreases as a result the voltage at the junction start increasing. The thermistor resistance decreases which makes almost total supplied voltage appear at the junction. As a PN-junction diode 1N4007 is connected to this voltage and the forward maximum voltage of diode is 1V, the depletion layer disappears and the diode starts connecting the whole voltage and behaves as short circuited.

This voltage is appeared at the base of BC547 transistor, as base-emitter junction is also a kind of PN-junction the junction is shorted because of the high voltage at the base. As a result the collector voltage 0V is appeared at the emitter. The output is connected to other terminals of seven segment displays which display "FIRE".

As the other side of buzzer is now grounded it starts buzzing.

APPLICATIONS:

- Hospital rooms
- Power rooms
- Operating rooms
- Generator stations
- Telecommunication rooms

OUTPUTS:

Output voltage: 0v at emitter

Caution signals: "FIRE" display, buzzer sound