

12v DC SHORT CIRCUIT PROTECTOR

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Abstract : A short circuit is an abnormal connection between two nodes of an electric circuit intended to be at different voltages. This results in an electric current limited only by the Thévenin equivalent resistance of the rest of the network which can cause circuit damage, overheating, fire or explosion. A common type of short circuit occurs when the positive and negative terminals of a battery are connected with a low-resistance conductor, like a wire. With a low resistance in the connection, a high current will flow, causing the delivery of a large amount of energy in a short period of time.

A short circuit fault current can, within milliseconds, be thousands of times larger than the normal operating current of the system. Damage from short circuits can be reduced or prevented by employing necessary protecting devices or circuits.

Short circuit protection is very important for the work concerned in any field, as there are many chances for small or heavy damage to occur, if protection is not provided. The main object is to design a short circuit protected power supply. Its function is to supply a stable voltage, to a circuit or device that must be operated within certain power supply limits. It must be in operation whenever rewuired, that is at the time of faulty conditions, this circuit will completely isolates the working deivce or circuit from being damaged.

IndexTerms –Relay, S/C – Short circuit, NC- Normally closed, NO- Normally Opened, COM- Common, Push button.

I. INTRODUCTION

Electronic circuits consist of many small and fragile components which are very sensitive to any kind of change in current or voltage. Unstable power supplies will raise a big risk for the circuit. Another problem which occurs is due to the size of PCB boards, and the size of the electrical components, there is an increased possibility of a short circuit occurring. Damage to these components leads to the need of replacing the entire component which tends to increase the cost of the circuit which is undesirable .Hence the need arises for a regulated power supply, as protection of the power supply is very important as it ensures the circuit works correctly and that no damage will arise either.

There are many types of regulated power supply circumstances available, ranging from transformers used for the input, to a full wave bridge rectifier, both having an alternating current supply. The regulating components range from integrated chips or transistors with

A short circuit (sometimes abbreviated to short or s/c) is an electrical circuit that allows a current to travel along an unintended path with no or very low electrical impedance. This results in an excessive current flowing through the circuit. The opposite of a short circuit is an "open circuit", which is an infinite resistance between two nodes. It is common to misuse "short circuit" to describe any electrical malfunction, regardless of the actual problem.

II. MTERIALS

Relay (12v), Resistor(1000 Ohms), Two Diodes, Center tapped transformer (12V, 1A), push Button, Capacitor (100 micro farads), Light emitting Diode (Red and Green).

2.1 Rectifier

A rectifier is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC), which flows in only one direction.

2.2 Filtration

In order to obtain a ripple less output from a rectifying circuit a filter circuit must be used. A filter circuit may be an L-type, LC-type, C-type. As C-type filter has some advantages it is preferable.

2.3 Light Emitting Diodes (LEDs)

The Light Emitting Diodes (LED_s) is a forward biased P-N junction which emits visible light when energized. The colour of light emitted depends on the material and for example, emits infrared radiation or invisible light, emits red or green light and emit red or yellow radiation or amber light. To choose LEDs for a particular application, one or more of the following points have to be considered; wavelength of light emitted the required input power efficiency, turn-on and turn-off time of the switching devices, circuit construction, light intensity, brightness, among others. The uses of LEDs include. They are also used in image sensing circuits. LEDs are used for numeric displays in hand-held portals.

2.4 Resistors

Resistors are used in the circuits to limit current, set bias levels, control gain in switching components, fixing time constant, impedance matching and loading, voltage division and sometimes heat generation. Resistors used in the circuit (1k ohms)

2.5 Transformer:

Transformer is an electrical device that is used to either step down or step-up alternating voltage. It consists of a primary coil connected to the input power supply, and a secondary coil connected to the load. The transformer used in this project is 12V

centre tapped connected to the circuit to produce an output voltage of 12V. For this project the transformer is used as step-down transformer in the circuit.

2.6 Relay

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and most have double throw (changeover) switch contacts as shown in the diagram.

Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits, the link is magnetic and mechanical. The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available. Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available.

2.7 Push Button

The "push-button" has been utilized in calculators, push-button telephones, kitchen appliances, and various other mechanical and electronic devices, home and commercial.

In industrial and commercial applications, push buttons can be connected together by a mechanical linkage so that the act of pushing one button causes the other button to be released. In this way, a stop button can "force" a start button to be released. This method of linkage is used in simple manual operations in which the machine or process has no electrical circuits for control.

Red push buttons can also have large heads (called mushroom heads) for easy operation and to facilitate the stopping of a machine. These pushbuttons are called emergency stop buttons and for increased safety are mandated by the electrical code in many jurisdiction. This large mushroom shape can also be found in buttons for use with operators who need to wear gloves for their work and could not actuate a regular push button.

III. MEATHOD

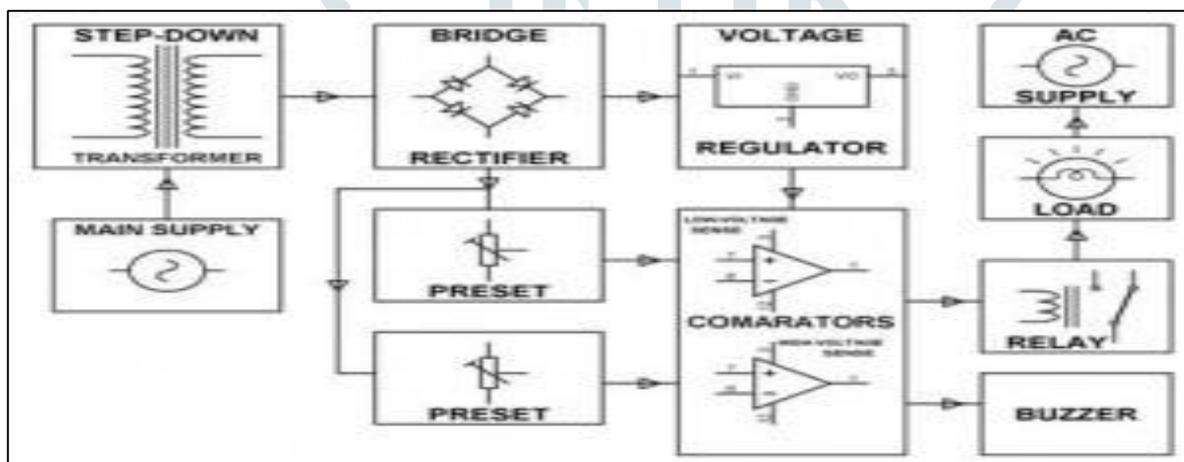


Fig 3.1 Block Diagram Of Short circuit protector

Simple low power DC Short-circuit Protection Circuit is shown above which consists of a 12v relay consisting of two coils named as Normally open coil (NO) and Normally closed coil (NC). The working of the entire circuit is depended on the operation of this relay. The basic operation of this relay gives the operation of the entire circuit. When ever the output terminals get short circuited, due to the flow of high current and having no voltage across the NC, the relay trips the circuit and makes the NC to open condition and as discussed above that a relay can be used to transfer the connection from one circuit to another, the circuit is now transferred to safe condition that is now the circuit is isolated from the fault condition.

After rectifying the fault the circuit can be brought to normal operating condition by pressing the push button, which makes the NO coil to NC. The Green and Red LED are used to implement the flow of current through the circuit and short circuit condition.

The preset and reset are used to bring the operation of circuit to normal condition whenever the fault is occurred. When the fault occurred the circuit will shifted to isolated mode and hence in order to bring the circuit to normal operation conditions this preset and reset terminals are used. They are nothing but the terminals of com and no. A Push button is usually used to act as preset.

IV. RESULTS AND DISCUSSION

4.1 Circuit Operation

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The picture shows a working relay with its coil and switch contacts. You can see a lever on the left being attracted by magnetism when the coil is switched on. This lever moves the switch contacts. There is one set of contacts (SPDT) in the foreground and another behind them, making the relay DPDT.

Most relays are designed for PCB mounting but you can solder wires directly to the pins providing you take care to avoid melting the plastic case of the relay.

The relay's switch connections are usually labelled COM, NC and NO:

- COM = Common, always connect to this, it is the moving part of the switch.
 - NC = Normally Closed, COM is connected to this when the relay coil is off.
 - NO = Normally Open, COM is connected to this when the relay coil is on.
- Connect to COM and NO if you want the switched circuit to be on when the relay coil is on.
Connect to COM and NC if you want the switched circuit to be on when the relay coil is off.

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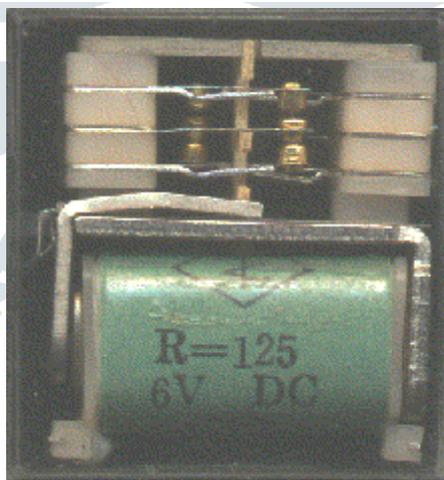


Fig 4.1 operation of relay

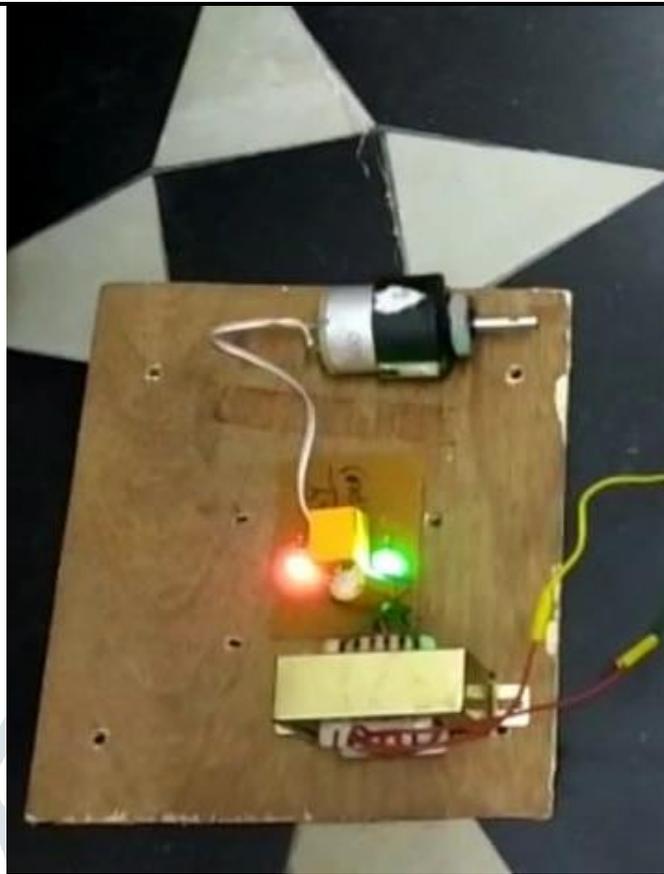


Fig 4.2 Prototype Model

4.2 Realy switching

Normal condition- NC is closed and NO is opened

Short circuit condition – NC is opened and NO is closed

V.ACKNOWLEDGMENT

We express our thanks to project guide **Miss. S. VaraLakshmi, Assistant Professor of Electrical and Electronics Engineering**, who deserves a special note of thanks and gratitude, for having extended their fullest cooperation and guidance, without this, project would never have materialized.

We express our deep sense of gratitude to **Dr.K.SATYANARAYANA, Vice-Principal & Head of the Department of Electrical and Electronics Engineering**, for having shown keen interest at every stage of development of our project work and for guiding us in every aspect.

We wish to express our special thanks to our beloved **Dr.S.SAMBHU PRASAD, Principal** for giving guidelines and encouragement.

We wish to express sincere gratitude to our beloved and respected **Dr. P. KRISHNARAO, Chairman** and **Sri.M.V.HARANATHA BABU, Director (Management)**, and **Sri. M. SATISH, Vice-President** for their encouragement and blessing.

We are thankful to all our faculty members of the department for their valuable suggestions. Our sincere thanks also extended to all the teaching and the non-teaching staff of Pragati Engineering College.

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