INTELLIGENT SWITCH

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ABSTRACT

Whenever power goes off we need to search for match box & candles or at least for charging light. In the darkness it becomes hard to locate the required things, at the same time it is expensive to install inverter. It will be good if light glows automatically when ever power is off. This intelligent switch circuit enables automatic, switching on of an emergency light system during darkness in the event of mains failure.

Coming to the working of the circuit there are two parts in first part the mains power supply is detected.in the second part the day light is sensed. Thus when all the required conditions are met the bulb is made glow.

Mains power failure conditions detected by the section consisting of mains step-down transformer X1 followed by bridge rectifier comprising diodes D1 through D4 and smoothing capacitor C1. If the mains are available then it causes energisation of relay RL1 which has two sets of changeover contacts. The light/darkness condition is detected by the circuit comprising phototransistor FPT100/2N5777 followed by Darlington pair comprising transistors T2 and T3 .The working of the intelligent switch is summarised in the table.

During daylight	when mains is present	Intelligent Switch is off
	when mains is absent	
During night darkness	when mains is present	Intelligent Switch is off
	when mains is absent	Intelligent Switch is on

CONTENTS

INTRODUCTION

In this busy world, minimizing the human effort and time is the ultimate aim of technology. When doing some work seriously it may be disappointing for us when lights switch off due to power failure. Even searching for charging light or maintainence of inverter is time consuming process and costly. The project 'intelligent switch' helps avoid this problem by switching on light automatically when it detects darkness in the room. To avoid switch on light during morning times when darker photo diode can be used. This intelligent switch circuit enables automatic, switching on of an emergency light system during darkness in the event of mains failure

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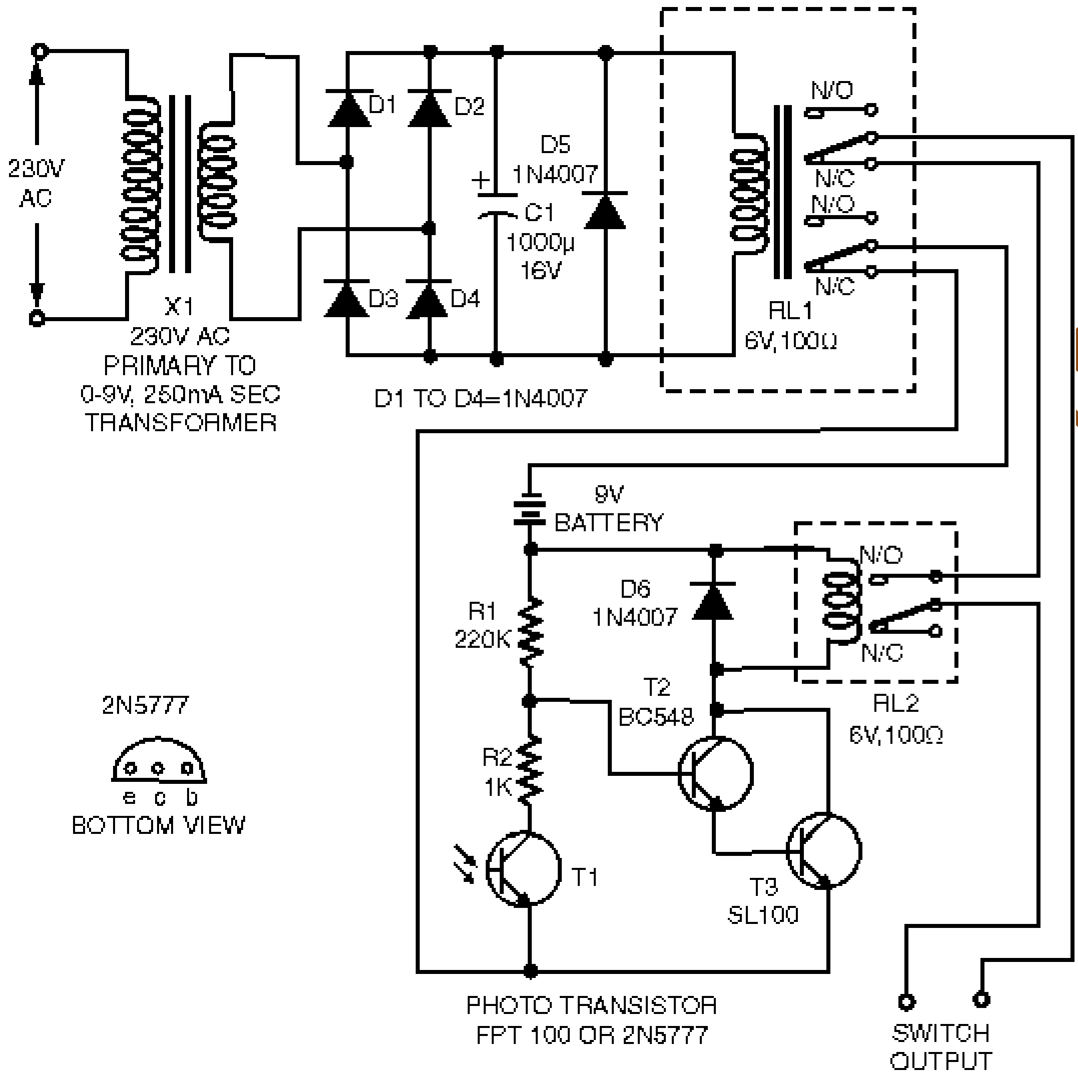
CIRCUIT DIAGRAM


230V
AC
X1
230V AC
PRIMARY TO
0-9V, 250mA SEC
TRANSFORMER
D1
D2
D3
D4
D1 TO D4=1N4007
D5
1N4007
C1
1000µ
16V
N/O
N/C
N/O
N/C
RL1
6V,100Ω
9V
BATTERY
R1
220K
R2
1K
D6
1N4007
T2
BC548
N/O
N/C
RL2
6V,100Ω
T1
T3
SL100
2N5777
e c b
BOTTOM VIEW
PHOTO TRANSISTOR
FPT 100 OR 2N5777
SWITCH
OUTPUT

CIRCUIT OPERATION

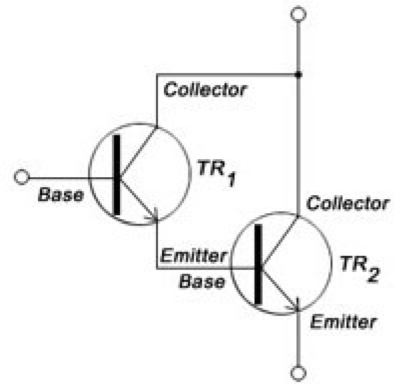
This intelligent switch circuit enables automatic, switching on of an emergency light system during darkness in the event of mains failure. The mains power failure condition is detected by the section consisting of mains step-down transformer X1 followed by bridge rectifier comprising diodes D1 through D4 and smoothing capacitor C1. If the mains is available

Then it causes energisation of relay RL1 which has two sets of changeover contacts. The light/darkness condition is detected by the circuit comprising phototransistor FPT100/2N5777 followed by Darlington pair comprising transistors T2 and T3. However, this section will function only when mains supply is not available (i.e. when relay RL1 is in de-energized state) since battery supply (negative lead) path gets completed via lower N/C contact of relay RL1.

During daylight, photo transistor conducts and places transistor T2 base near ground potential. Thus Darlington pair remains cut-off and relay RL2remains de-energized. However, during darkness, photo transistor is cut-off and therefore transistor T2 receives forward base bias via resistor R1 (connected to positive rail), as resistor R2 i s no more grounded (via photo- transistor T1). As a result, relay RL2 gets energized. T h u s i t would be observed that when mains is absent (relay RL1 de- energized) and it is dark (relay RL2 energized), the switch. Output path is complete. In any other condition switch output path would get broken.

The switch output terminals can be used (in series with supply) to control a lighting system directly or indirectly through another contactor/heavy-duty relay depending upon the load.

Darlington Pair:



Darlington Pair

In electronics, the **Darlington transistor** (often called a **Darlington pair**) is a compound structure consisting of two bipolar transistors (either integrated or separated devices) connected in such a way that the current amplified by the first transistor is amplified further by the second one. This configuration gives a much higher current gain (written β, h_{fe}, or h_{FE}) than each transistor taken separately and, in the case of integrated devices, can take less space than two individual transistors because they can use a *shared* collector. Integrated Darlington pairs come packaged singly in transistor-like packages or as an array of devices (usually eight) in an integrated circuit.

A Darlington pair behaves like a single transistor with a high current gain (approximately the product of the gains of the two transistors). In fact, integrated devices have three leads (B, C and E), broadly equivalent to those of a standard transistor.

A general relation between the compound current gain and the individual gains is given by:

$$\beta_{\text{Darlington}} = \beta_1 \cdot \beta_2 + \beta_1 + \beta_2$$

If β_1 and β_2 are high enough (hundreds), this relation can be approximated with:

$$\beta_{\text{Darlington}} \approx \beta_1 \cdot \beta_2$$

A typical modern device has a current gain of 1000 or more, so that only a small base current is needed to make the pair switch on. However, this high current gain comes with several drawbacks.

One drawback is an approximate doubling of base-emitter voltage. Since there are two junctions between the base and emitter of the Darlington transistor, the equivalent base-emitter voltage is the sum of both base-emitter voltages:

$$V_{BE} = V_{BE1} + V_{BE2} \approx 2V_{BE1}$$

For silicon-based technology, where each V_{BEi} is about 0.65 V when the device is operating in the active or saturated region, the necessary base-emitter voltage of the pair is 1.3 V.

Darlington pairs are available as integrated packages or can be made from two discrete transistors; Q_1 (the left-hand transistor in the diagram) can be a low power type, but normally Q_2 (on the right) will need to be high power. The maximum collector current I_C(max) of the pair is that of Q_2. A typical integrated power device is the 2N6282, which includes a switch-off resistor and has a current gain of 2400 at I_C=10A.

A Darlington pair can be sensitive enough to respond to the current passed by skin contact even at safe voltages. Thus it can form the input stage of a touch-sensitive switch.

APPLICATIONS

- For automatic switching of bulbs when power fails.
- Can be used for switching on of emergency systems when power fails suddenly.
- This circuit switches off the TV or any other low-wattage (approx. 100W) device once the power supply resumes after a failure, so that power is not wasted.

CONCLUSION

Thus by using this intelligent switch we can automatically switch on the lights or emergency systems. In some applications automatic switch may play a vital role, for example consider a student's having exam when the power fails at that time this automatic switching system is really an boon for them. This may also be very important when some emergency systems are to be switched on whenever the power fails within in seconds then our circuit plays a key role thus this is useful in many ways.