



LED Light Intensity Controller (using **MOSFET**)



Electronic Circuits Project Report

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Abstract

The LED Light Intesity Controller using MOSFET was a fun and enlightening way to study the MOSFET.

Introduction

The simplest solution that might come to mind to dim the LED is to increase the value of the resistor. Doubling the resistor value results in about half the current through the LED. This is common practice in the industry for simple applications, but has three major disadvantages:

1. The brightness is fixed
2. LEDs are non-linear, making it hard to set the brightness precisely
3. At lower currents some LEDs change their color slightly

But there are a few methods to solve the first issue one of them is to use MOSFET, that is the project we will be discussing in this report.

Project Description

The LED light intensity controller simply controls the brightness of the LED light using only a small amount of components including an IRF540 MOSFET which Increases and decreases the brightness of the LED light using the two Micro Switch.

Project Objective

The consumption of power at home makes up great energy usage/consumption. The power consumption of lights in a typical home is a factor that cannot be ignored. We typically require different light intensities according to different places and situations. This project aims for energy saving and to reduce power consumption at homes using a minimum amount of hardware components.

This circuit is capable of dimming in or dimming out any light source and can be used on a wider perspective for controlling incandescent, and fluorescent lamp brightness through push-button pressing.

Project Applications

The light level in a room affects the way we do our work, and it has a huge effect on how we feel. It is difficult for us to read or study under a single candle, and having dinner under a 1,500-watt halogen lamp isn't ideal.

We need to use some rooms for many different purposes, and these different functions call for varying amounts of light. This is when the light intensity controller circuit comes into place; a useful electrical circuit (switch) that lets you adjust light levels from nearly dark to fully lit by simply pressing a button.

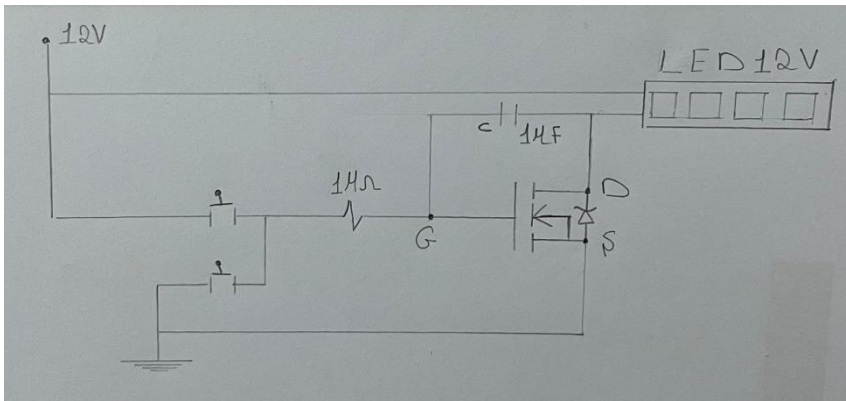
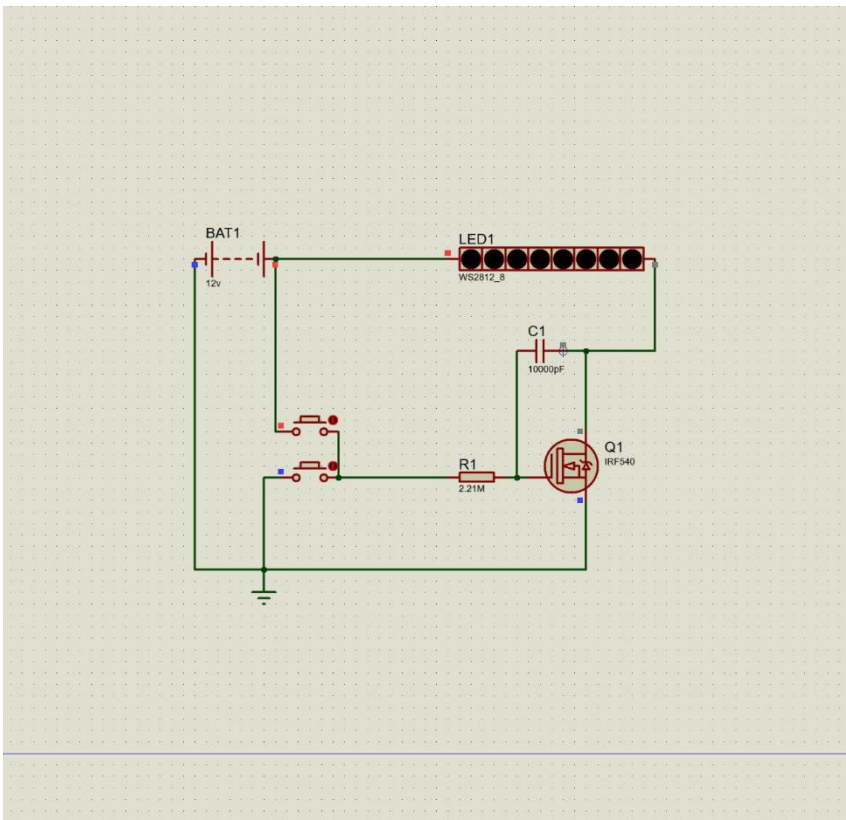


Figure (1) Hand-drawn circuit diagram

Circuit diagrams



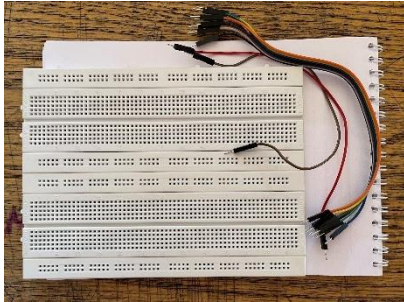
Figure(2) Circuit diagram using proteus

Hardware components

- MOSFET - IRF540

IRF540 is an N-Channel powered MOSFET used for very fast switching operations as well as for amplification processes. It operates in enhancement mode. Its input impedance is quite high as compared to the general transistor so, it's a lot sensitive in comparison to them. It has a lot of applications in daily life, for example, switching regulators, relay drivers, switching converters, motor drivers, high-speed power switching drivers, etc. You should also have a look at other MOSFETs and can compare their values with IRF540.

This is a special type of MOSFET which is of NPN type and it is generally operated in the enhanced mode. This MOSFET can perform a very fast switching than any other MOSFET, The input impedance of this MOSFET is also quite high as compared to other transistors in the market and it is very sensitive compared to them also.



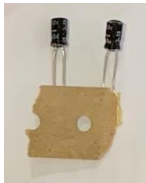
3.a bread board



3.b IRF540



3.c Push buttons



3.d Capacitor



3.e 1MΩ



3.f LED

Figure (3) Hardware Components

- Micro Switch

A push-button switch is a small, sealed mechanism that completes an electric circuit when you press on it. When it's on, a small metal spring inside makes contact with two wires, allowing electricity to flow. When it's off, the spring retracts, contact is interrupted, and the current won't flow. The body of the switch is made of non-conducting plastic.

Most push-button switches function in the same way. Pressure is placed on the button or actuator, resulting in the depression of the internal spring and contacts and the touching of stable contacts at the bottom of the switch. This process will either close or open the electrical circuit. You can choose between pushbuttons featuring normally open or closed contacts, which change state upon actuation.

With the normally-off switch, there's no connection till you push the button. Most push-button switches are used this way. Examples include doorbell buttons, cell phone keys, and garage door openers.

With the normally-on switch, the switch conducts normally but interrupts the circuit when you press on it. For example, connecting a normally-on switch in parallel with a light bulb will light the bulb when the button's pushed; otherwise, current will flow through the switch, leaving the bulb off.

- Resistor
- Capacitor
- LED
- Adapter

COMPONENTS	VALUES	COST
MOSFET (1)	IRF540	8 L.E
Resistor (1)	1M Ω	0.50 L.E
Capacitor (1)	1 μ F	1 L.E
Push buttons (2)	-	1 L.E/Each
LED	12v	9 L.E
Adapter	12v	25 L.E
Total cost	45.5 L.E	

Table (1)

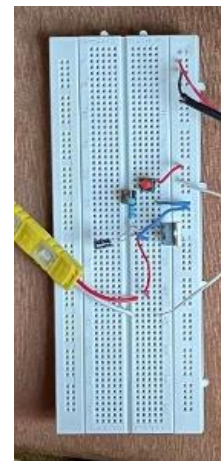
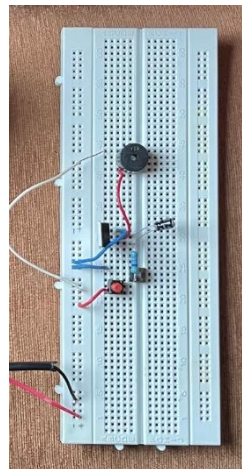
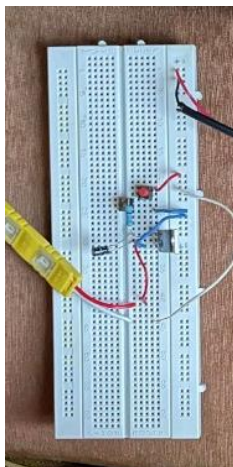
Table of the used hardware components

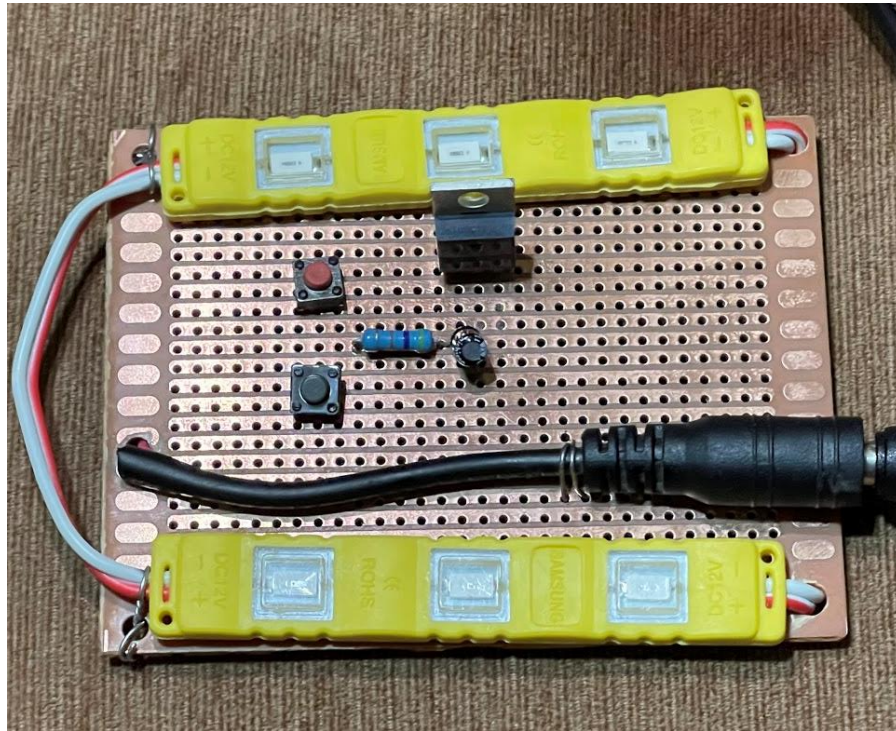
Circuit Operation

The most important component of this circuit is the IRF540 MOSFET, which acts as an amplifier so that there is enough current to drive the light source. The Micro Switches (Push Buttons) connected to the gate of the MOSFET act as a dimmer. A Light Emitting Diode (LED) emits light at an intensity that depends on the current passing through the LED, not the voltage. so By adjusting the current, we adjust the voltage being fed to the gate of the MOSFET. The voltage to the gate changes the load current so that the LED adjusts its level of brightness.

The IRF540 MOSFET is an n-channel, enhancement-type MOSFET. By N-channel, this is referring to how the MOSFET is internally doped. When connecting an n-channel MOSFET, in order to get it to work, the positive voltage must be connected to the drain of the MOSFET. By enhancement-type MOSFET, this is referring to how the MOSFET operates. Enhancement-type MOSFETs are MOSFETs that are normally off. When you connect an enhancement-type MOSFET, no current flows from drain to source when no voltage is applied to its gate. This is why it is called a normally-off device. There is no current flow without a gate voltage. An enhancement-type MOSFET is so named an enhancement device, because as the voltage to the gate increases, the current increases more and more, until at maximum level.

Circuit Process





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To succeed, work hard, never give up and above all, cherish a magnificent obsession.
—Walt Disney