DIAC - TRIAC

MOTOR SPEED CONTROL

BY

SHARVIL PANANDIKAR

DISHANT MEHTA

RICHARD NORONHA

AJINKYA PADWAD

In partial fulfillment for the award of the degree

Of

Bachelor of Engineering(B.E)

IN

ELECTRONICS ENGINEERING

UNDER THE GUIDANCE OF

MR. ABHIJIT SHETE

AFFILIATED TO

VIVEKANAND EDUCATION SOCIETY'S
INSTITUTE OF TECHNOLOGY
CHEMBUR, MUMBAI-400071

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VIVEKANAND EDUCATION SOCIETY'S
INSTITUTE OF TECHNOLOGY
CHEMBUR, MUMBAI-400071

CERTIFICATE OF APPROVAL

Project titled "DIAC - TRIAC MOTOR SPEED CONTROL"

Submitted by Sharvil Panandikar, Dishant Mehta,

Richard Noronha and Ajinkya Padwad

is approved for the degree of Engineering.

_____ _____

Guide
Mr. Abhijit Shete

Examiner

_____ _____

Head of the Department

Principal
Mrs. J. M.Nair

CERTIFICATE

This is to certify that the project entitled

"DIAC - TRIAC MOTOR SPEED CONTROL"

is the bonafide work carried out by Sharvil Panandikar, Dishant Mehta, Richard Noronha and Ajinkya Padwad, students of degree in Electronics department ,Mumbai University (MU), during the year 2014-2015, in partial fulfillment of the requirements for the award of the degree in Electronics department and that the project has not formed the basis for the award previously of any degree, diploma, associate ship, fellowship or any other similar title.

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Signature of the Guide

Place:

Date:

Department of Electronics Engineering

V. E. S. I . T. , Mumbai-400071

PREAMBLE

This project report is being presented for the project work carried out on the topic ' DIAC-TRIAC

Motor Speed Control '.

It will give a brief information about the project aim, various components used in the project, working principle along with the circuit diagram and desired output of the project.

Also mentioned in projects are the problems faced while preparing the project, different references used and future scope of the project.

CONTENTS

INTRODUCTION

DIAC and TRIAC are one of the most widely used electronic components in today's world for the industrial as well as the domestic purposes.

Switching circuits of the combination of the above components can be implemented in order to control the phase variations and voltage variations.

Another common type of TRIAC switching circuit uses phase control to vary the amount of voltage, and therefore power applied to a load, in this case a motor, for both the positive and negative halves of the input waveform.

This type of AC motor speed control gives a fully variable and linear control because the voltage can be adjusted from zero to the full applied voltage.

It is required to control the speed of an AC motor, without causing an overload current. The functioning of the motor should not be affected in any way. When the motor is turned on, the motor should not draw too much current so as to cause an overload or burning of the coils of the motor.

Changing the motor often due to burning up of motor coils is not feasible. The main objective of the project is to design a suitable circuit so as to prevent such damage to the motor.

Thus, to solve the problem of controlling of voltage of the motor, we propose to implement a circuit that uses a DIAC and TRIAC combination. To control the surge of initial current to the motor, we use a fuse.

LITERATURE REVIEW

This project implements motor speed control using the combination of DIAC and TRIAC components with other active and passive components.

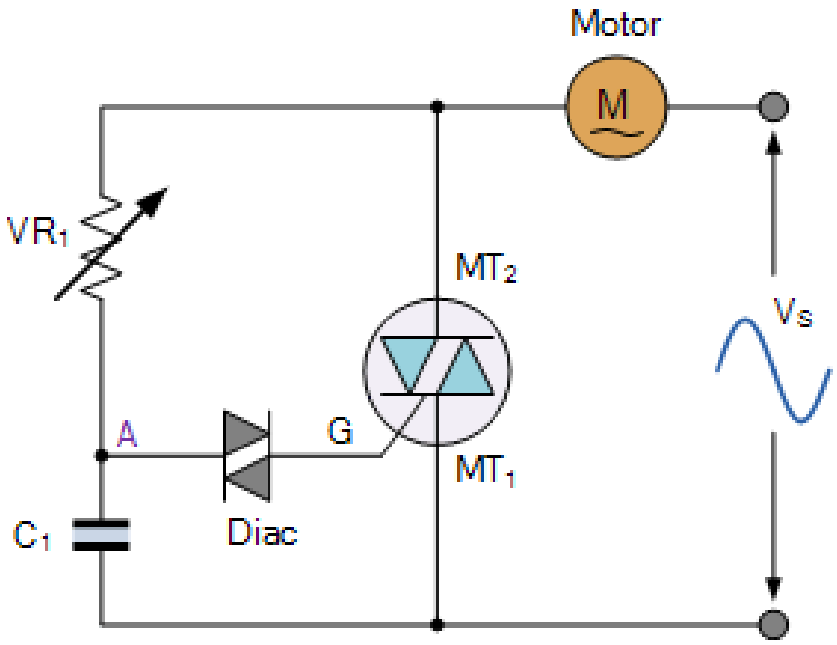
Instead of the conventional methods for voltage control, this project proposes a robust and easy to implement way for the same.

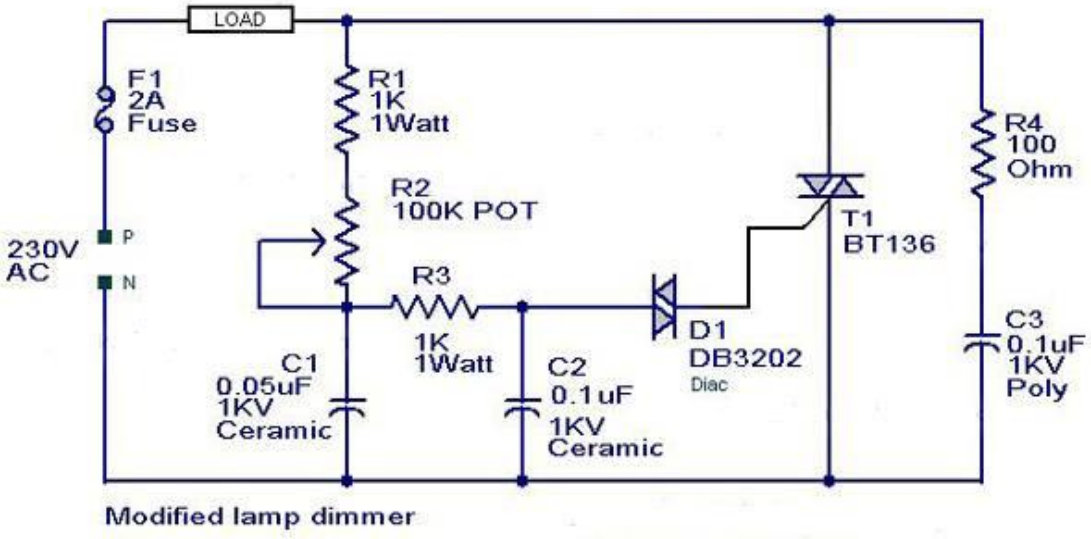
Moreover, the simplicity of the circuit makes it easy for domestic use as well.

List of components for the project :

1. 75 kΩ Variable resistor
2. 0.1 μF, 100V ceramic capacitor
3. 0.22 μF, 400V ceramic capacitor
4. TRIAC BT-136
5. DIAC DB3202
6. 100Ω, 400W resistor
7. Soldering Iron
8. Soldering Wire
9. Wires
10. Printed Circuit Board(PCB)

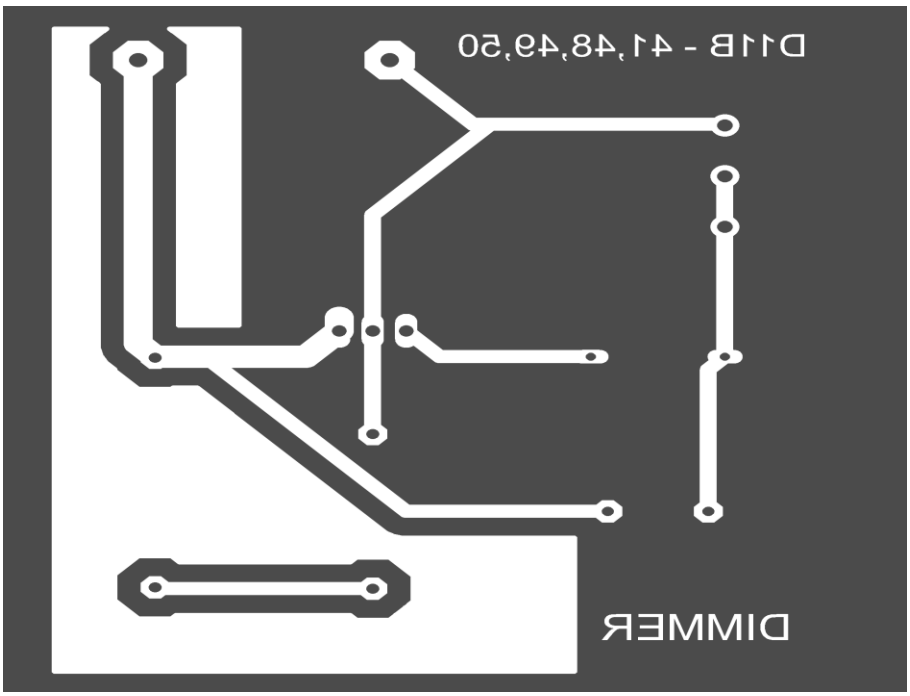
CIRCUIT DIAGRAMS

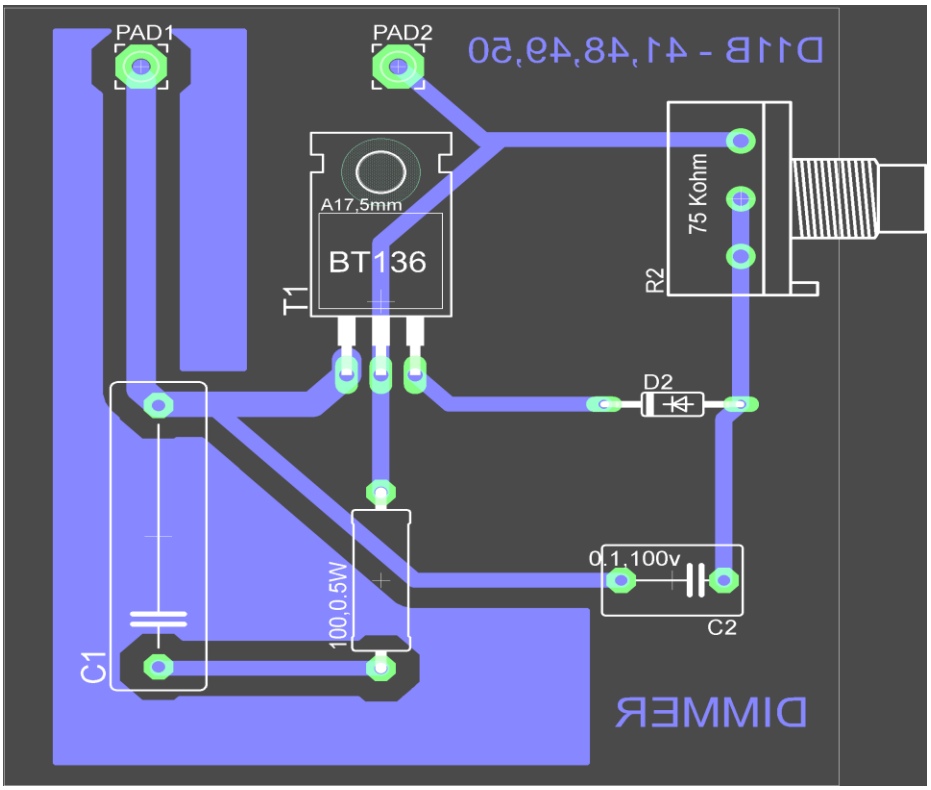




Modified lamp dimmer

PCB LAYOUTS


DIMMER


PAD1
PAD2
A17,5mm
BT136
T1
75 Kohm
R2
D2
0,1,100v
C2
100,0,5W
C1
DIMMER

WORKING

The basic phase triggering circuit uses the TRIAC in series with the motor across an AC sinusoidal supply. The variable resistor, VR1 is used to control the amount of phase shift on the gate of the TRIAC which in turn controls the amount of voltage applied to the motor by turning it ON at different times during the AC cycle.

The TRIAC's triggering voltage is derived from the VR1 – C1combination via the DIAC (The DIAC is a bidirectional semiconductor device that helps provide a sharp trigger current pulse to fully turn-ON the TRIAC).

At the start of each cycle, C1 charges up via the variable resistor, VR1. This continues until the voltage across C1 is sufficient to trigger the DIAC into conduction which in turn allows capacitor, C1 to discharge into the gate of the TRIAC turning it "ON".

Once the TRIAC is triggered into conduction and saturates, it effectively shorts out the gate triggering phase control circuit connected in parallel across it and the TRIAC takes control for the remainder of the half-cycle.

As we have seen above, the TRIAC turns-OFF automatically at the end of the half-cycle and the VR1 – C1 triggering process starts again on the next half cycle.

However, because the TRIAC requires differing amounts of gate current in each switching mode of operation, for example I+ and III–,

a TRIAC is therefore asymmetrical meaning that it may not trigger at the exact same point for each positive and negative half cycle.

This simple TRIAC speed control circuit is suitable for not only AC motor speed control but for lamp dimmers and electrical heater control and in fact is very similar to a TRIAC light dimmer used in many homes.

Electrical AC power control using a TRIAC is extremely effective when used properly to control resistive type loads such as incandescent lamps, heaters or small universal motors commonly found in portable power tools and small appliances.

CONCLUSION

The proposed project will be useful in controlling the speed of motors using just a simple potentiometer. Once implemented, the circuit can be used effectively without damage to the motor coils. This damage would have been caused to the motor if proper safety measures were not taken.

The proposed project reduces the cost of replacing the motor due to burning of coils, thus making it simple yet effective in various applications at domestic household use as well.