CLOSED LOOP SPEED CONTROL OF BLDC MOTORUSING MICRO CONTROLLER

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Abstract: The hardware project is designed to control the speed of a BLDC motor using closed loop control technique. BLDC motor has various application used in industries like in drilling, lathes, spinning, electric bikes etc. The speed control of the DC motors is very essential. This proposed system provides a very precise and effective speed control system. The user can enter the desired speed and the motor will run at that exact speed.

Index Terms: **BLDC, Sensor, mivrocontroller,pwm**

1. INTRODUCTION

Brushless DC motors (**BLDC motors**, **BL motors**) also known as **electronically commutated motors** (ECMs, EC motors) are synchronous electric motors powered by directcurrent (DC) electricity and having electronic commutation systems, rather than mechanical commutators and brushes. The current-to-torque and frequency-to-speed relationships of BLDC motors are linear.

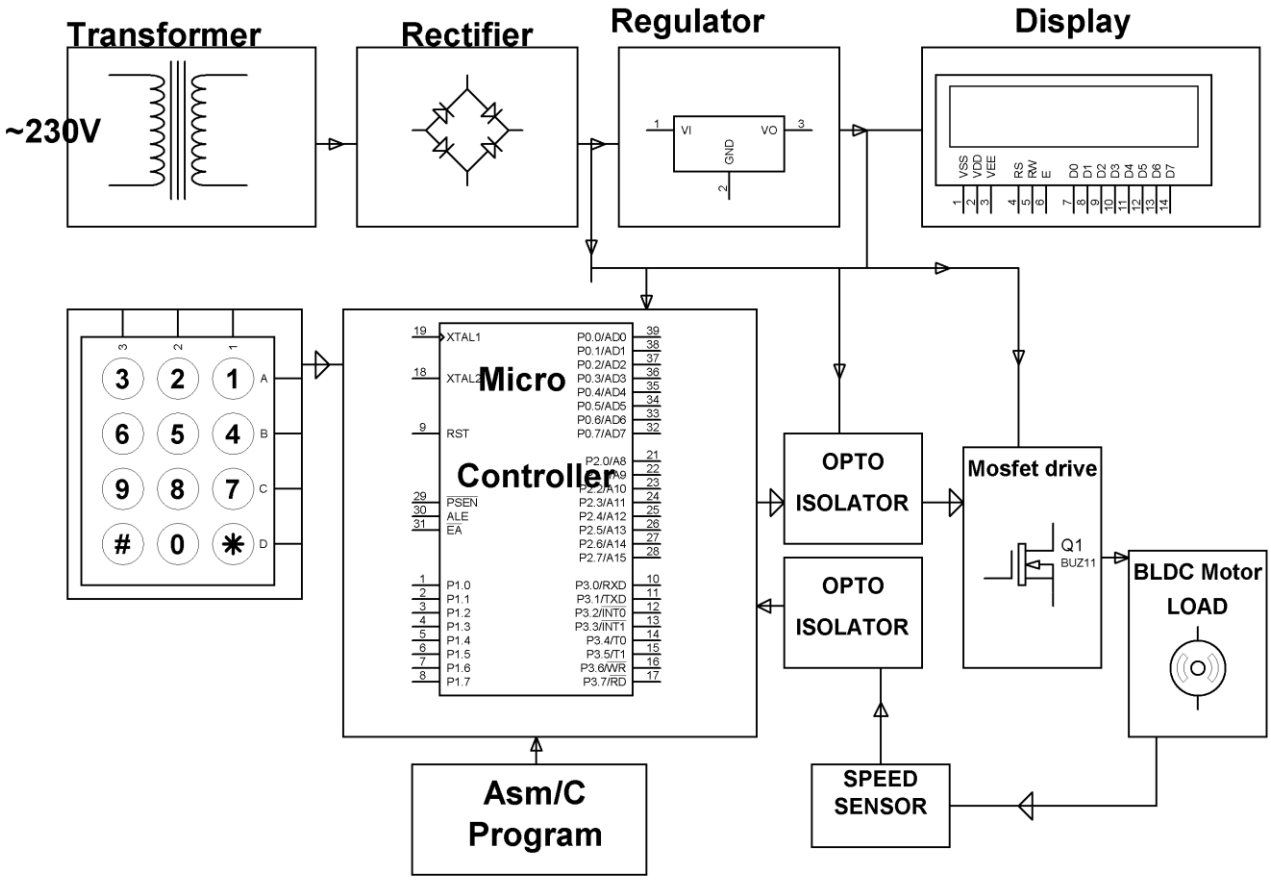


Fig 1.1 Functional Block Diagram.

A BLDC motor has permanent magnets which rotate and a fixed armature, eliminating the problems of connecting current to the moving armature. An electronic controller replaces the brush/commutator assembly of the brushed DC motor, which continually switches the phase to the windings to keep the motor turning. The controller performs similar timed power distribution by using a solid-state circuit rather than the brush/commutator system.

BLDC motors offer several advantages over brushed DC motors, including more torque per weight and efficiency, reliability, reduced noise, longer lifetime (no brush and Commutator erosion), elimination of

ionizing sparks from the commutator, more power, and overall reduction of electromagnetic interference (EMI). With no windings on the rotor, they are not subjected to centrifugal forces, and because the windings are supported by the housing, they can be cooled by conduction, requiring no airflow inside the motor for cooling. This in turn means that the motor's internals can be entirely enclosed and protected from dirt or other foreign matter. The maximum power that can be applied to a BLDC motor is exceptionally high, limited almost exclusively by heat, which can weaken the magnets. (Magnets demagnetize at high temperatures, the Curie point, and for neodymium-iron-boron magnets this temperature is lower than for other types.) A BLDC motor's main disadvantage is higher cost

2 VOLTAGE REGULATOR 7805

Features

• Output Current up to 1A.
• Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24V.
• Thermal Overload Protection.
• Short Circuit Protection.Output Transistor Safe Operating Area Protection.

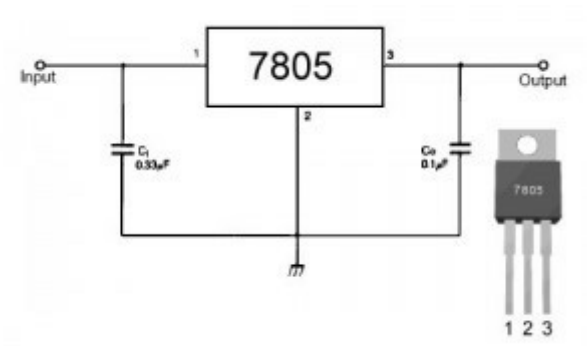


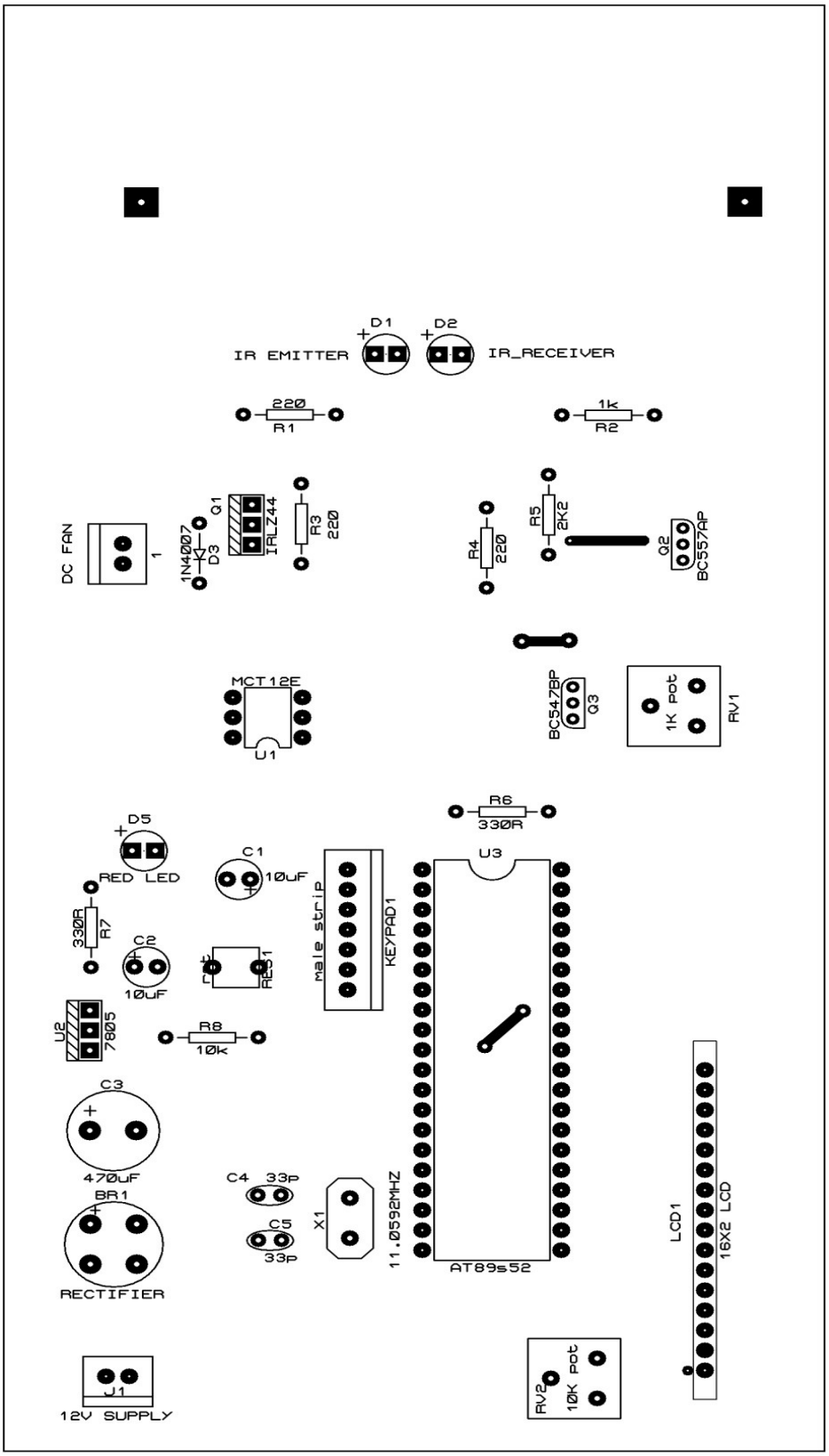
Fig 1.1 Functional. **VOLTAGE REGULATOR 7805**

3HARDWARE REQUIREMENTS

HARDWARE COMPONENTS:

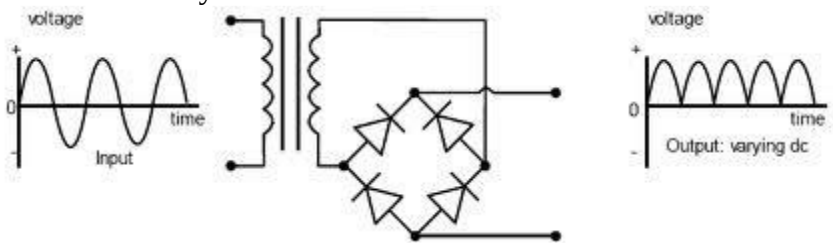
1. TRANSFORMER (230 – 12 V AC)
2. VOLTAGE REGULATOR (LM 7805)
3. FILTER
4. RECTIFIER
5. MICROCONTROLLER (AT89S52/AT89C51)
6. KEYPAD
7. LCD DISPLAY
8. IR LED
9. PHOTODIODE
10. BLDC MOTOR
11. BC547
12. 1N4007
13. LED
14. RESISTORS

4.LAYOUT DIAGRAM

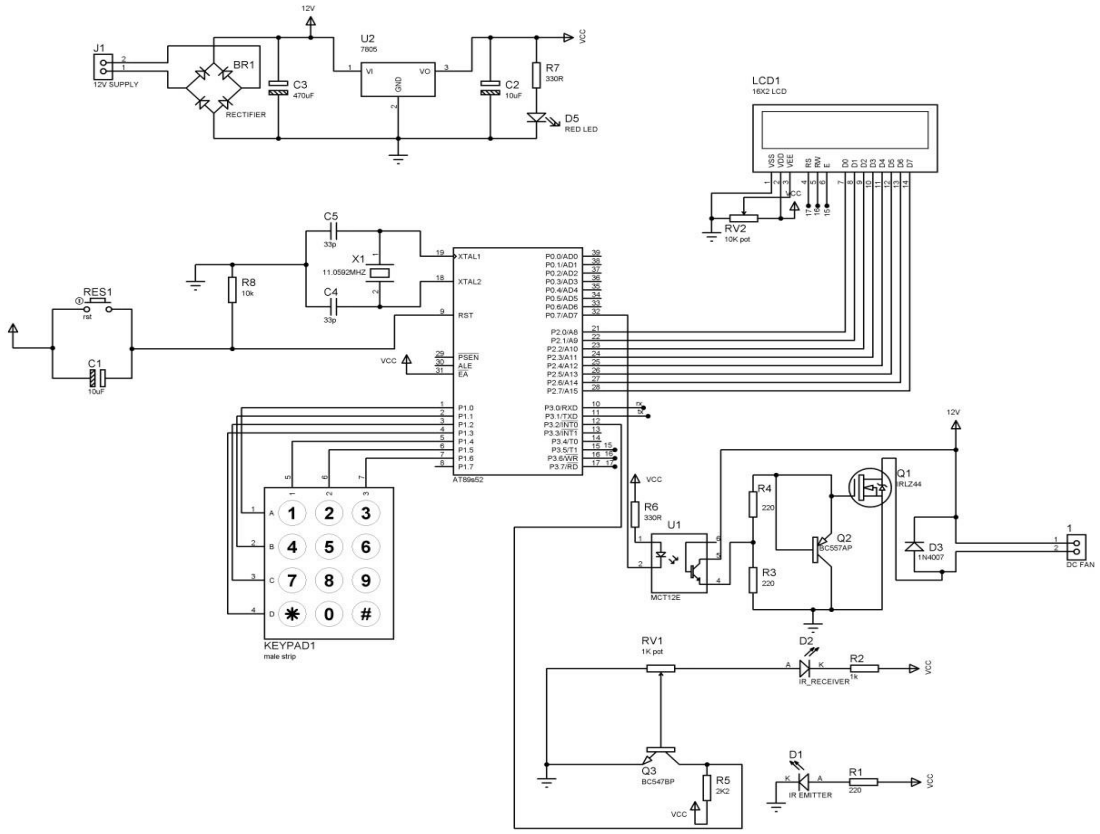


5 RECTIFIER

A rectifier is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC), current that flows in only one direction, a process known as rectification. Rectifiers have many uses including as components of power supplies and as detectors of radio signals. Rectifiers may be made of solid state diodes, vacuum tube diodes, mercury arc valves, and other components. The output from the transformer is fed to the rectifier. It converts A.C. into pulsating D.C. The rectifier may be a half wave or a full wave rectifier. In this project, a bridge rectifier is used because of its merits like good stability and full wave rectification. In positive half cycle only two diodes(1 set of parallel diodes) will conduct, in negative half cycle remaining two diodes will conduct and they will conduct only in forward bias only.



6. SCHEMATIC DIAGRAM



7.HARDWARE TESTING

7.1 CONTINUITY TEST:

In electronics, a continuity test is the checking of an electric circuit to see if current flows (that it is in fact a complete circuit). A continuity test is performed by placing a small voltage (wired in series with an LED or noise-producing component such as a piezoelectric speaker) across the chosen path. If electron flow is inhibited by broken conductors, damaged components, or excessive resistance, the circuit is "open".

Devices that can be used to perform continuity tests include multi meters which measure current and specialized continuity testers which are cheaper, more basic devices, generally with a simple light bulb that lights up when current flows. An important application is the continuity test of a bundle of wires so as to

find the two ends belonging to a particular one of these wires; there will be a negligible resistance between the "right" ends, and only between the "right" ends. This test is the performed just after the hardware soldering and configuration has been completed. This test aims at finding any electrical open paths in the circuit after the soldering. Many a times, the electrical continuity in the circuit is lost due to improper soldering, wrong and rough handling of the PCB, improper usage of the soldering iron, component failures and presence of bugs in the circuit diagram. We use a multi meter to perform this test. We keep the multi meter in buzzer mode and connect the ground terminal of the multi meter to the ground. We connect both the terminals across the path that needs to be checked. If there is continuation then you will hear the beep sound.

7.2 POWER ON TEST:

This test is performed to check whether the voltage at different terminals is according to the requirement or not. We take a multi meter and put it in voltage mode. Remember that this test is performed without microcontroller. Firstly, we check the output of the transformer, whether we get the required 12 v AC voltage. Then we apply this voltage to the power supply circuit. Note that we do this test without microcontroller because if there is any excessive voltage, this may lead to damaging the controller. We check for the input to the voltage regulator i.e., are we getting an input of 12v and an output of 5v. This 5v output is given to the microcontrollers' 40_{th} pin. Hence we check for the voltage level at 40_{th} pin. Similarly, we check for the other terminals for the required voltage. In this way we can assure that the voltage at all the terminals is as per the requirement.

8. CONCLUSION

This project of **CLOSED LOOP FEEDBACK OPERATED MOTOR SPEED CONTROL** is a cost effective, practical, eco friendly and the safest way to save energy. Now-a-days electronics is becoming very popular in automated world because everything in the life was being automated to meet the human requirements. Here in this project we are designing a product which is automated in measuring the speed of motor rotating with high frequency using a Remote IR module which is being kept on the either sides of the motor shaft. This IR module will interrupt the micro controller which acts as the main heart of the project. By that action of the IR module with the controller at a time being is measured and the result is displayed on the LCD.

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