

Electrical Hybrid Street light with security and maintenance alert

Vidya Niketan Institute of Engineering & Technology, Nagpur
Shubham R. Shukla, Vinay D. Kadu, Pranav P. Ghormade.

Abstract - This paper aims at designing and executing the advanced development in energy saving of street lights and controlling. This project provides the auto switching facility which makes project smart. It means when any problem occurred with battery then it auto switch to thermal supply.

This paper gives the best solution for electrical power wastage. Also the manual operation of the lighting system is completely eliminated. In this paper the sensor Surface Mount Magnetic Contact with Terminals is use for battery security. In this project we provide a parallel connection to lights in this common circuitry (battery & solar-plate) is use because of that the installation cost of street light is reduces.

The microcontroller 8051 is used as brain to control the street light system, where the programming language used for developing the software to the microcontroller is C-language. Finally, the system has been successfully designed and implemented

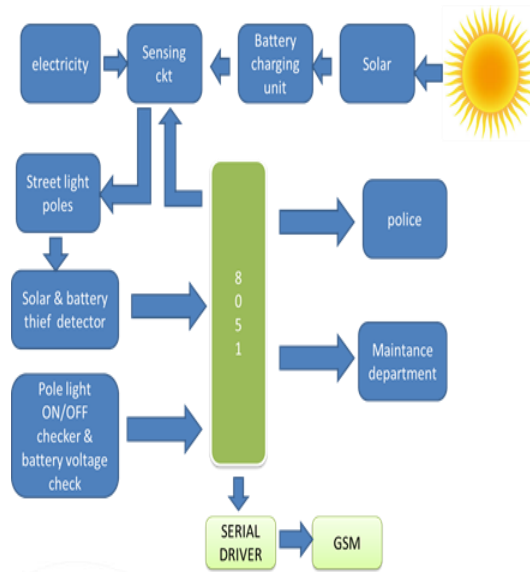
I. INTRODUCTION

The project is designed for LED based street lights with auto intensity control using solar power from photovoltaic cells. As awareness for solar energy is increasing, more and more individuals and institutions are opting for solar energy. Photovoltaic panels are used for charging batteries by converting the sunlight into electricity. A charge controller circuit is used to control the charging. Intensity of street lights is required to be kept high during the peak hours. As the traffic on the roads tends to decrease slowly in late nights, the intensity can be reduced progressively till morning to save energy. Thus, the street lights Switch ON at the dusk and then switch OFF at the dawn automatically. The process repeats every day.

High Intensity Discharge lamps (HID) used for urban street light are based on principle of gas discharge, thus the intensity is not controllable by any voltage reduction method as the discharge path is broken. LED lights are the future of lighting, because of their low energy consumption and long life they are fast replacing conventional lights world over... The intensity control helps in saving energy during late nights while traffic density on the streets is low.

A programmable microcontroller of 8051 family is engaged to provide different intensities at the different times of night using PWM technique, for energy saving for solar based system, using a charge controller for battery charging, overload and deep discharge protection. It automatically shifts to electricity when solar panel batteries completely discharge. It has maintenance system controller unit detect the light fuse if it found then it send the message to NMC pole number. If any theft found due sensor then controller unit automatically send the alert message to the patrolling police with pole number.

II. BLOCK DIAGRAM



III. HARDWARE REQUIREMENTS

1. TRANSFORMER:-

Transformers convert AC electricity from one voltage to another with a little loss of power. Step-up transformers increase voltage, step-down transformers reduce voltage. Most power supplies use a step-down transformer to reduce the dangerously high voltage to a safer low voltage.

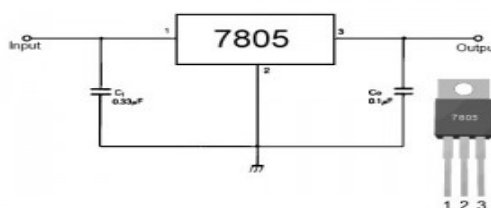


The input coil is called the primary and the output coil is called the secondary. There is no electrical connection between the two coils; instead they are linked by an alternating magnetic field created in the soft-iron core of the transformer. The two lines in the middle of the circuit symbol represent the core. Transformers waste very little power so the power out is (almost) equal to the power in. Note that as voltage is stepped down and current is stepped up.

2. VOLTAGE REGULATOR 7805:-

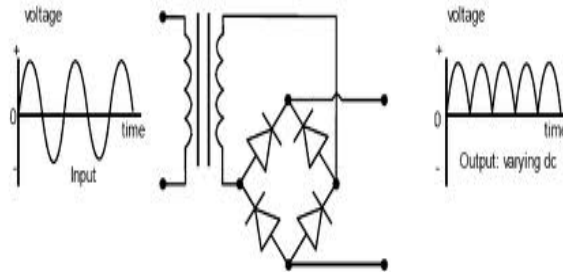
Features

- 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.

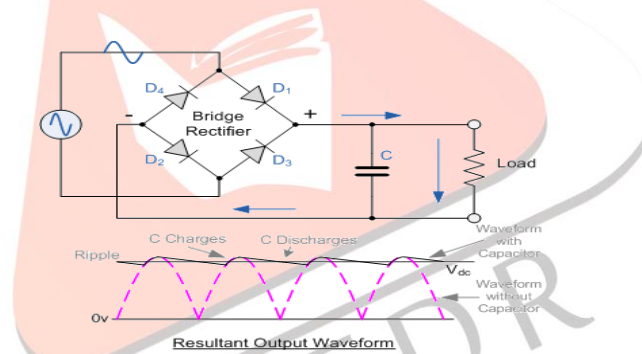


The LM78XX/LM78XXA series of three-terminal positive regulators are available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a Wide range of applications. Each type employs internal current limiting, thermal shutdown and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output Current.

3. RECTIFIER & FILTER:-

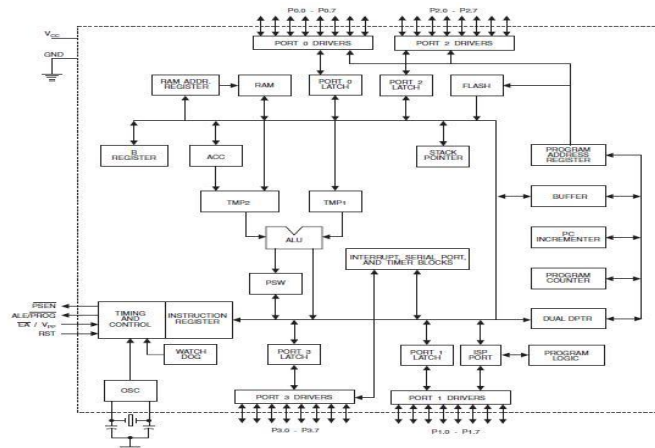


A rectifier is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC), current that flows in only one direction, a process known as rectification. Rectifiers have many uses including as components of power supplies and as detectors of 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.



Capacitive filter is used in this project. It removes the ripples from the output of rectifier and smoothens the D.C. Output received from this filter is constant until the mains voltage and load is maintained constant. However, if either of the two is varied, D.C. voltage received at this point changes. Therefore a regulator is applied at the output stage.

4. MICROCONTROLLER AT89S52:-



Features:

- 32 Programmable I/O Lines
- Three 16-bit Timer/Counters
- Eight Interrupt Sources
- Full Duplex UART Serial Channel
- Low-power Idle and Power-down Modes
- Interrupt Recovery from Power-down Mode
- Watchdog Timer
- Dual Data Pointer
- Power-off Flag

PIN DESCRIPTION:

I. **VCC** Supply voltage.

II. **GND** Ground.

III. Port 0

Port 0 is an 8-bit open drain bi-directional I/O port. As an output port, each pin can sink eight TTL inputs. In this mode, P0 has internal pull-ups. Port 0 also receives the code bytes during Flash programming and outputs the code bytes during program verification. External pull-ups are required during program verification.

IV. Port 1

Port 1 is an 8-bit bi-directional I/O port with internal pull-ups. The Port 1 output buffers can sink/source four TTL inputs. When 1s are written to Port 1 pins, they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 1 pins that are externally being pulled low will source current (IIL) because of the internal pull-ups. Port 1 also receives the low-order address bytes during Flash programming and verification. Port Pin Alternate Functions

P1.5	MOSI	In-System Programming
P1.6	MISO	In-System Programming
P1.7	SCK	In-System Programming

I. Port 2

Port 2 is an 8-bit bi-directional I/O port with internal pull-ups. The Port 2 output buffers can sink/source four TTL inputs. Port 2 emits the contents of the P2 Special Function Register. Port 2 also receives the high-order address bits and some control signals during Flash programming and verification.

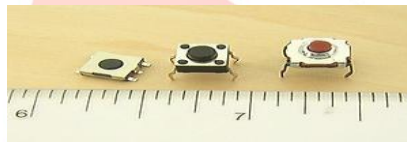
II. Port 3

Port 3 is an 8-bit bi-directional I/O port with internal pull-ups. The Port 3 output buffers can sink/source four TTL inputs.

P3.0	RXD (serial input port)
P3.1	TXD (serial output port)
P3.2	INT0 (external interrupt 0)

P3.3	INT1 (external interrupt 1)
P3.4	T0 (timer 0 external input)
P3.5	T1 (timer 1 external input)
P3.6	WR (external data memory write strobe)
P3.7	RD (external data memory read strobe)

5. PUSH BUTTONS:-



A push-button (also spelled pushbutton) or simply button is a simple switch mechanism for controlling some aspect of a machine or a process. Buttons are typically made out of hard material, usually plastic or metal. The surface is usually flat or shaped to accommodate the human finger or hand, so as to be easily depressed or pushed. Buttons are most often biased switches, though even many un-biased buttons (due to their physical nature) require a spring to return to their un-pushed state. Different people use different terms for the "pushing" of the button, such as press, depress, mash, and punch

6. DIODES:-

Diodes are used to convert AC into DC these are used as half wave rectifier or full wave rectifier. Three points must be kept in mind while using any type of diode.

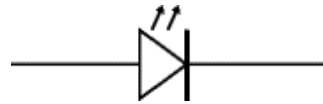
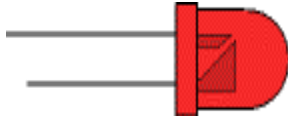
1. Maximum forward current capacity
2. Maximum reverse voltage capacity
3. Maximum forward voltage capacity



7. LED:-

LEDs are semiconductor devices. Like transistors, and other diodes, LEDs are made out of silicon. What makes an LED give off light are the small amounts of chemical impurities that are added to the silicon, such as gallium, arsenide, indium, and nitride.

When current passes through the LED, it emits photons as a byproduct. Normal light bulbs produce light by heating a metal filament until it is white hot. LEDs produce photons directly and not via heat, they are far more efficient than incandescent bulbs.



8. RESISTORS:-

A resistor is a two-terminal electronic component designed to oppose an electric current by producing a voltage drop between its terminals in proportion to the current, that is, in accordance with Ohm's law:

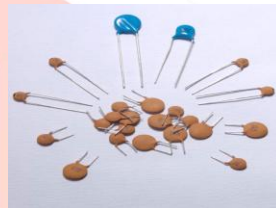
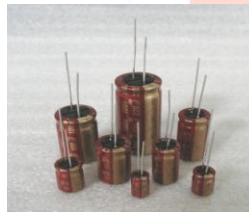
$$V = IR.$$

Resistors can be integrated into hybrid and printed circuits, as well as integrated circuits. Size, and position of leads (or terminals) are relevant to equipment designers; resistors must be physically large enough not to overheat when dissipating their power



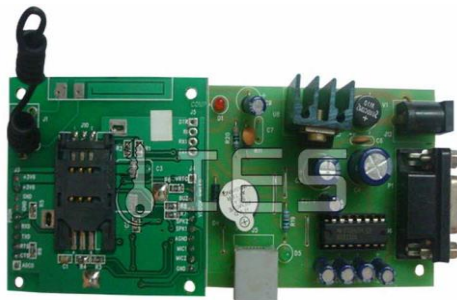
9. CAPACITOR:-

A capacitor or condenser is a passive electronic component consisting of a pair of conductors separated by a dielectric. When a voltage potential difference exists between the conductors, an electric field is present in the dielectric. This field stores energy and produces a mechanical force between the plates. The effect is greatest between wide, flat, parallel, narrowly separated Conductors.



10. GSM SIM 300:

The Modem is designed with RS232 Level converter circuitry, which allows you to directly interface PC Serial Port. This GSM/GPRS RS232 Modem is having Internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS as Well as DATA transfer application in M2M interface



The modem needed only 3 wires (TX, Rx, and GND) except Power supply to interface with Microcontroller/Host PC. The built in Low Dropout Linear voltage regulator allows you to Connect wide range of unregulated power supply (4.2V -13V). Using this modem, you will be able to send & Read SMS, connect to internet via GPRS through simple AT commands.

Features:

- High Quality Product (Not hobby grade)
- Quad-Band GSM/GPRS
- 850/ 900/ 1800/ 1900 MHz
- Built in RS232 Level Converter (MAX3232)
- Configurable baud rate
- SMA connector with GSM L Type Antenna.
- Built in SIM Card holder.
- Inbuilt Powerful TCP/IP protocol stack for internet data transfer over GPRS.
- Audio interface Connector
- Normal operation temperature: -20 °C to +55 °C
- Input Voltage: 5V-12V DC

11. LM358 :-



Description

The LM2904, LM358/LM358A, LM258/LM258A consist of two independent, high gain, internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltage. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. Application areas include transducer amplifier, DC gain blocks and all the conventional OP-AMP circuits which now can be easily implemented in single power supply systems.

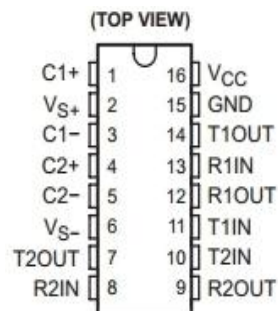
12. MAX232:-

Description

The MAX232 is a dual driver/receiver that includes a capacitive voltage generator to supply TIA/EIA-232-F voltage levels from a single 5-V supply. Each receiver converts TIA/EIA-232-F inputs to 5-V TTL/CMOS levels.

These receivers have a typical threshold of 1.3 V, a typical hysteresis of 0.5 V, and can accept ± 30 -V inputs.

Each driver converts TTL/CMOS input levels into TIA/EIA-232-F levels. The driver, receiver, and Voltage-generator functions are available as cells in the Texas Instruments Liassic library.



Features:

1. Operates From a Single 5-V Power
2. Supply with 1.0F Charge-Pump
3. Capacitors Operates up to 120 Kbit/s.
4. Two Drivers and Two Receivers ± 30 -V Input Levels
5. Low Supply Current . . . 8 mA
6. Applications - TIA/EIA- 232F, Battery Powered Systems, Terminals, Modems, and Computers.

IV. SOFTWARE REQUIREMENTS

1. Kiel Micro Vision (Ide)
2. Compiler
3. Cross Compiler
4. Kiel C Cross Compiler
5. Building An Application In μ vision2
6. Creating Your Own Application In μ vision2
7. Debugging An Application In μ vision2
8. Starting μ vision2 And Creating A Project
9. Window – Files
10. Building Projects And Creating A Hex Files
11. Cpu Simulation
12. Database Selection
13. Start Debugging
14. Disassembly Window
15. Embedded C

V. CONCLUSION

This paper elaborates the design and construction of automatic street control system circuit. Circuit works properly to turn street lamp ON/OFF. After designing the circuit which controls the light of the street as illustrated in the previous sections. LDR sensor, the Theft prevent sensor mean magnet sensor, Automatic switching circuit means hybrid system are the two main conditions in working the circuit. If the two conditions have been satisfied the circuit will do the desired work according to specific program. Each sensor controls the turning ON or OFF the lighting column. The street lights have been successfully controlled by microcontroller. With commands from the controller the lights will be ON in the places of the movement when it's dark. Furthermore the drawback of the street light system using timer controller has been overcome. Finally this control circuit can be used in long roadways between the cities.

If theft found it sends the message to police if theft found and it reduce the solar panel and battery theft. It drives whole system on battery until discharge and reduces CO2 emission.

VI. REFERENCE

- [1] W.-K. Chen, *Linear Networks and Systems*, Belmont, CA: Wadsworth, 1993, pp. 123-135.
- [2] H. Poor, *an Introduction to Signal Detection and Estimation*; New York: Springer-Verilog, 1985, Ch. 4.
- [3] R. A. Schultz, "The Spread Spectrum Concept," in *Multiple Access*, N. Abramson, Ed. Piscataway, NJ: IEEE Press, 1993, Ch. 3, pp. 121-123.