Suntime

Sneha Kopallu

April 4,2015

Abstract

Suntime switch knows the sunset and sunrise timings and can switch the lamps on exact timing. The Suntime switch is easy to install. You will find all the technical details in this document.

1 Introduction

Suntime is developed at Techno e School, Talegaon. Suntime unit switches the lamps on exact sunset and sunrise timings. This unit does not use any sensor. RTC chip gives Suntime a sense of time and the sunset and sunrise timings of 53 weeks are stored in the memory of micro-controller.

Suntime unit mainly consists of micro-controller, RTC and relay. RTC is Real Time Calendar/clock IC. RTC counts seconds,minutes,hours,date of the month,month,day of the week and year with leap year compensation valid up to 2100.

Micro-controller retrives current date and time from RTC. From this information it finds standard sunset and sunrise timings for that day which are stored in flash memory of micro-controller. Then current time is compared with standard sunset and sunrise timings and accordingly lamps are switched ON or OFF.

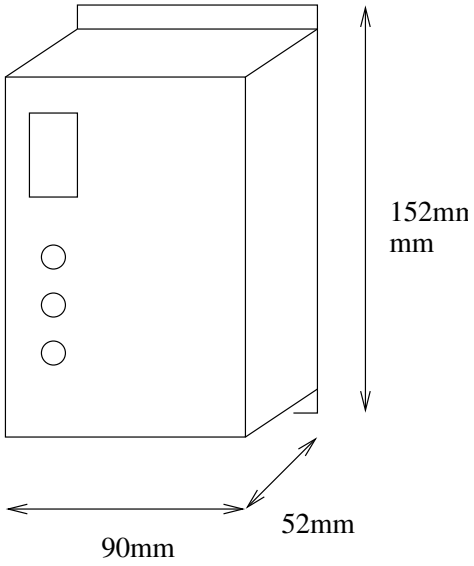
2 Features

Some main features are listed below:

- Compact and light weight
- Easy to install
- Use of RTC(Real Time Calendar/clock) and AVR micro-controller
- Bypass switch
- Indicator LEDs

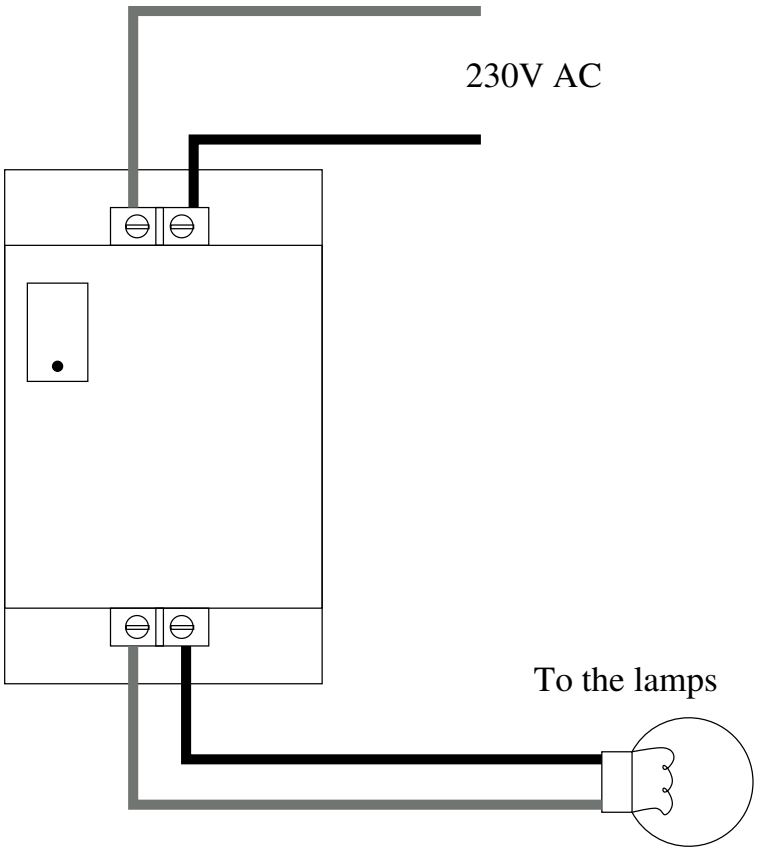
2.1 Compact and light weight

The simple design makes the Suntime unit very compact and light weight. Transformer, Suntime PCB, Relays and connectors are the main components.



2.2 Easy to install

As the Suntime is compact and light weight, it is easy to install and use. While installing,there is no need to open the suntime box. Two connectors are provided on the Suntime box. One for input 230 volts and other is for output controlled by Suntime. The following connection diagram will help you to install the Suntime.



2.3 Use of RTC(Real Time Calendar/clock) and AVR micro-controller

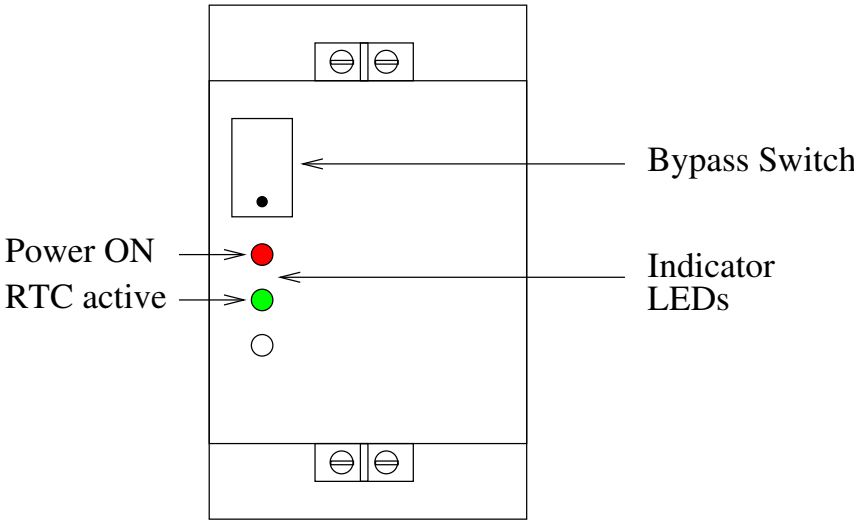
RTC DS1307 and AVR controller ATmega8 is used in Suntime. RTC is initialized with the current date and time.Battery CR2032 is connected to DS1307. The DS1307 has a built-in power sense circuit that detects power failures and automatically switches to the battery supply. Hence, the RTC can update the time even though the powerfail occurs.

AVR micro-controller ATmega8 is used in suntime. ATmega8 has two pins dedicated to I2C protocol. AVR communicates with RTC on these two pins to access the current date and time.

2.4 Bypass switch

suntime unit has a bypass switch to switch ON the lamps at any time. When bypass switch is in ON state,it bypasses the suntime unit and switches ON the lamps even during the day time.That means lamps will not be controlled by suntime unit When you switch OFF the bypass switch, the suntime will

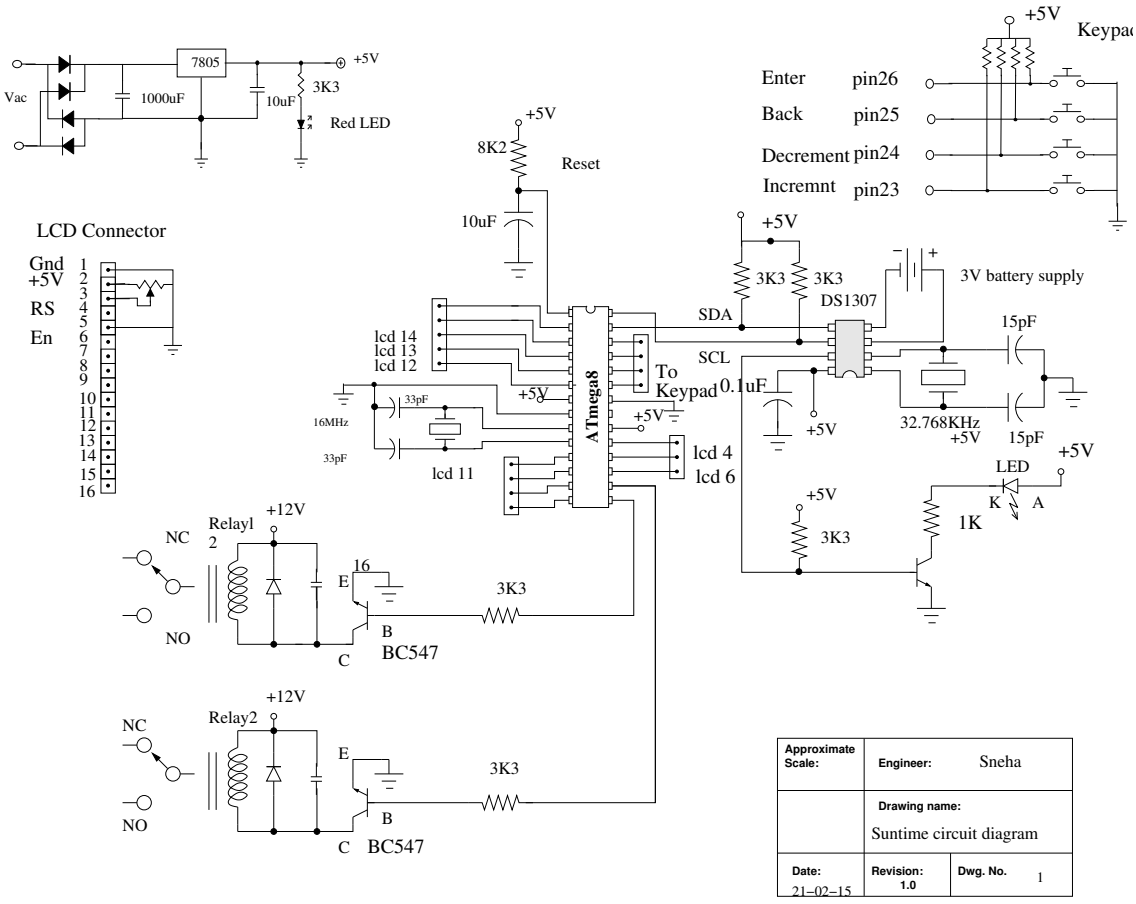
controll the lamps. For automatic switching of lamps on sunset and sunrise timings, bypass switch must be in OFF state.



2.5 Indicator LEDs

There are two LEDs on your suntime unit.The red LED is for power ON indication. The green LED keeps blinking and it indicates that your sutime unit is working properly.

3 Hardware



4 Source code

The application is developed in Arduino language.

Source code is available at `http://technoeschool.in/micro/announcement.html`

5 Material List

Sr.No.	Component	Specificaitions	Quantity
1	battery	CR2032	1
2	Battery Socket	CR2032	1
3	Capacitor	1000uF/25V	1
4	Capacitor	10uF/63V	2
5	Capacitor	33pF	2
6	Capacitor	15uF	2
7	Capacitor	0.1uF	3
8	Resistor	3K3	6
9	Resistor	8K2	1
10	Resistor	1K	1
11	Diode	1N4007	6
12	LED	Red 5mm	1
13	LED	Green 5mm	1
14	Transistor	BC547	3
15	Crystal	16MHz	1
16	Crystal	32.768KHz	1
17	Relay	SC5-S-DC12	1
18	IC	ATmega8	1
19	IC	DS1307	1
20	IC	7805	1
21	IC Socket	28pin	1
22	IC Socket	8 pin	1
23	Connector	3 pin PCB mount	2
24	connector	2 pin relimate	3
25	Transformer	230/7.6V,200mA	1
25	PCB	80*75mm	1
26	Switch	Double pole switch(22*16)mm	1
27	Suntime Box	152*90*52	1

6 PCB Layout

PCB is available at `http://technoeschool.in/micro/announcement.html`

7 Limitations

- CR2032 need to be changed after two or three years.
- RTC has to be reinitialize, if the green LED on the Suntime unit doen't blink.
- Two to five minutes error in sunset and sunrise timings since the sunset and sunrise timings are considered as per week, instead of per day.

if you are interested in this open source project, feel free to discuss
at the Forum on `http://technoeschool.in/micro/forum`