LED Emergency Light
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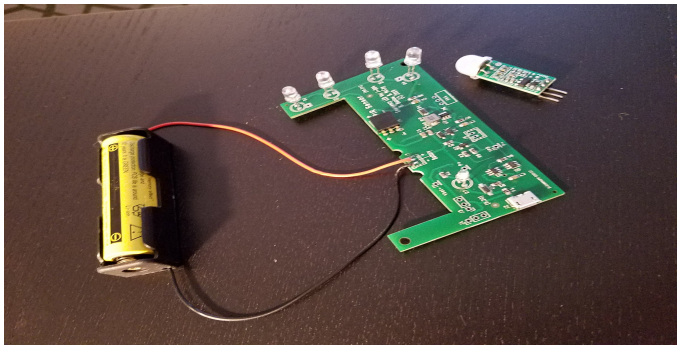


Shown with Optional PIR Motion Sensor

Abstract

This is a dual purpose emergency light kit. It is a battery operated unit which provides features during normal AC operation and as well as automatically providing light during a power outage.

Modes:

- Night Light
  A single LED illuminates when the unit is supplied with power from a standard USB charger. This can be either a bright or dim LED (bright white LED provided). The LED can be omitted.
- Power Out Light
  When power is removed, the unit switches to battery power and automatically illuminates a string of 4 bright white LEDs. These may be oriented in any manner by the user, depending on the mounting arrangement and placement.
- Motion Detector (optional)
  A standard PIR motion sensor can be installed which will operate the 4 LEDs for approximately 10 seconds.

The battery is a standard Li 18650 which provides HOURS of continuous operation when power is lost.

Circuit Description

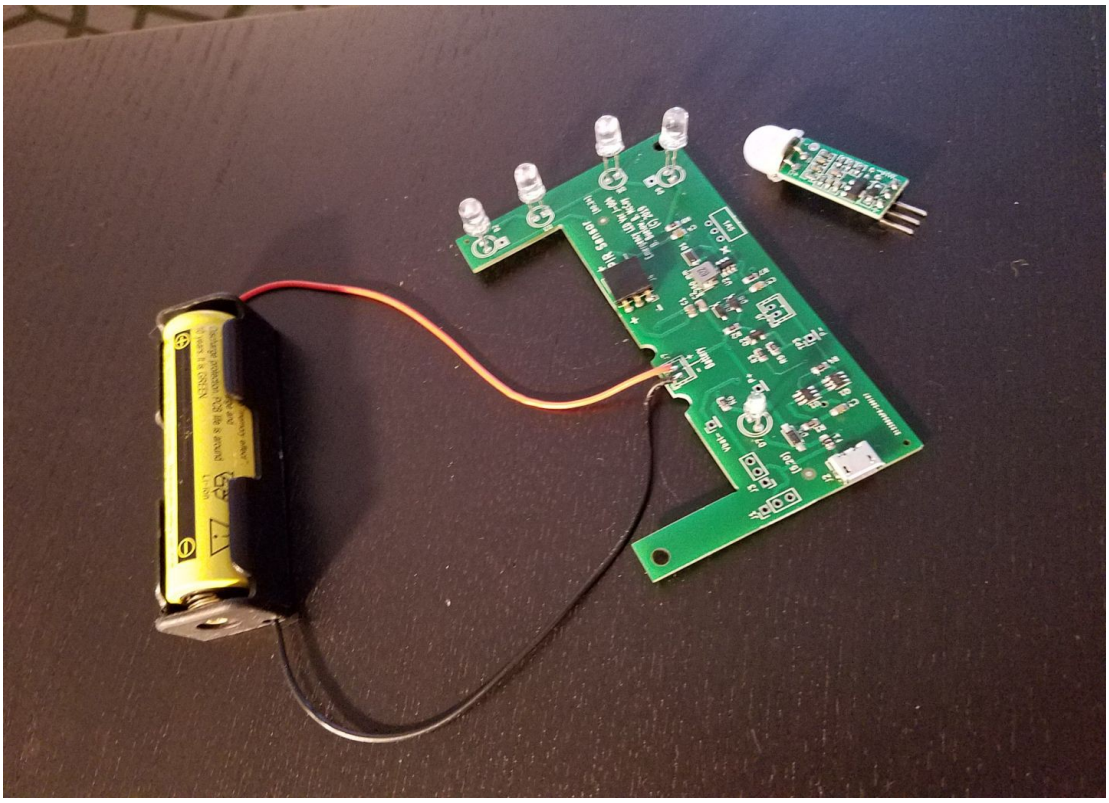
The circuit is design and built using SMD. This miniaturizes the implementation.

The use of a Li battery requires a management device which is a simple IC to monitor and prevent over-charge and over discharge. Today, this is a small simple 6 pin device. In order to operate the string of LEDs a small LED driver IC is used to step the battery voltage up and generate the voltage necessary to provide 20mA of LED current.

User Assembly

The PCB is supplied with ALL SMD FULLY ASSEMBLED. The user only needs to install 5 LEDs.

The orientation of the LED pins is that the LONG LEG of the LED goes into the ROUND hole in the PCB. 2 of the locations have multiple Square holes. This is to allow the LED to be mounted at either 0 or 90 degrees.



Shown with Optional PIR Motion Sensor

User assembly is simple and only requires installing 5 LEDs.

WAIT – DON'T DO ANYTHING!

Remove the 18650 battery from the holder and place the battery aside.

You need to decide where the unit will be mounted, then determine both the amount of light and the direction of the LEDs.

1. If the unit is mounted under a kitchen cabinet, the LEDs can be oriented to shine horizontally to cover a wide area or vertically to illuminate the counter top.

   Vertical LED orientation (pointing down) is less annoying if the light is mounted above head height when seated.

2. Similarly, if the PCB is mounted vertically, the LEDs can point outward or down.

Also, the 2 LEDs on the end of the PCB can be turn to point to the sides. Use the alternate square hole to mount the LED rotated 90 degrees from the center pair of LEDs.

After determining the light placement and best LED orientation, preform the LED leads by bending the

leads as desired. It is best to have about 0.5 inches of lead length between the LED and the PCB. This will allow the LED to be moved around when installing the PCB in the plastic case.

Install the 4 LEDs with orientation as desired. Solder and clip the leads.

Install the Nightlight LED. Solder and clip the leads.

Install the battery holder (no battery installed – yet) by soldering the Red (+) & Black (-) leads to the PCB.

Carefully inspect the entire assembly to ensure there are no shorts and that the batter wires (polarity) is correct.

Attach a charger to the USB connector. The single Nightlight LED should illuminate.

Disconnect the USB charger.

Install the battery.

Testing

1. Apply power by attaching a USB charger. Observe the Nightlight is illuminated.
2. Remove power and observe:

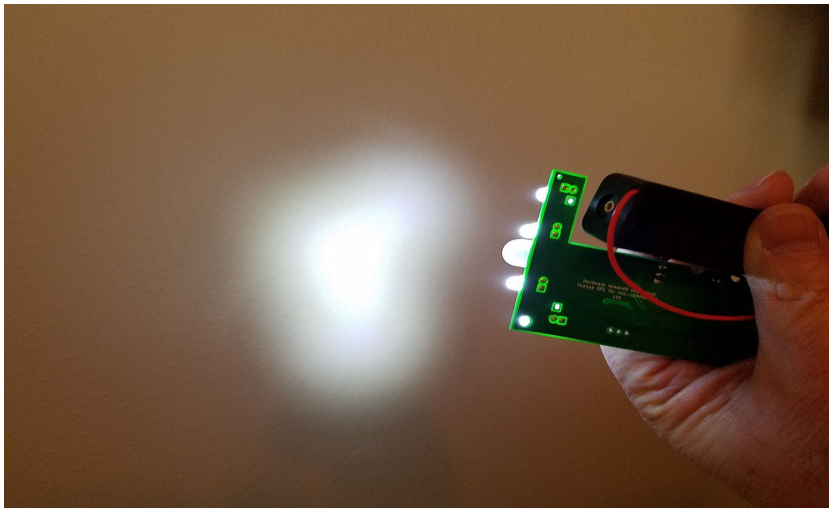
   The Nightlight is extinguished and

   The main LEDs illuminate.

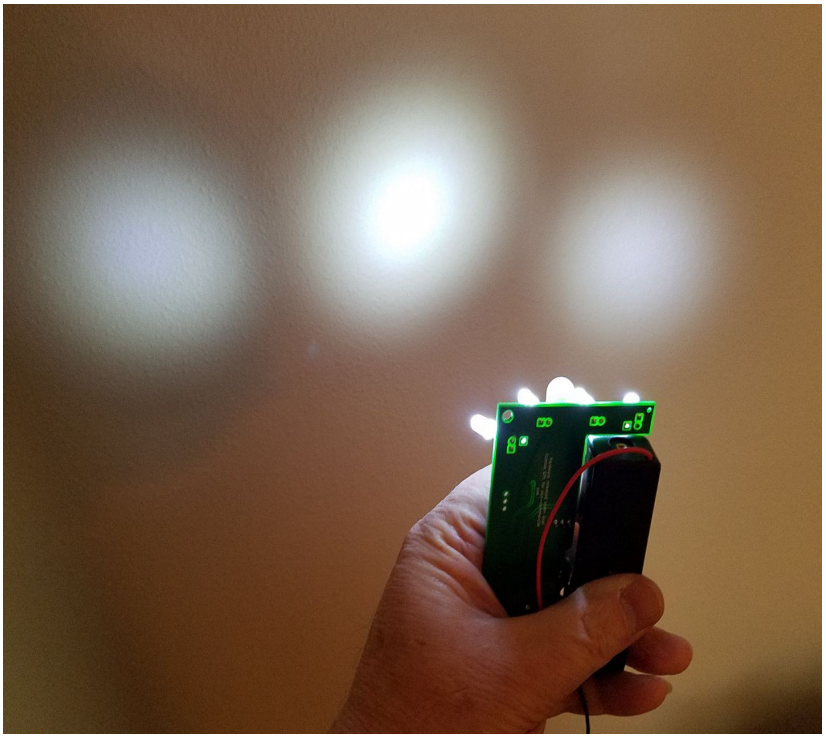
If the optional PIR Motion Sensor is to be used:

1. Remove USB charger
2. Remove the battery
3. Install the Sensor – be sure to check to polarity of the connector
4. Reinstall the battery. The LEDs may illuminate.
5. Apply USB power. The LEDs may be illuminated. Place the assembly so it will not detect a heat source like a person or appliance. Wait 10-30 seconds. The main LEDs should extinguish.

Move your hand in front of the sensor and the LEDs should illuminate. Repeated motion may result in the sensor “retriggering” and illuminating the LEDs. Allow it to timeout and it should operate normally.



Example light pattern with all LEDs aligned.



Example light pattern with end LEDs angled out slightly.
LEDs can be oriented 90 degrees in 2 axis.

There is also a LED for the Night Light feature. This LED is illuminated any time that charging power is available. If this LED is NOT illuminated when the AC power is available, there has been a failure of either the charger, the USB connection to the light or an internal failure in the light assembly.

Drill the Case

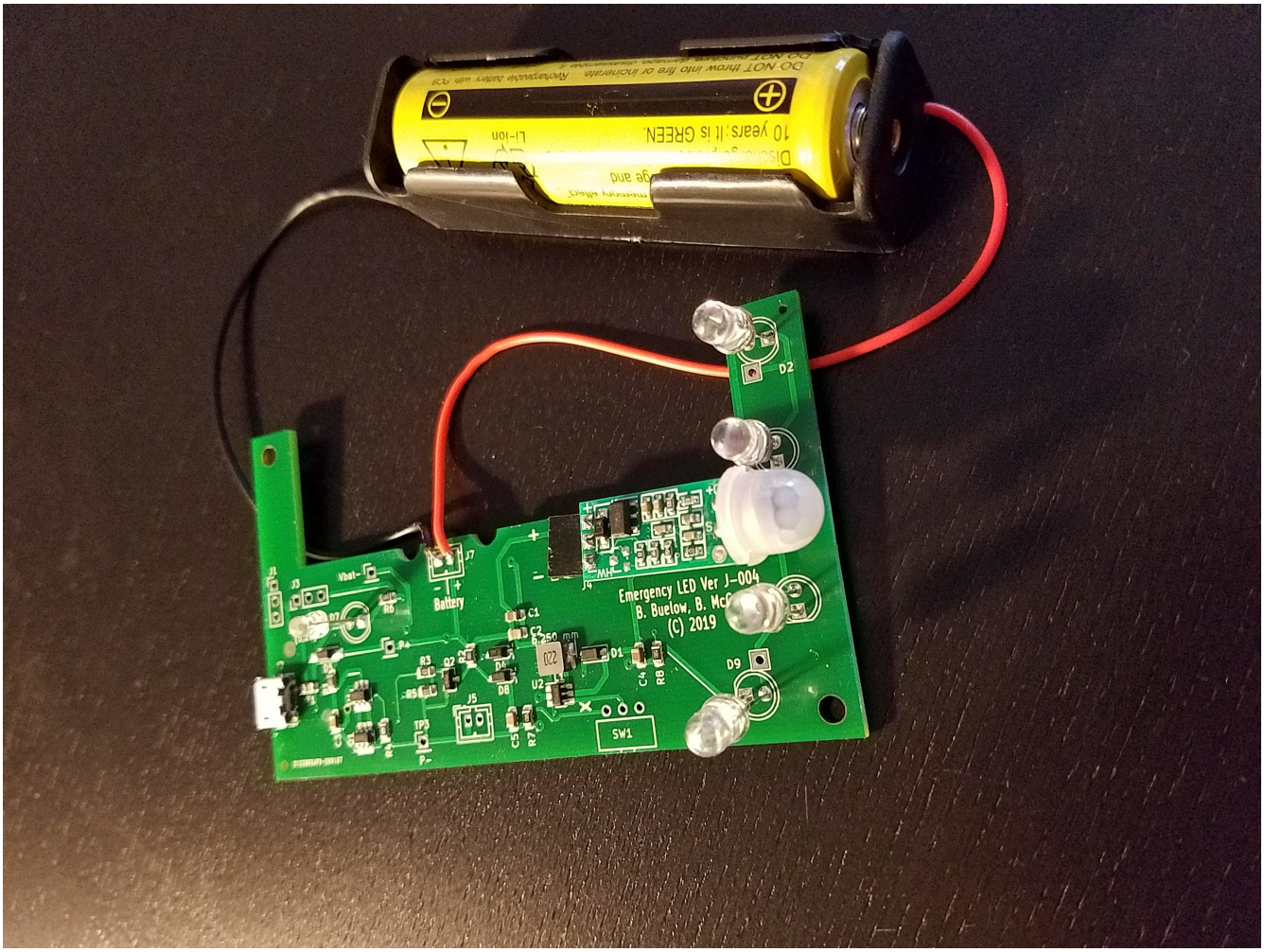
If a case is used, drill 0.25 inch diameter holes for the 4 LEDs. This may be in the case side walls or the lid.

Note the case is soft and needs to be carefully backed with a scrap piece of wood to prevent cracking

the case.

PIR Motion Sensor

If you purchased the Motion Sensor option, then install the 3 pin female connector. The sensor has pins that plug into the socket. LOOK AT THE PINS and orient the Sensor PCB to maintain proper polarity. The sensor MAY BE DAMAGED if installed incorrectly.



The PIR sensor installs with the components facing up (as shown in the photo).

The case requires a hole about 0.5” diameter for the sensor. Most of the dome should be exposed to view the area of interest. This sensor works regardless of ambient light so you will know that the device is alive and charging when the LEDs activate.

Since the plastic case is very soft, a 0.25” hole can be enlarged with an xacto or other sharp knife.

BE CAREFUL WITH SHARP KNIVES

Troubleshooting

Problem	Diagnosing	Possible Cause
Charging LED not illuminated	Check to see if the charger and cable will charge a cell phone. Use a different charger on the light.	Wall charger, Cable to light assembly Light assembly
White LEDs not illuminating – NO PIR	If single night light led is illuminated, this is proper operation	Light unit is charging.
White LEDs not illuminating – NO PIR	Remove charging power, LEDs should illuminate	Battery or light assembly
Not detecting motion	LEDs illuminate if charging is removed	PIR sensor
Not detecting motion	LEDs do NOT illuminate if charging is removed	Battery or light assembly