



How to Choose an LED Light Bulb

You've decided it's time to purchase some LED light bulbs, but with all the different types available, you're confused about which will be the right one for you. The great news is that almost everything you need to know is right on the package – you just need to take a couple of minutes to understand what it all means.

There are various characteristics to consider when buying an LED bulb: **efficacy**, **cost**, **rated life and warranty**, **brightness**, **color appearance**, and **lighting purpose** (**dimmiability** and **color rendering index**).

Luminous Efficacy

You probably already realize that LEDs are extremely efficient bulbs, but how do you compare efficiencies? For light bulbs, you can determine how efficient a light bulb is at giving off light by examining its luminous efficacy. This is determined by dividing the lumens by the number of watts. For example, a 60-watt incandescent bulb that provides 850 lumens has a luminous efficacy of 14 lumens per watt. This means, for every watt of power that goes into the bulb, you are getting 14 lumens of light. For an LED that provides 800 lumens and uses 8.5 watts, the luminous efficacy is 94 lumens. That's nearly 7 times more! Although you won't see the luminous efficacy printed on the packaging, you can quickly calculate it based on the lumens and watts shown, allowing you to do this for any light bulb.

Cost

It's important to remember the purchase cost of the LED should not be the primary consideration. While incandescent bulbs might be cheaper to purchase than LEDs, they also don't last as long (see the section on rated life below). An LED might last ten years, while the incandescent lasts a single year. This often makes the purchase cost of multiple incandescent bulbs greater than purchasing a single LED.

And that's just the initial cost. The majority cost of a light bulb comes from its energy use, so when you consider the energy costs, LEDs become even cheaper. For more information, take a look at our "[LED Light Bulbs fact sheet](#)," where we show that operating four incandescent bulbs for 10 years costs \$332.44, or \$83.11 for a single incandescent bulb. The operating cost for four LED bulbs over 10 years is \$47.10, or \$11.78 for a single bulb.

Rated Life and Warranty

The rated life for all bulbs can be found on the package, as shown in **Figure 1**. When comparing one bulb to another, rated life can be used to judge cost of the light bulb over time and to see if the bulbs are comparable. As discussed above, the light bulb with the shorter rated life will need to be replaced more often. This will increase the purchase price of that bulb compared to the one with the longer life.

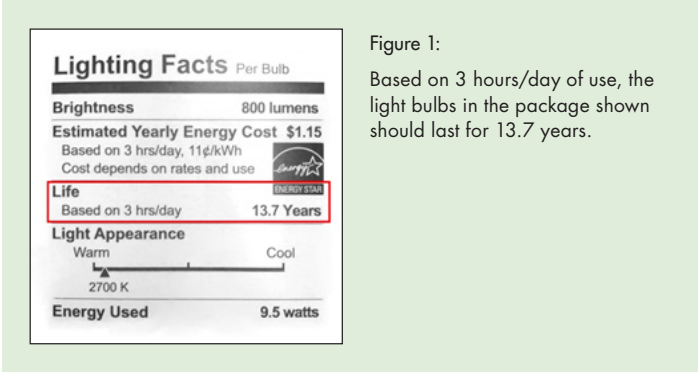


Figure 1: Based on 3 hours/day of use, the light bulbs in the package shown should last for 13.7 years.

Warranty is a factor closely associated with the rated life – it speaks to how confident the manufacturer is in the quality and life of its light bulbs. A common warranty period for LEDs is one year, although you can also typically find LEDs with 3 to 5-year warranties. If the cost, life, and lumens of two light bulbs are all similar, you may consider choosing one over the other based on its warranty.

As an example of how the warranty works, if you have a light bulb with a 5-year warranty and it stops working after four years, **DO NOT BUY ANOTHER BULB TO REPLACE IT.** You can go to the manufacturer to get a refund. Make sure you save the receipt and the universal product code (UPC) on the package. One easy way to tell how long you've had the light bulb installed is to write the date of installation on the base of the bulb using a permanent marker, as shown in **Figure 2.**



Figure 2:
Writing the date that the light bulb was installed on the base of the light bulb will help you keep track of when each light bulb was installed.

Brightness

The brightness of light bulbs is measured in lumens. The higher the number of lumens, the brighter the light, so you should select a light bulb that has the lumens required for your particular location or task. For example, you may not need much light in a hallway or closet, but when it comes to a craft- or sewing-room, a brighter light will help you with those detailed tasks.

The table below may help you decide which light to use if you're replacing an existing incandescent or CFL with an LED.¹

Lumens	Incandescent	CFL	LED
450	40 watt	9 watt	6 watt
800	60 watt	14 watt	9 watt
1100	75 watt	18 watt	11 watt
1600	100 watt	23 watt	14 watt

Color Appearance

Have you ever purchased a light bulb and it looked different than your other lights? This occurs when the bulbs have different color temperatures, some are warmer or more orange-colored, and some are cooler or more blue-colored. To avoid this from happening to you, make sure you consider the color appearance (also known as the color-correlated temperature). The label on the package will indicate where the bulb falls on a Kelvin scale of 2700 to 6000. The lower the number, the warmer the bulb (similar to a candle or incandescent bulb). A higher number indicates a colder bulb (similar to natural daylight), or what you might typically see in an office setting.

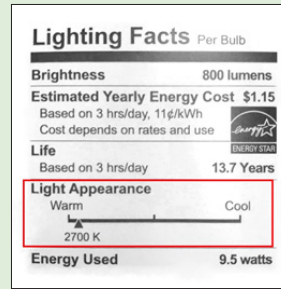


Figure 3:
The light bulbs in the package shown have a light appearance of 2700K, which will appear more yellow.

Lighting Purpose

Dimmability

Make sure you read the package carefully to determine whether the bulb is suitable for its intended purpose. Possible considerations include indoor/outdoor use and whether the bulb will be used in a dimmable fixture. Using a bulb that is not intended for these purposes can have a significant impact on its rated life.

Color Rendering Index

The color rendering index (CRI) is not a characteristic usually identified on the packaging. The CRI is the ability of the bulb to render colors accurately, that is, reds look red, yellows look yellow, etc. See **Figure 4.** CRI ranges on a scale from 0 to 100, with 100 being the best. If color accuracy is of particular importance to you (for example, in an art gallery), you should do additional research by getting a manufacturer specification sheet to confirm the CRI of the bulb is as close to 100 as possible.²



Figure 4:
As CRI decreases, the accuracy of the color decreases.

References

- <http://www.westinghouselighting.com/lighting-education/brightness-lumens.aspx>
- https://www.energystar.gov/index.cfm?c=fixture_guide.pr_fixtures_guide_lightquality