LED Optical Unit

About LED Optical Unit

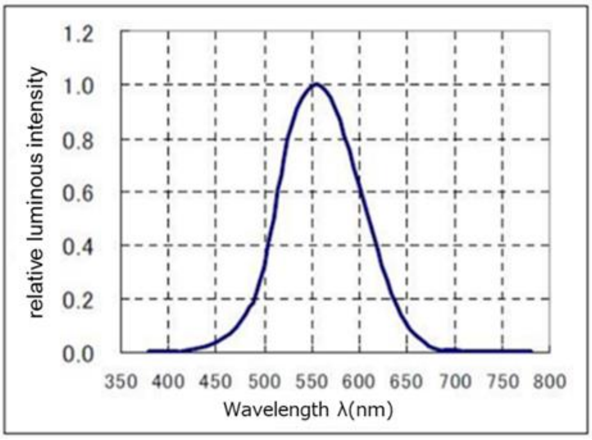
One of the most important LED characteristics is the optical characteristics. This property is important because it determines the application for which the LED is used. However, there are many different types of optical units, and the choice of which optical unit to use depends on the application. In this section, we will discuss the optical units used in LEDs.

radiant flux

The amount of energy that passes through a surface in a unit of time is the radiant flux. It is expressed in W (watts). Radiant Flux represents the light energy itself and does not take into account how it appears to the human eye. Just because the radiant flux is high, it does not mean that the light appears brighter. Infrared and ultraviolet light are invisible to the human eye even if the radiant flux is high. This is because the brightness that the human eye perceives varies with the wavelength.

relative sensitivity

Humans can perceive brightness at a wavelength of 380 to 780 nm. The CIE (International Commission on Illumination) 1924 standard relative visual sensitivity curve shows how easy it is for the eye to perceive the light at this wavelength. The human eye perceives light at 555 nm as the brightest in bright places (507 nm in the dark). The standard relative visual sensitivity curve shows visual sensitivity for each wavelength, where the brightness at 555nm is 1



luminous flux

Luminous flux is the radiant flux plus the sensitivity of the human eye to light and is expressed in lm (lumens). It is a value that indicates how bright the light energy is perceived by the human eye.

If the radiant flux from a given radiator is given by $\Phi e(\lambda)$ and the standard specific visual sensitivity is given by $V(\lambda)$, then the light flux Φ can be expressed as follows

$$\Phi_V[\mathrm{lm}] = \mathrm{Km}\int_{380}^{780} \Phi_e[\lambda]\ V\ [\lambda]\ d\lambda$$

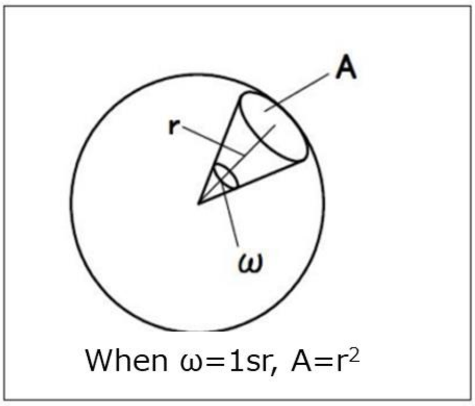
where λ: wavelength, Km: maximum value of the visual sensitivity curve, and
It is about 683lm/W at about 555nm.

Luminosity and solid angle

Luminous intensity is the amount of light flux per unit stereoscopic angle of light emitted from a point light source and is expressed in cd (candela).
Stereoscopic angle (steradian (sr)) is an angle in a solid. It is defined as the area A(m2) on a sphere of radius r

No. 63AN144E Rev.001
2020.10

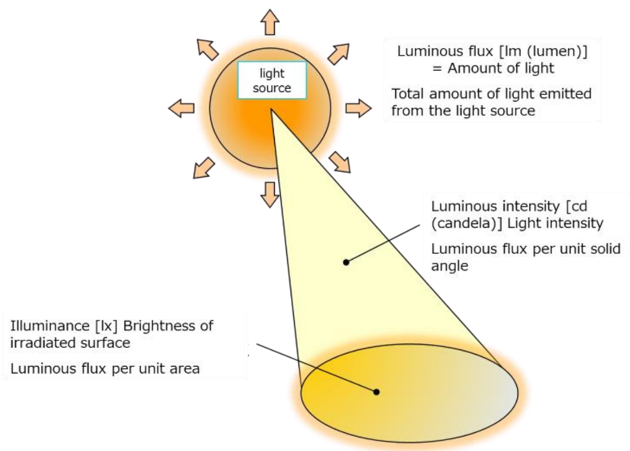
divided by r2, and if the stereoscopic angle is ω(sr)
ω(sr) = A/r2.



Since the surface area of the sphere is 4Πr2, the solid angle is
ω(sr) = A/r2 = 4Π(sr)
In the case of a point light source, even if the size of the cone changes, the amount of light passing through the cone will not change if the solid angle does not change.
In the case of a point light source, even if the size of the cone is changed, the amount of light passing through the inside of the cone does not change unless the solid angle is changed.
Therefore, the luminous intensity is the same regardless of the distance from the light source, whether it is near or far.

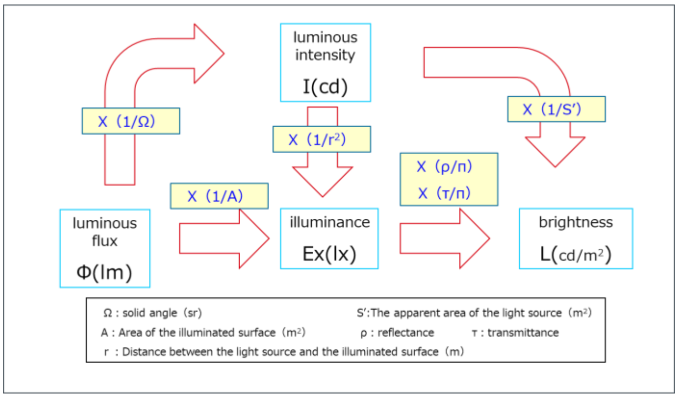
illuminance

Illuminance is a value that shows how much light flux per unit area of light incident on a surface at a distance from a light source and is expressed in lx. Illuminance differs from luminous intensity in that it varies with distance from the light source.



The relationship between each optical unit

The relationship between each optical unit can be summarized as follows



Notes

1) The information contained herein is subject to change without notice.

2) Before you use our Products, please contact our sales representative and verify the latest specifications :

3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors.
Therefore, in order to prevent personal injury or fire arising from failure, please take safety measures such as complying with the derating characteristics, implementing redundant and fire prevention designs, and utilizing backups and fail-safe procedures. ROHM shall have no responsibility for any damages arising out of the use of our Poducts beyond the rating specified by ROHM.

4) Examples of application circuits, circuit constants and any other information contained herein are provided only to illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.

5) The technical information specified herein is intended only to show the typical functions of and examples of application circuits for the Products. ROHM does not grant you, explicitly or implicitly, any license to use or exercise intellectual property or other rights held by ROHM or any other parties. ROHM shall have no responsibility whatsoever for any dispute arising out of the use of such technical information.

6) The Products specified in this document are not designed to be radiation tolerant.

7) For use of our Products in applications requiring a high degree of reliability (as exemplified below), please contact and consult with a ROHM representative : transportation equipment (i.e. cars, ships, trains), primary communication equipment, traffic lights, fire/crime prevention, safety equipment, medical systems, servers, solar cells, and power transmission systems.

8) Do not use our Products in applications requiring extremely high reliability, such as aerospace equipment, nuclear power control systems, and submarine repeaters.

9) ROHM shall have no responsibility for any damages or injury arising from non-compliance with the recommended usage conditions and specifications contained herein.

10) ROHM has used reasonable care to ensure the accuracy of the information contained in this document. However, ROHM does not warrants that such information is error-free, and ROHM shall have no responsibility for any damages arising from any inaccuracy or misprint of such information.

11) Please use the Products in accordance with any applicable environmental laws and regulations, such as the RoHS Directive. For more details, including RoHS compatibility, please contact a ROHM sales office. ROHM shall have no responsibility for any damages or losses resulting non-compliance with any applicable laws or regulations.

12) When providing our Products and technologies contained in this document to other countries, you must abide by the procedures and provisions stipulated in all applicable export laws and regulations, including without limitation the US Export Administration Regulations and the Foreign Exchange and Foreign Trade Act.

13) This document, in part or in whole, may not be reprinted or reproduced without prior consent of ROHM.

ROHM SEMICONDUCTOR

Thank you for your accessing to ROHM product informations.
More detail product informations and catalogs are available, please contact us.

ROHM Customer Support System

http://www.rohm.com/contact/