To search page

2015

Development of High Luminous Flux/High Efficiency White LED Exceeding Halogen Lamps and Mercury Lamps (Citizen Electronics)

~ Discrete Semiconductor/Others ~

In the LED, attention is paid especially to high luminous efficiency among its features. Comparison with the conventional light source is shown in Fig.1. Especially in Japan, due to the sudden change in the power energy infrastructure caused by the Great East Japan Earthquake and the rising consciousness of energy conservation accompanying this, the market was developed and generalization of LED lighting is advancing rapidly.

Initially, LED lighting started to spread from application fields where the light flux is relatively small, such as an incandescent lamp of 100W or less, a fluorescent lamp of 40W or less and so on. Thereafter, LED lighting applications were steadily progressing in the indoor and outdoor lighting fields that required large amount of light, where the HID lamp (High Intensity Discharge lamp) like halogen or mercury lamps were used.

In order to replace the conventional light sources, it is desired not to largely change the overall product size and light distribution controllability of the lighting fixture. In order to satisfy this requirement, it is necessary to output a large amount of light flux from a single package with high luminous density comparable to conventional light sources. Fig.2 compares how shadows appear when an object (irradiated object) is illuminated with multiple packages and a single package. It shows that a more natural shadow is obtained in a single package.

Even with its high efficiency and low power consumption, when LED lighting equipment with a strong light intensity is used replacing light equipment like HID for outdoor use, the input power to the LED package reaches several hundred watts. For the LED packages with densely arranged LED dies, comprehensive heat dissipation design becomes the most important issue, including the selection of package materials to maintain luminous efficiency and ensuring reliability.

From the beginning of development of LED products for lighting, Citizen Electronics has adopted a COA (Chip-on-Aluminum) structure focusing on luminous efficiency and heat dissipation performance. It has provided a wide variety of products assuming replacement of variety of conventional light sources in various forms. (Fig.3)

Furthermore, in 2015, it realized commercialization of the CLU 550 series which enabled replacement of 1kW mercury lamp. (Fig.4)

- Rated driving power 240W (luminous flux: 36,650 lm, luminous efficiency: 151 lm / W)
- Maximum driving power 595W (luminous flux: 71,735 lm, luminous efficiency: 120 lm / W)

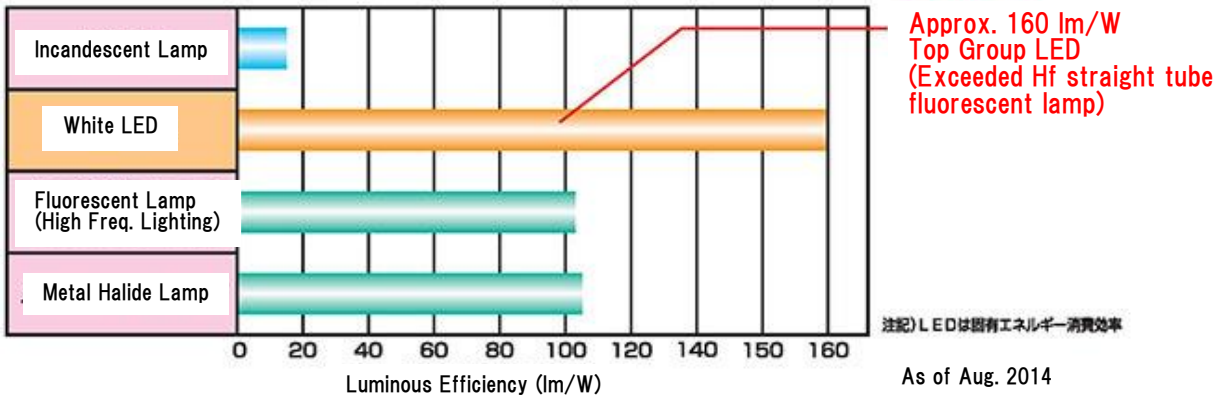

Fig.1: Emission efficiency of white LED and conventional light source

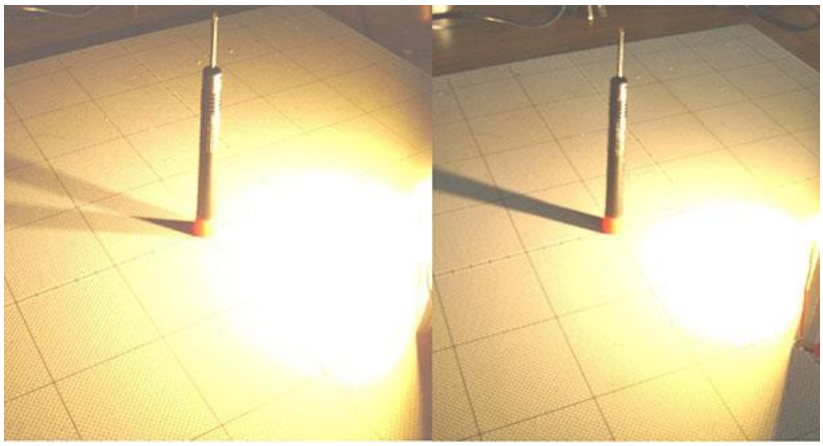

Fig.2: Multiple package lighting (left) and single package lighting (right)
(By courtesy of Citizen Electronics)

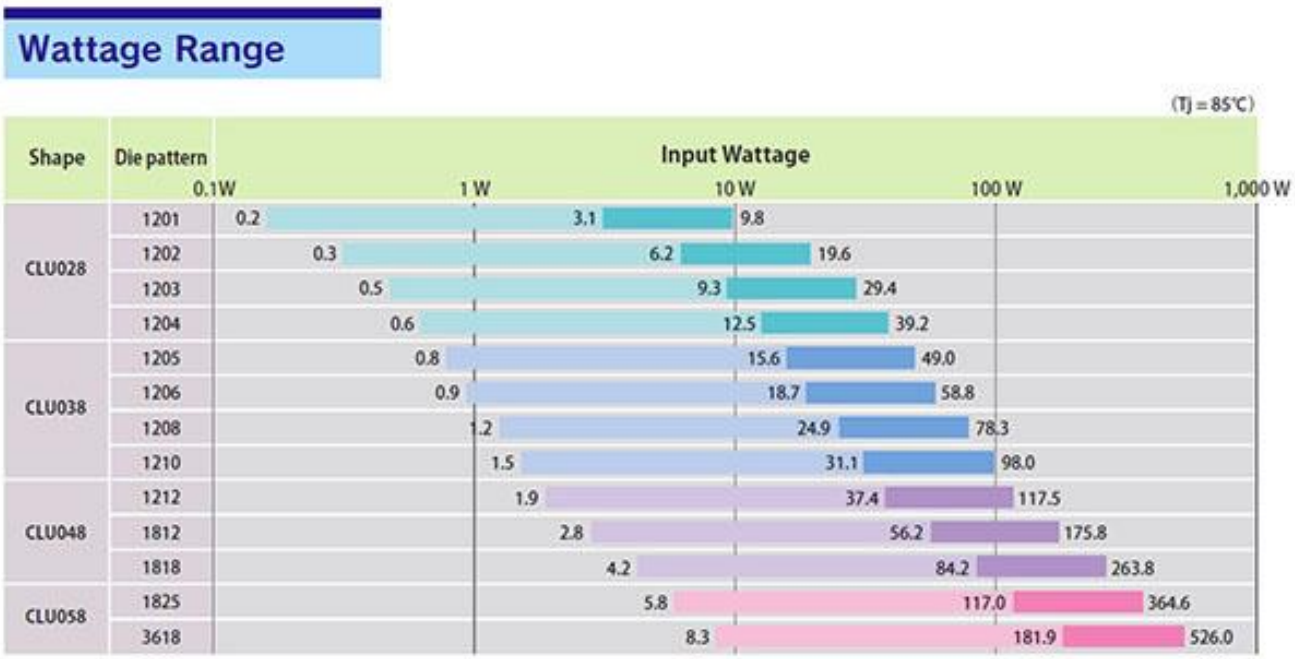

Fig.3: White LED product example (covering 0.1W to 1kW)

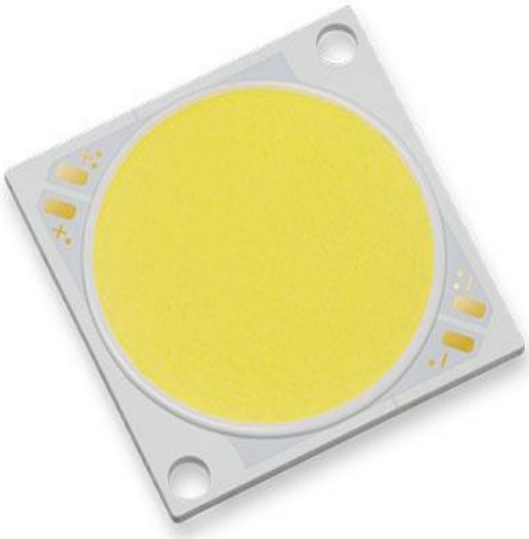

Fig.4: LED capable of outputting total luminous flux of 70,000 lumens
(External dimensions 38.0 mm × 38.0 mm × 1.4 mm)
(By courtesy of Citizen Electronics)

Version 2019/2/20