

## Glossary of LED Terms

### LED (Light-Emitting Diode)

A semiconductor diode element that emits light. LEDs have a function that converts part of the electrical energy in the junction (active layer) between the P-layer and N-layer into light energy. The wavelength and intensity of the light generated is dependent on the semiconductor elements used.

### Visible-light LED

An LED that emits light in wavelengths visible to the human eye (380 to 780 nm).

### Infrared LED

An LED that emits light with a peak wavelength of 780nm or more.

\* The wavelength of LED light is generally wide, and may appear red in some ranges.

### LED lamp

A type of LED that is mounted on a printed wiring board with the leads inserted through holes in the board. The LED element is mounted on a lead frame and then embedded in encapsulating resin shaped into a bead with a diameter such as 3 or 5 mm.



Pinned LED lamps

### Chip LED

A generic name for a type of LED that is surface-mounted on a printed wiring board. PWB LEDs and PLCC LEDs are examples of chip LEDs.



PWB-type chip LED



PLCC-type chip LED

### Number display device

An LED with seven linear light-emitting segments arranged so that combinations of segments can be used to represent numbers.



### Surface display device

An LED with a planar light-emitting surface that functions as a flat light-emitting device.



### Directive characteristics

A graph showing the light radiation distribution characteristics of an LED in all spatial directions, taking the LED central axis as the origin.

### Forward voltage

The voltage between anode and cathode terminals that is generated for a forward current value.

### Reverse current

The current value generated when a reverse bias is applied between the anode and cathode.

### Luminous intensity

The amount of light emitted from an LED per unit solid angle on the optical axis when the LED is taken to be a point light source.

## Light flux

The total amount of light emitted by an LED in all directions when the LED is taken to be a point light source.

## Peak wavelength

The wavelength with the highest radiant spectral concentration in the spectral distribution of emitted light.

## Dominant wavelength

The wavelength of the point where a straight line linking the LED chromaticity point and the white point chromaticity coordinates (0.33, 0.33) intersects the spectral locus.

## Chromaticity coordinates

The stimulus value for the color emitted by the LED expressed using orthogonal coordinates. Normally expressed as an x-y coordinate.

## Spectral half-width

The range of wavelengths in the spectral distribution of emitted light with a relative intensity that is 50% or more of peak wavelength.

## Half intensity angle

In terms of directional characteristics, the inside angle of those directions for which the light intensity is 50% that of the light on the main optical axis. Where the central axis is taken as 0° and the inside angle is a value such as  $\pm 50^\circ$ , the half intensity angle is the range through which the relative light intensity is 50% or higher. In this case, the half intensity angle of  $\pm 50^\circ$  is expressed as 100°.

## Duty ratio

The proportion of the time during which the LED is on for each cycle when driven by repeated pulses. Normally expressed as a percentage (%).

## Thermal resistance

A coefficient indicating resistance to heat transfer. Higher values denote greater thermal resistance and lower heat radiation.

## Thermal conductivity

A physical property specific to the material. Expressed as a coefficient that indicates the propensity for thermal transfer.

## Junction temperature

In an LED, this indicates the temperature of the P-N junction where electrical energy is converted to light energy.

## CIE

Acronym for Commission Internationale de l'Eclairage (French)

## Static lighting (static drive)

A method of lighting LEDs that uses a continuous flow of direct current.

## Dynamic lighting (dynamic drive)

A method of lighting LEDs that uses a cyclical current flow. Also referred to as time-division drive, this method simplifies LED connections when multiple LEDs are to be lit.

## ESD (Electrostatic Discharge)

An event where charge flows over a short period of time from an object charged with static electricity to another object with a different charge.

## PLCC (Plastic Leaded Chip Carrier)

This is a generic term for resin-encapsulated semiconductor packages in which the lead terminals are bent around in a J shape on the product. PLCC LEDs are intended for surface mounting on PWBs, etc. Current package types include PLCC-2 with 2 terminals, and PLCC-4 with 4 terminals.



Example of a PLCC-4 package



Example of a PLCC-2 package

### Luminous intensity rank

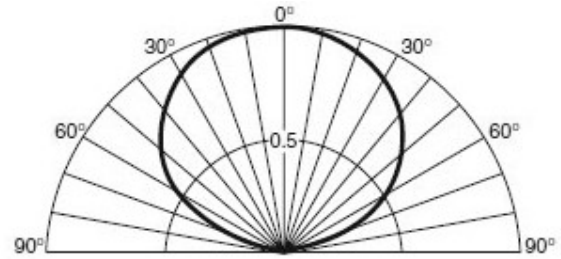
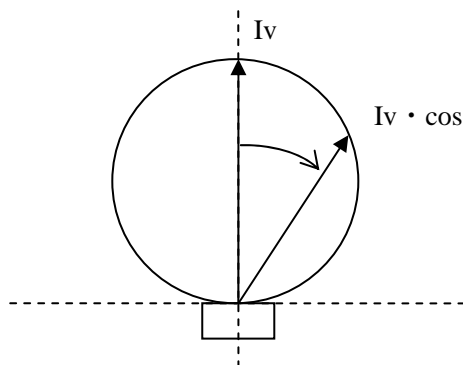
LED products are classified into various ranks according to their luminous intensity. Ranks are generally set such that values are 2x the ratio between the maximum and minimum values within a rank and  $\sqrt{2}x$  between ranks.

### Color rank

Ranks used to set or classify LEDs according to their dominant wavelength. Rank settings differ according to the color emitted.

### Lambertian distribution

A light distribution pattern in which the luminous intensity in the direction of an angle  $\theta^\circ$  can be expressed using a multiple of  $\cos\theta$  for the luminous intensity on the optical axis ( $\theta = 0^\circ$ ). The angle that has a luminous intensity half that of the optical axis can then be calculated as  $60^\circ$  since  $\cos\theta = 0.5$ . Accordingly, the half-intensity angle ( $2\theta_{1/2}$ ) for an LED with this light distribution is  $120^\circ$ .



Example of Lambertian distribution

### V series

A range of Stanley LED products that provide a more detailed set setting and selection options for luminous intensity rank and color rank than products sold normally. With specifications that can be more effectively tailored to particular operating temperatures, V-series LEDs offer greater convenience as indicators for center consoles and indicators in cars. These products are referred to as the “V series” since the product names all begin with “V” to distinguish them from ordinary products.

### Radiation intensity

The radiation energy that is emitted by an LED per unit solid angle on the optical axis when the LED is taken to be a point light source.

### Light output

The total radiant flux emitted toward the  $2\pi$  region at the front of the LED.

### Response speed

The amount of time it takes for radiation intensity to rise from 10% to 90% or fall from 90% to 10% of its maximum value with respect to a pulse-driven input.

### Cutoff frequency

The frequency at which the amplitude of a sine wave output, which is obtained by applying a sine wave to adjust intensity, drops to 50% of standard amplitude (low frequency).

### Junction capacity

The capacitance between the anode and cathode of an LED when the bias voltage is 0V.

## Terms Used in Maximum Ratings

### Max. forward current

The maximum permitted value for forward current at 25°C.

### Max. pulse forward current

The maximum permitted value during repeated pulse lighting as stipulated by the pulse width and duty ratio.

### Current decrease rate

The rate to which the forward current value must be limited for each 1°C rise in the ambient operating temperature.

### Max. power dissipation

The maximum permitted value for the consumption of forward current and the forward voltage it generates at 25°C.