

# LED PACKAGE FOR GENERAL LIGHTING



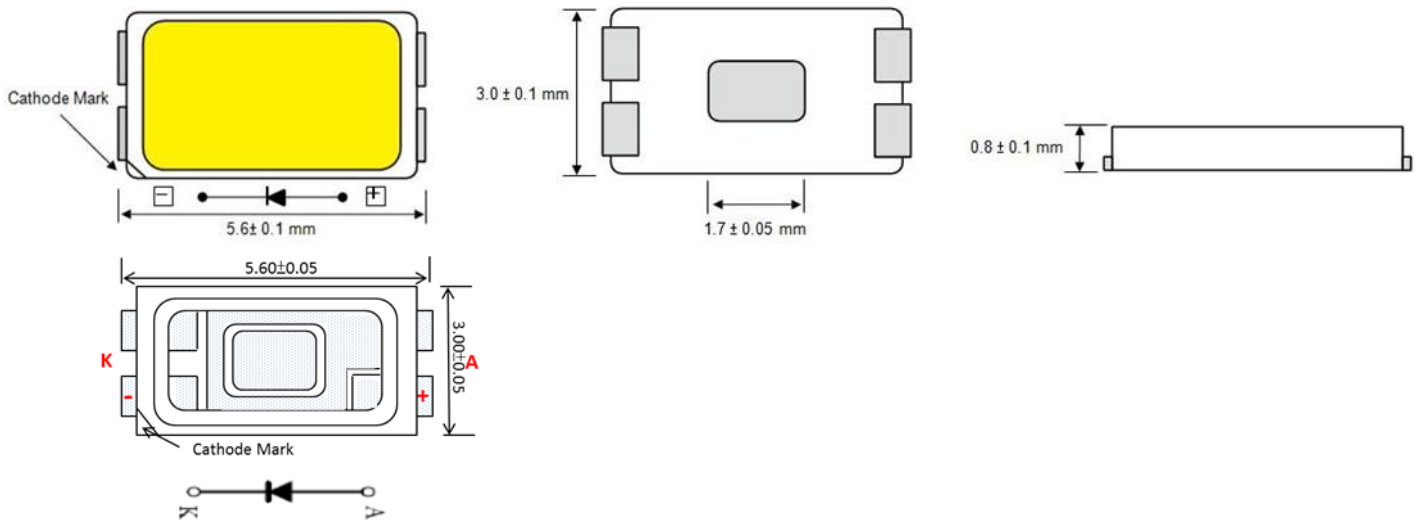
## Features

- Small package with high efficiency
- Low voltage operation, instant light
- Long operating life
- Lead-free product
- RoHS compliant

## Applications

- Architectural / Decorative Lighting
- Landscape lighting lamp

## Package Dimensions



NOTE1: All dimensions are in mm

NOTE2: Tolerance is  $\pm 0.15$  mm unless otherwise noted.

ELECTRICAL/OPTICAL SPECIFICATION

T<sub>j</sub>=25°C

| ITEM               | SYMBOL | CONDITION | MIN.   | TYP | MAX.   | UNIT   |
|--------------------|--------|-----------|--------|-----|--------|--------|
| Forward Voltage    | VF     | If=120mA  | 2.8    | -   | 3.2    | V      |
| Reverse Current    | IR     | Vr=5V     | 0      | -   | 5      | μA     |
| Luminous Intensity | IV     | If=120mA  | 12,600 | -   | 19,600 | mcd    |
| Luminous Intensity | LM     | If=120mA  | 40     | -   | 70     | lm     |
| View Angle         | 2θ 1/2 | If=120mA  | -      | 120 | -      | degree |
| CRI                | -      | If=120mA  | 95     | -   | -      | -      |
| R9                 | -      | If=120mA  | 90     | -   | -      | -      |

NOTE: Please refer to CIE 1931 chromaticity diagram

ABSOLUTE MAXIMUM RATINGS

T<sub>j</sub>=25°C

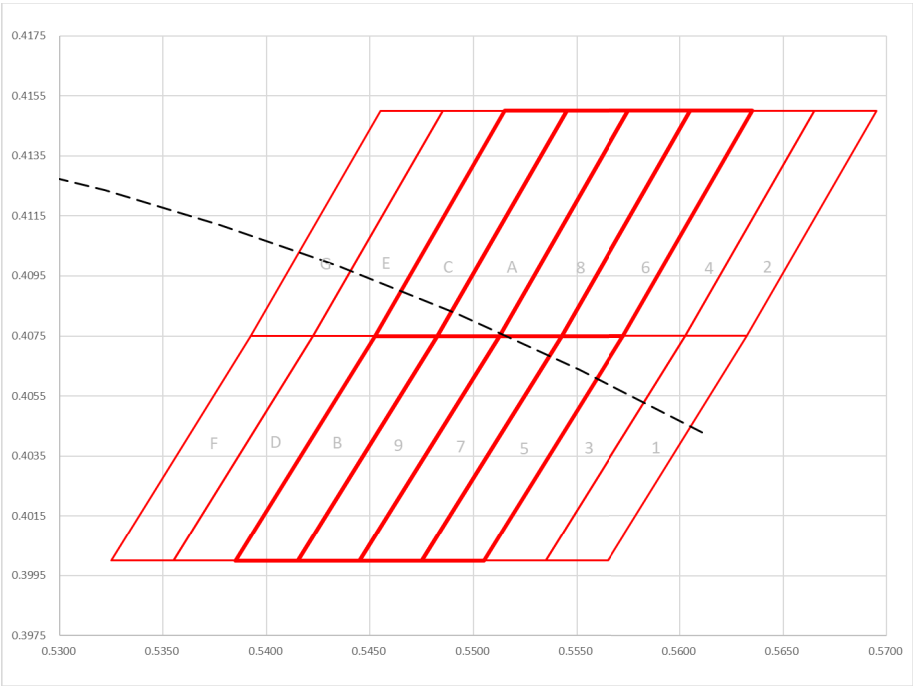
| ITEM                   | SYMBOL | MAXIMUM RATING                                              | UNIT |
|------------------------|--------|-------------------------------------------------------------|------|
| Forward Current        | If     | 200                                                         | mA   |
| Pulse Forward Current* | Ifp    | 250                                                         | mA   |
| Reverse Voltage        | Vr     | 5                                                           | V    |
| Power Dissipation      | Pd     | 400                                                         | mW   |
| Operation Temperature  | Top    | -30 ~ +85                                                   | °C   |
| Storage Temperature    | Tstg   | -40 ~ +100                                                  | °C   |
| Soldering Temperature  | Tsld   | Reflow Soldering: 260°C/10sec<br>Hand Soldering: 350°C/3sec |      |

\*Duty Cycle < 1/10 ; Pulse Width < 10 msec.

NOTE: Subjecting the LED to stresses beyond those listed above may cause permanent damage to the device. These are stress ratings only and do not imply that the device will function beyond these ratings. Extended exposure to these absolute maximum ratings is not recommended.

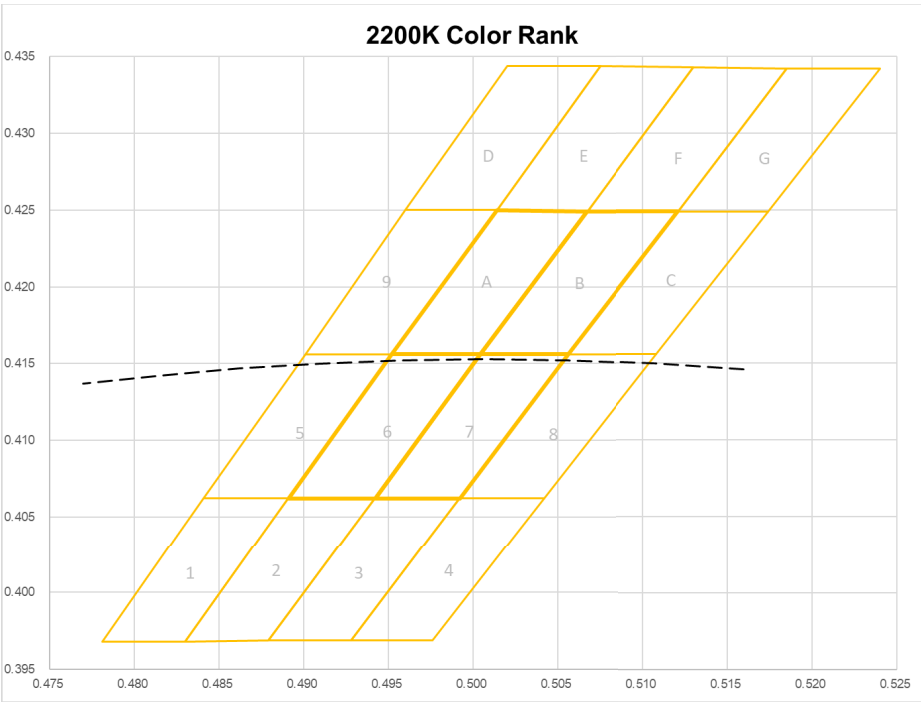
CIE COLOR RANK

1800K



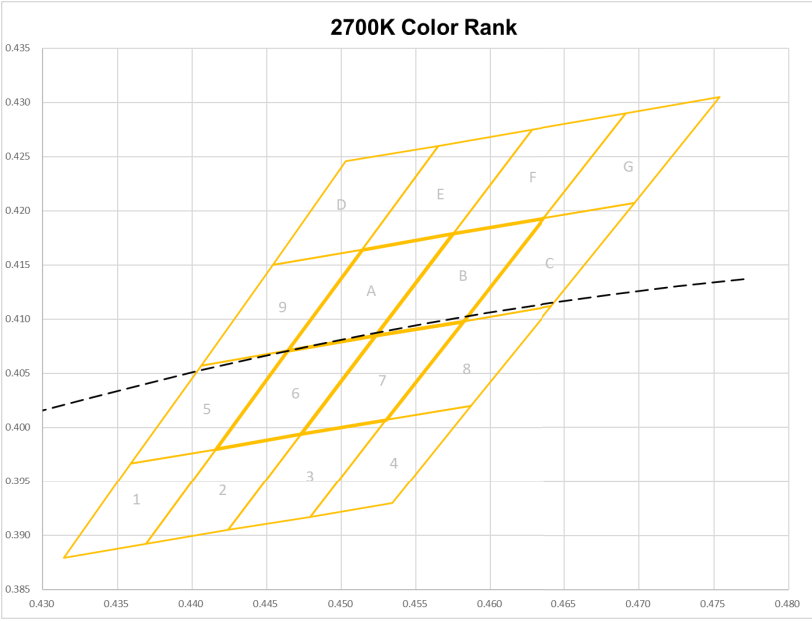
NOTE: CIE Chromaticity Diagram for ANSI

2200K



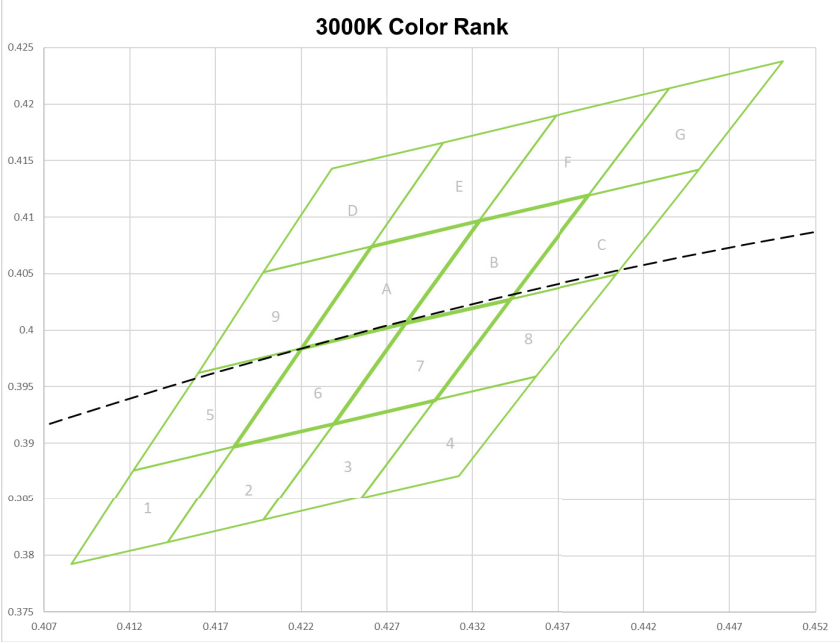
NOTE: CIE Chromaticity Diagram for ANSI

2700K



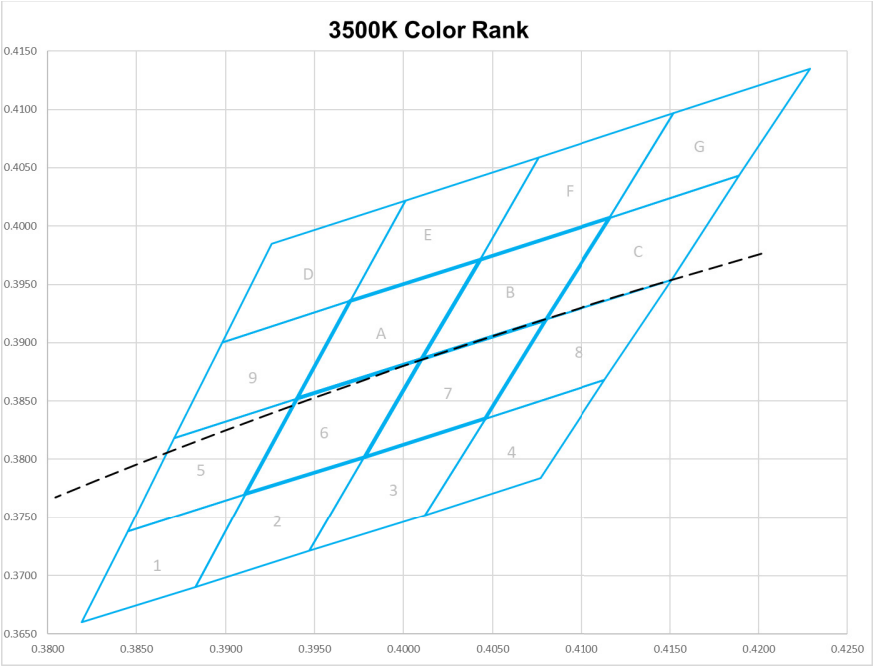
NOTE: Measurement Uncertainty of the Coolor Coordinates:  $\pm 0.01$

3000K



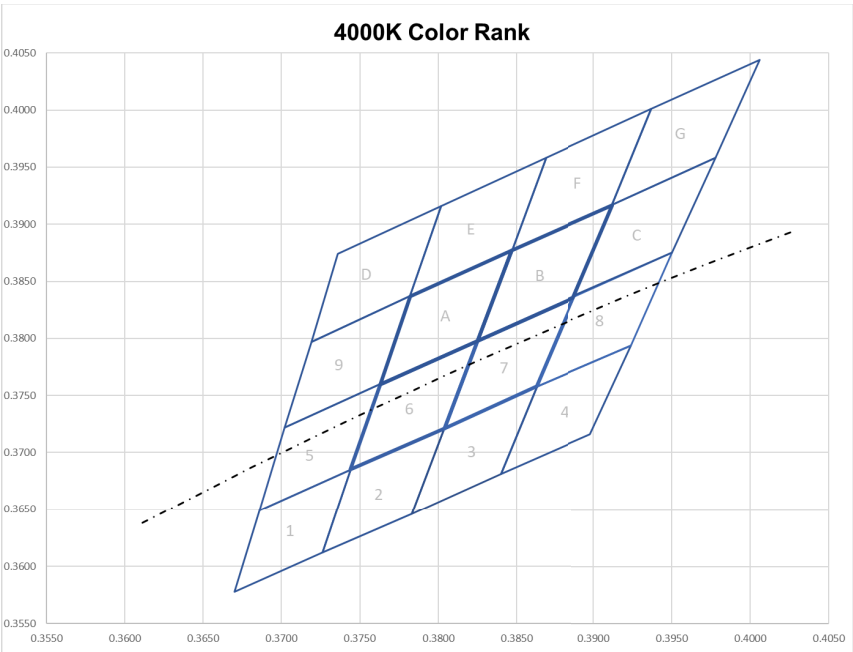
NOTE: Measurement Uncertainty of the Coolor Coordinates:  $\pm 0.01$

3500K



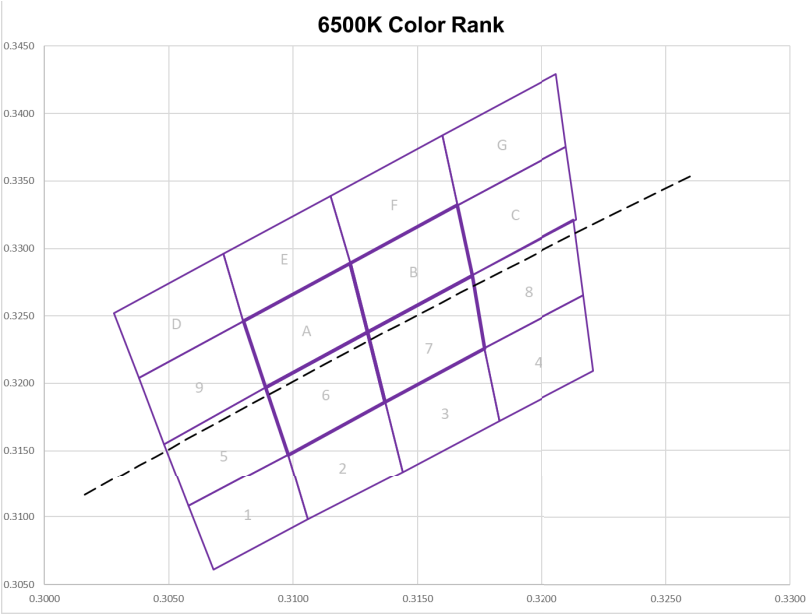
NOTE: Measurement Uncertainty of the Coolor Coordinates:  $\pm 0.01$

4000K



NOTE: Measurement Uncertainty of the Coolor Coordinates:  $\pm 0.01$

6500K



NOTE: Measurement Uncertainty of the Color Coordinates:  $\pm 0.01$

### FORWARD VOLTAGE RANKS

Forward Voltage Measured at if + 180mA     **Tj=25°C**

| VF CODE | MIN. (V) | MAX. (V) |
|---------|----------|----------|
| 2.8     | 2.8      | 3.0      |
| 3.0     | 3.0      | 3.2      |

NOTE: Forward Voltage Measurement Tolerance is ± 0.05

### LUMINOUS INTENSITY RANKS

Luminous Intensity Measured at if + 180mA     **Tj=25°C**

| LM CODE | MIN. (lm) | MAX. (lm) |
|---------|-----------|-----------|
| 40      | 40        | 45        |
| 45      | 45        | 50        |
| 50      | 50        | 55        |
| 55      | 55        | 60        |
| 60      | 60        | 65        |
| 65      | 65        | 70        |

NOTE: Luminous Intensity Measurement Toleranve is ± 10%

### MAIN BIN

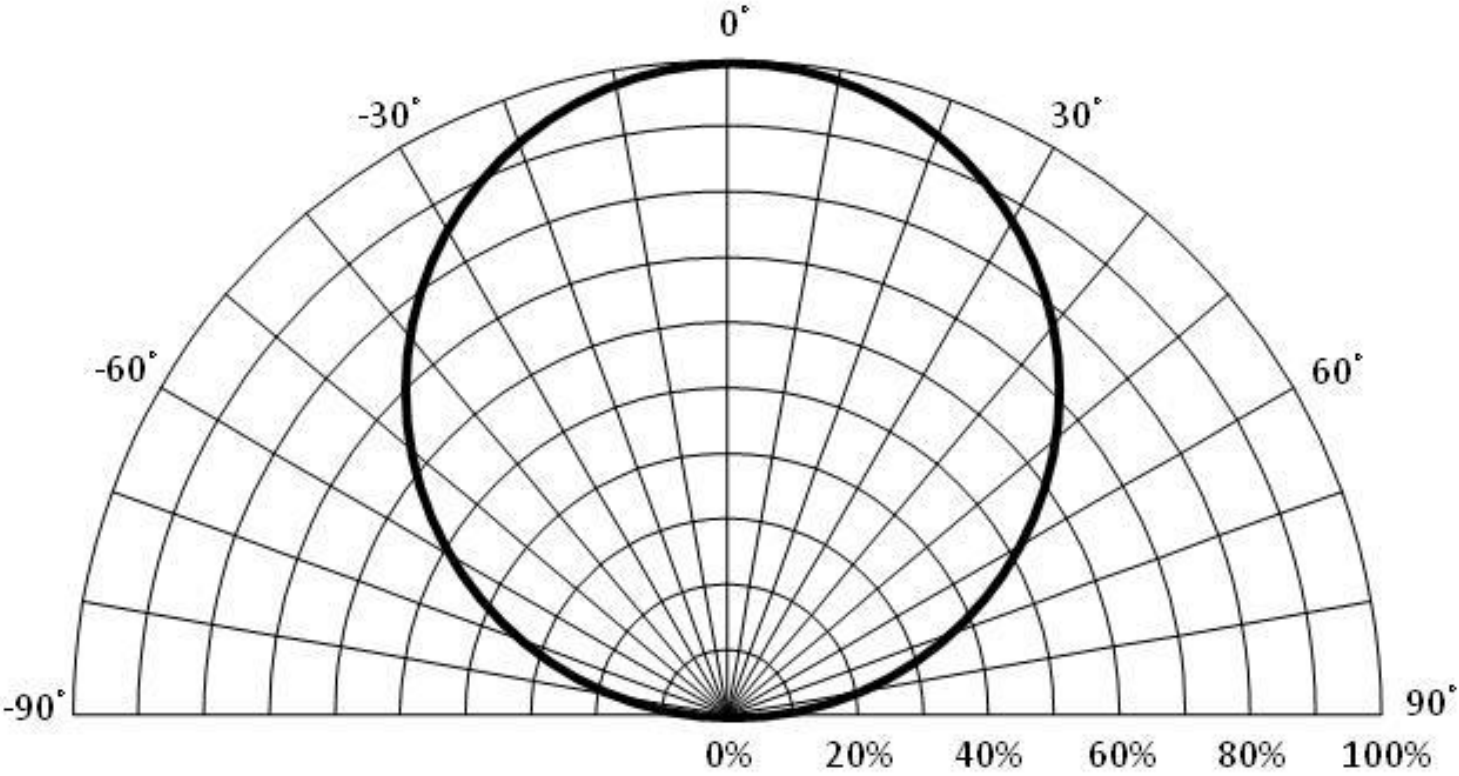
**Tj=25°C**

| TYPE      | FLUX (LM) | CIE RANK |    |    |    |
|-----------|-----------|----------|----|----|----|
| A (1800K) | ≥ 40      | A6       | A7 | AA | AB |
| Y (2200K) | ≥ 45      | Y6       | Y7 | YA | YB |
| W (2700K) | ≥ 60      | W6       | W7 | WA | WB |
| V (3000K) | ≥ 60      | V6       | V7 | VA | VB |
| U (3500K) | ≥ 65      | U6       | U7 | UA | UB |
| T (4000K) | ≥ 65      | T6       | T7 | TA | TB |
| P (6500K) | ≥ 70      | P6       | P7 | PA | PB |

### MATERIALS

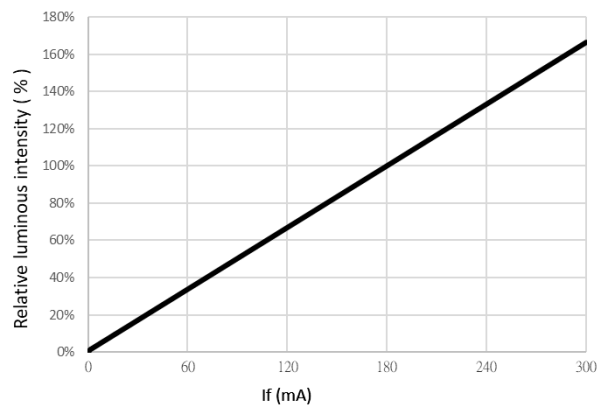
| ITEM                | MATERIALS                      |
|---------------------|--------------------------------|
| Package             | Heat Resistant Polymer         |
| Encapsulating Resin | Silicone Resin (with Phosphor) |
| Electrodes          | Ag Plating Copper Alloy        |

RADIATION CHARACTERISTICS

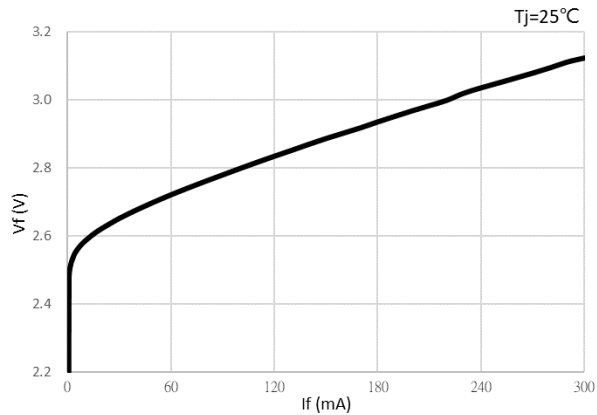


OPTICAL/ELECTRICAL CHARACTERIZATION

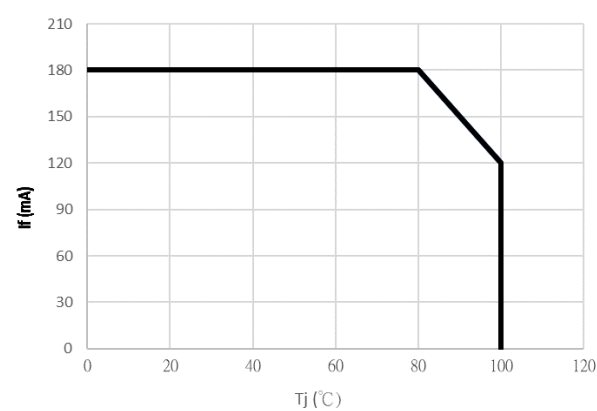
Relative Luminous vs. Forward Current



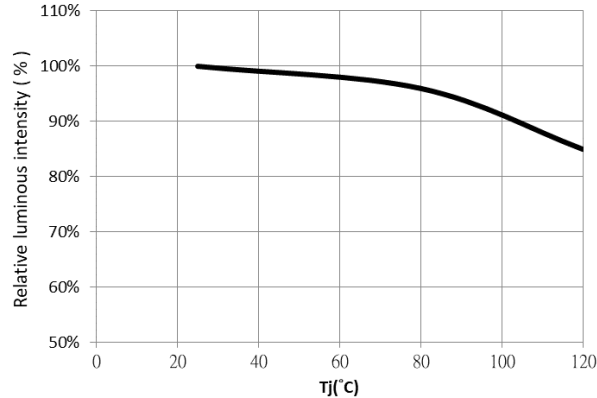
Forward Voltage vs. Forward Current



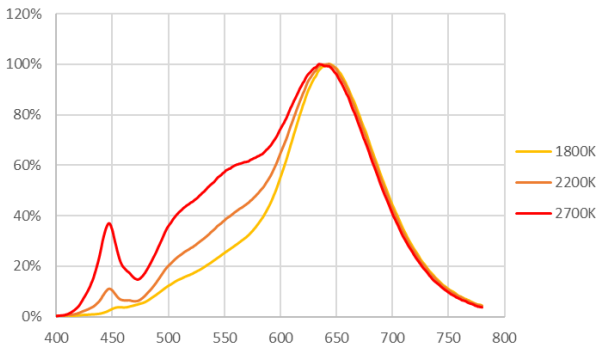
Forward Voltage vs. Ambient Temperature



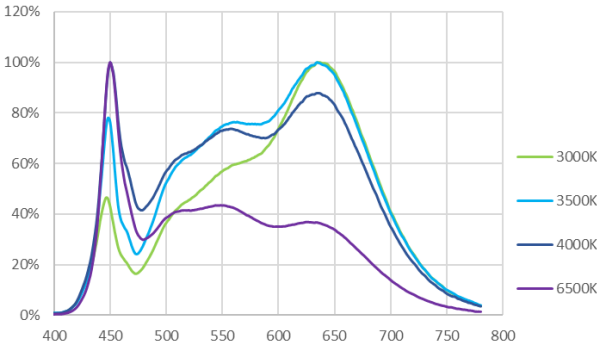
Relative Luminous vs. Ambient Temperature



OPTICAL ELECTRICAL CHARACTERIZATION SPECTRUM  
1800K/2200K/2700K

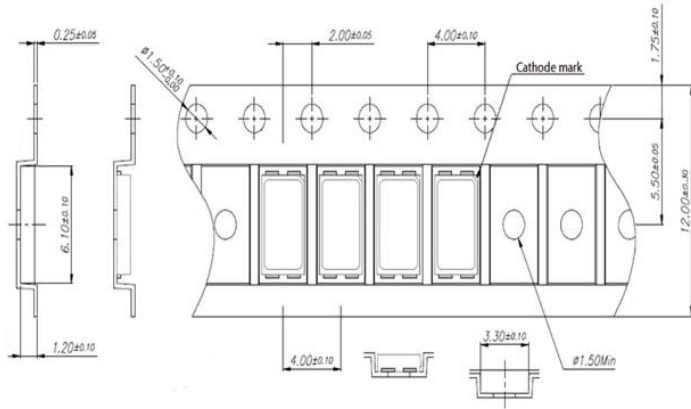


3000K/3500K/4000K/6500K

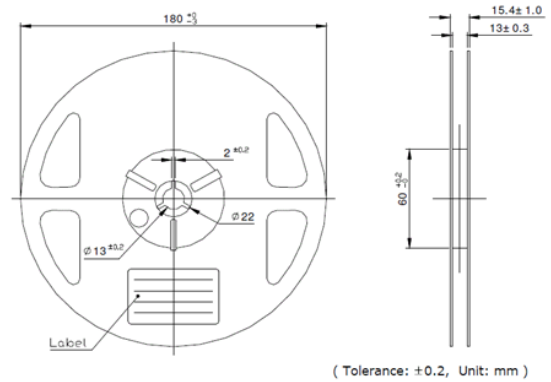


## PACKING INFORMATION

### Embossed Tape Dimension



### Reel Dimension

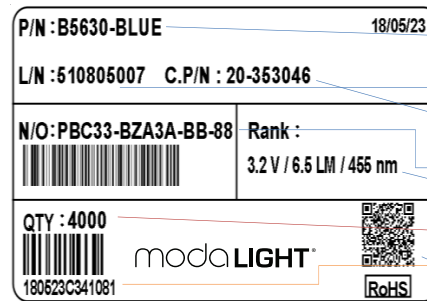
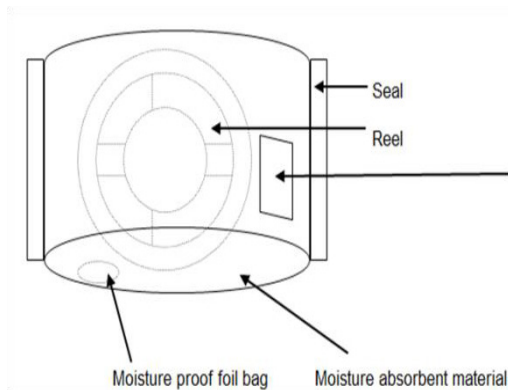


NOTE 1: Dimensions are in millimeters

NOTE 2: Dimensions confirm to JIS-C-0805 and EIA-481

### Moisture Proof Bag

Label on the moisture proof bag consists of the following information



1. Type Name
2. Date code
3. Lot No.
4. Customer Part Number
5. Moda Light Part Number
6. Spec
7. Identification Code
8. QR Code

### Packing Unit

| PACKAGE            | DIMENSIONS (mm)      | No. OF REEL/UNIT | QUANTITY (pcs) |
|--------------------|----------------------|------------------|----------------|
| Moisture Proof Bag | N/A                  | 1 Reel/Bag       | 4,000 Max      |
| Cardboard Box 25P  | 350 x 210 x 210 x 4t | 25 Reels/Box Max | 100,000 Max    |
| Cardboard Box 50P  | 410 x 350 x 210 x 4t | 50 Reels/Box Max | 200,000 Max    |

NOTE 1: To avoid possible damage, it is recommended that same packing arrangement should be used.

NOTE 2: Packing tolerance is ±0.1%

## RELIABILITY

| TEST ITEM                                            | TEST STANDARD            | TEST CONDITIONS                                                                              | FAILURE RATE |
|------------------------------------------------------|--------------------------|----------------------------------------------------------------------------------------------|--------------|
| Resistance to Soldering Heat (Re-flow Soldering)     | JEITA ED-4701<br>300 301 | Tsld = 260°C (10 sec), 2 times<br>(Pre-treatment 30°C, 70%, 168 hrs)                         | 0/50         |
| Solder ability (Reflow Soldering)                    | JEITA ED-4701<br>300 303 | Tsld = 215+5°C (3 sec),<br>1 time (Lead Solder)                                              | 0/50         |
| Thermal Shock                                        | JEITA ED-4701<br>300 307 | 0°C (3 min) ~ 100°C (3min),<br>20 cycles                                                     | 0/50         |
| Temperature Cycle                                    | JEITA ED-4701<br>100 105 | -40°C (30min) ~ 25°C(5min) ~<br>100°C(30min) ~ 25°C(5min),100 cycles                         | 0/50         |
| Moisture Resistance Cycle                            | JEITA ED-4701<br>200 203 | 25°C ~ 65°C ~ -10°C, 10 cycles<br>90%RH, 24 hrs./cycle                                       | 0/50         |
| High Temperature Storage                             | JEITA ED-4701<br>200 201 | Ta = 100°C<br>1000 hrs.                                                                      | 0/50         |
| Temperature Humidity Storage                         | JEITA ED-4701<br>100 103 | Ta = 60°C, RH = 90%<br>1000 hrs.                                                             | 0/50         |
| Lo Temperature Storage                               | JEITA ED-4701<br>200 202 | Ta = -40°C<br>1000 hrs.                                                                      | 0/50         |
| Steady State Operation Life                          |                          | Ta = 25°C, If = 150 mA<br>1000 hrs.                                                          | 0/50         |
| Steady State Operation Life -<br>Condition II        |                          | Ta = 25°C, If = 180 mA<br>1000 hrs.                                                          | 0/50         |
| Steady State Operation Life of High<br>Temperature   |                          | Ta = 85°C, If = 150 mA<br>1000 hrs.                                                          | 0/50         |
| Steady State Operation Life of High<br>Humidity Heat |                          | Ta = 60°C, RH = 90%, If = 180 mA<br>500 hrs.                                                 | 0/50         |
| Steady State Operation Life of Low<br>Temperature    |                          | Ta=-30°C,If=150mA<br>1000 hrs.                                                               | 0/50         |
| Vibration                                            | JEITA ED-4701<br>400 403 | 100 ~ 2000 ~ 100 Hz Sweep, 4 min.<br>200 m/sec <sup>2</sup> , 3 direction, 4 cycles, 48 min. | 0/50         |
| Substrate Bending                                    | JEITA ED-4702            | 3mm, 5+1 sec.<br>1 time                                                                      | 0/50         |
| Stick                                                | JEITA ED-4702            | 5N, 10+1 sec.<br>1 time                                                                      | 0/50         |

## FAILURE CRITERIA

| ITEMS              | CONDITIONS               | FAILURE CRITERIA |
|--------------------|--------------------------|------------------|
| Forward Voltage    | @ If = 180 mA, Tj = 25°C | >1.1 x USL       |
| Reverse Current    | @ Vr = 5V, Tj = 25°C     | >2.0 x USL       |
| Luminous Intensity | @ If = 180mA, Tj = 25°C  |                  |

NOTE: Moda Light defined failure criteria as single 50% or average 35% degradation

## CAUTIONS

The lifetime and performance of the LEDs are sensitive to environment and operating conditions. Cautions should be taken after due consideration when using LEDs.

**(1) Moisture Proof Package** SMD type LED devices are sensitive to moisture uptake. Changes of optical characteristics or contact exfoliation may be resulted from moisture uptake. Moisture proof packages are used for product delivery. It is recommended that the original moisture proof bag or similar arrangement should be used for storage after the opening of sealed packages.

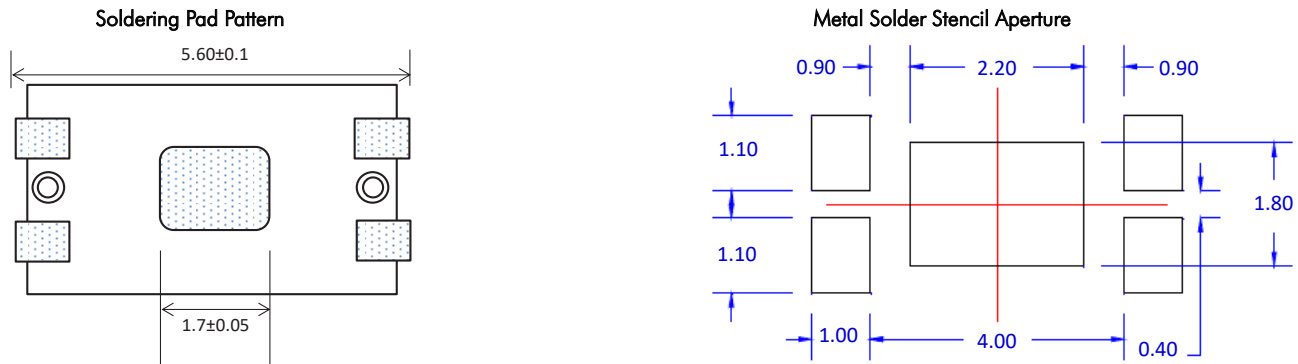
**(2) Storage** Storage Conditions Prior to opening of the package: The LEDs should be stored in an environment with temperature less than 30°C and 50% RH or less. The shelf lifetime of unopened LEDs is six months.

After opening of the package: The storage environment should be kept at 30°C or less and 50%RH or less. The LEDs should be soldered within 24 hours (1 day) after opening the package. It is recommended to store those unused LEDs in the original moisture proof bag with moisture absorbent material. If the moisture absorbent material (silica gel) has faded away or the LEDs have exceeded the storage time, baking treatment should be performed using the following conditions

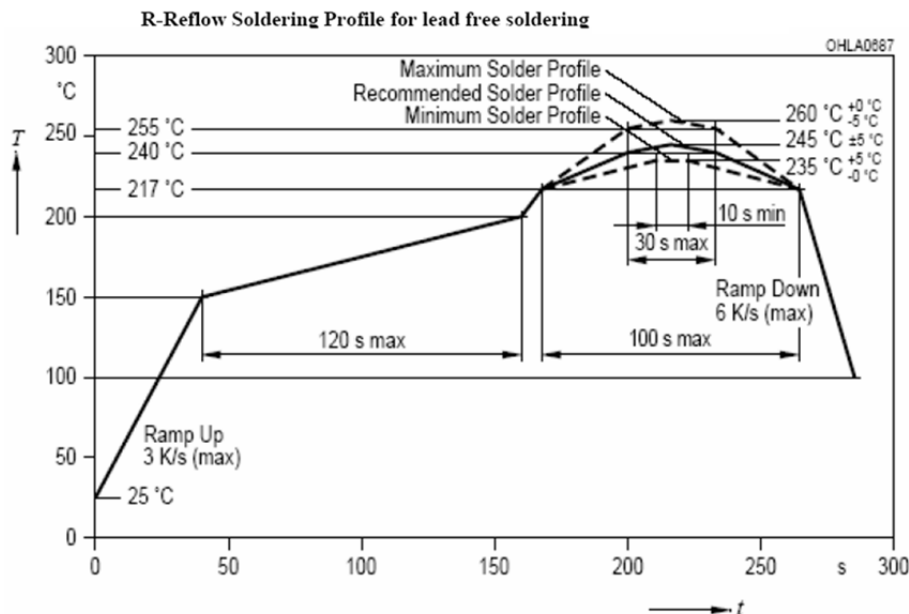
Baking treatment: More than 24 hours at  $70 \pm 5^\circ\text{C}$ . MODALIGHT electrode and lead frame are comprised of a silver plated copper alloy. Please avoid conditions which may cause the LED to corrode, tarnish or discolor. This corrosion or discoloration might lower solder ability or might affect on optical characteristics. Please avoid rapid transitions in ambient temperature, especially in high humidity environments where condensation can occur.

**(3) Heat Generation** The optical characteristics of LEDs are very sensitive to temperature. Therefore, thermal design of the end product is of paramount importance. It is necessary to avoid intense heat generation and operate within the maximum ratings given in this specification.

### (4) Soldering Conditions (Reference Outline)



NOTE: All dimensions in mm tolerance is  $\pm 0.1$ mm unless otherwise noted

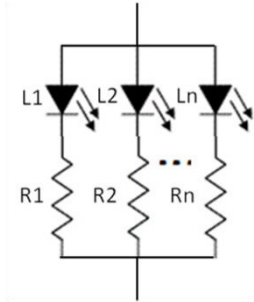


## CAUTIONS

The lifetime and performance of the LEDs are sensitive to environment and operating conditions. Cautions should be taken after due consideration when using LEDs.

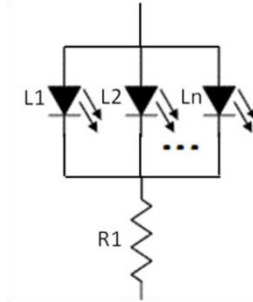
**(5) Recommended Circuit** When a parallel circuit LED driver is applied in lighting, a hot spot may occur in a low current operation (dimming mode) through the difference of the LED voltage in the low current region. In the worst case, some LED may be subjected to stresses in excess of the absolute maximum rating. It is recommended to use **Circuit A** which regulates the current flowing.

Circuit A: Recommended Circuit



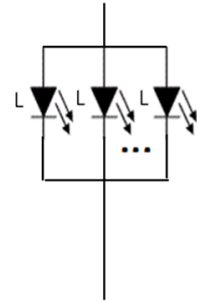
Separate resistor per each LED

Circuit B: Abnormal Circuit



Easy to occur brightness problem

Circuit C: Abnormal Circuit



Easy to occur brightness problem

**(6) Cleaning** It is recommended to clean the LEDs using Isopropyl alcohol. When using other solvents, it should be confirmed beforehand whether the solvents will dissolve the package and the resin or not. Freon solvents should not be used to clean the LEDs because of worldwide regulations. Never clean the LEDs with the ultrasonic machines.

**(7) Static Electricity** Static electricity or surge voltage will damage the LEDs. It is recommended that a wrist band or an anti-electrostatic glove be used when handling the LEDs. All devices, equipment and machinery must be properly grounded. It is recommended that measures be taken against surge voltage to the equipment that mounts the LEDs. When inspecting the final products in which LEDs were assembled, it is recommended to check whether the assembled LEDs are damaged by static electricity or not. It is easy to find static damaged LEDs by a light-on test or a VF test at a lower current (below 1mA is recommended). Damaged LEDs will show some unusual characteristics such as the leak current remarkably increases, the forward voltage becomes lower, or the LEDs do not illuminate at low current.

**Criteria:** (  $V_f > 2.0V$  at  $I_f = 0.5mA$  )

**(8) Others** Care must be taken to ensure that the reverse voltage will not exceed the absolute maximum rating when using the LEDs with matrix drive. The LED light output is strong enough to injure human eyes. Precautions must be taken to prevent looking directly at the LEDs with unaided eyes for more than a few seconds. Flashing lights have been known to cause discomfort in people: you can prevent this by taking precautions during use. Also, users should be cautious when using equipment that has had LEDs incorporated into it. The LEDs described in this brochure are intended to be used for ordinary electronic equipment. LED devices used in applications in which exceptional quality and reliability are required, particularly when the failure or malfunction of the LEDs may directly jeopardize life or health, must be expressly authorized. Due to the special conditions of the manufacturing processes of LED, the typical data or calculated correlations of technical parameters can only reflect statistical figures. These do not necessarily correspond to the actual parameters of each single product, which could differ from the typical data and calculated correlations or the typical characteristic line. If requested, e.g. because of technical improvements, these typical data will be changed without any further notice.