

## Technical Data Sheet

### Top View LEDs

#### 45-21/LK2C-B56702C4CB2/2T

#### Features

- Top view white LEDs
- White SMT package.
- Lead frame package with individual 2 pins.
- Wide viewing angle.
- Soldering methods: IR reflow soldering.
- Pb-free.
- The product itself will remain within RoHS compliant version.



#### Descriptions

- Due to the package design, 45-21 has wide viewing angle, low power consumption and white LEDs are devices which are materialized by combing Blue LEDs and special phosphors. This feature makes the LED ideal for light guide application.

#### Applications

- General lighting.
- Decorative and Entertainment Lighting
- Indicators.
- Illuminations.
- Switch lights.

#### Device Selection Guide

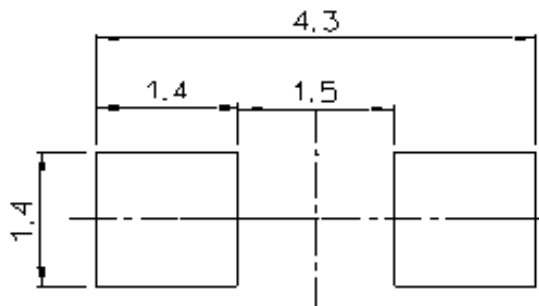
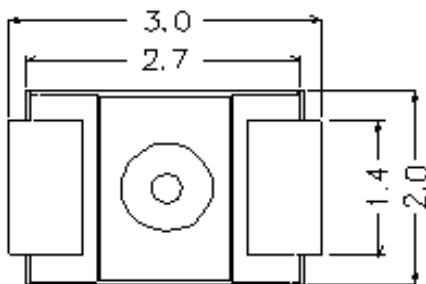
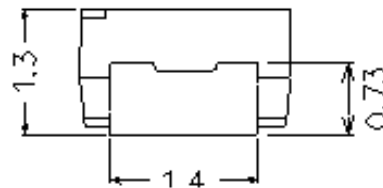
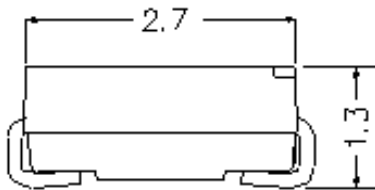
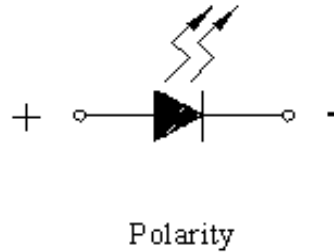
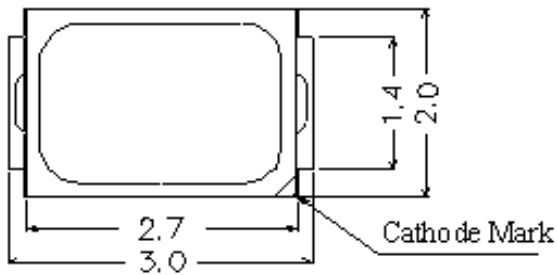
| Chip     | Emitted Color | Resin Color |
|----------|---------------|-------------|
| Material |               |             |
| InGaN    | Pure White    | Water Clear |

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#### Package Outline Dimensions



Recommended soldering pad design

**Note:** Tolerances unless mentioned is  $\pm 0.1\text{mm}$ ; Unit = mm

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#### Absolute Maximum Ratings (Ta=25 )

| Parameter                              | Symbol          | Rating   | Unit |
|--|-----------------|--|------|
| Reverse Voltage                        | V <sub>R</sub>  | 5  | V    |
| Forward Current                        | I <sub>F</sub>  | 30   | mA   |
| Peak Forward Current (Duty 1/10 @1KHz) | I <sub>FP</sub> | 100  | mA   |
| Power Dissipation                      | P <sub>d</sub>  | 110  | mW   |
| Electrostatic Discharge(HBM)           | ESD             | 1000   | V    |
| Operating Temperature                  | Topr            | -40 ~ +85  |      |
| Storage Temperature                    | Tstg            | -40 ~ +90  |      |
| Soldering Temperature                  | Tsol            | Reflow Soldering: 260 for 10 sec.<br>Hand Soldering : 350 for 3 sec. |      |

**Note:** The products are sensitive to static electricity and must be carefully taken when handling products.

#### Electro-Optical Characteristics (Ta=25 )

| Parameter             | Symbol            | Min. | Typ.  | Max. | Unit | Condition            |
|-----------------------|-------------------|------|-------|------|------|----------------------|
| Luminous Intensity    | I <sub>V</sub>    | 2000 | ----- | 2400 | mcd  | I <sub>F</sub> =20mA |
| Viewing Angle         | 2θ <sub>1/2</sub> | ---  | 120   | ---  | deg  | I <sub>F</sub> =20mA |
| Forward Voltage       | V <sub>F</sub>    | 2.90 | ----- | 3.60 | V    | I <sub>F</sub> =20mA |
| Reverse Current       | I <sub>R</sub>    | ---  | ---   | 50   | μA   | V <sub>R</sub> =5V   |
| Color Rendering Index | Ra                | 70   | ----  | ---- | ---- | I <sub>F</sub> =20mA |

**Notes:**

1. Tolerance of Luminous Intensity: ±11%
2. Tolerance of Forward Voltage: ±0.05V
3. Tolerance Color Rendering Index : ± 2

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#### Bin Range of Luminous Intensity

| Bin Code | Min. | Max. | Unit | Conduction           |
|----------|------|------|------|----------------------|
| 2C       | 2000 | 2200 | mcd  | I <sub>F</sub> =20mA |
| 4C       | 2200 | 2400 |      |                      |

#### Bin Range of Forward Voltage

| Group | Bin Code | Min. | Max. | Unit | Condition            |
|-------|----------|------|------|------|----------------------|
| B2    | 36       | 2.90 | 3.00 | V    | I <sub>F</sub> =20mA |
|       | 37       | 3.00 | 3.10 |      |                      |
|       | 38       | 3.10 | 3.20 |      |                      |
|       | 39       | 3.20 | 3.30 |      |                      |
|       | 40       | 3.30 | 3.40 |      |                      |
|       | 41       | 3.40 | 3.50 |      |                      |
|       | 42       | 3.50 | 3.60 |      |                      |

#### Notes:

1. Tolerance of Luminous Intensity:  $\pm 11\%$
2. Tolerance of Forward Voltage:  $\pm 0.05V$

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### Top View LEDs

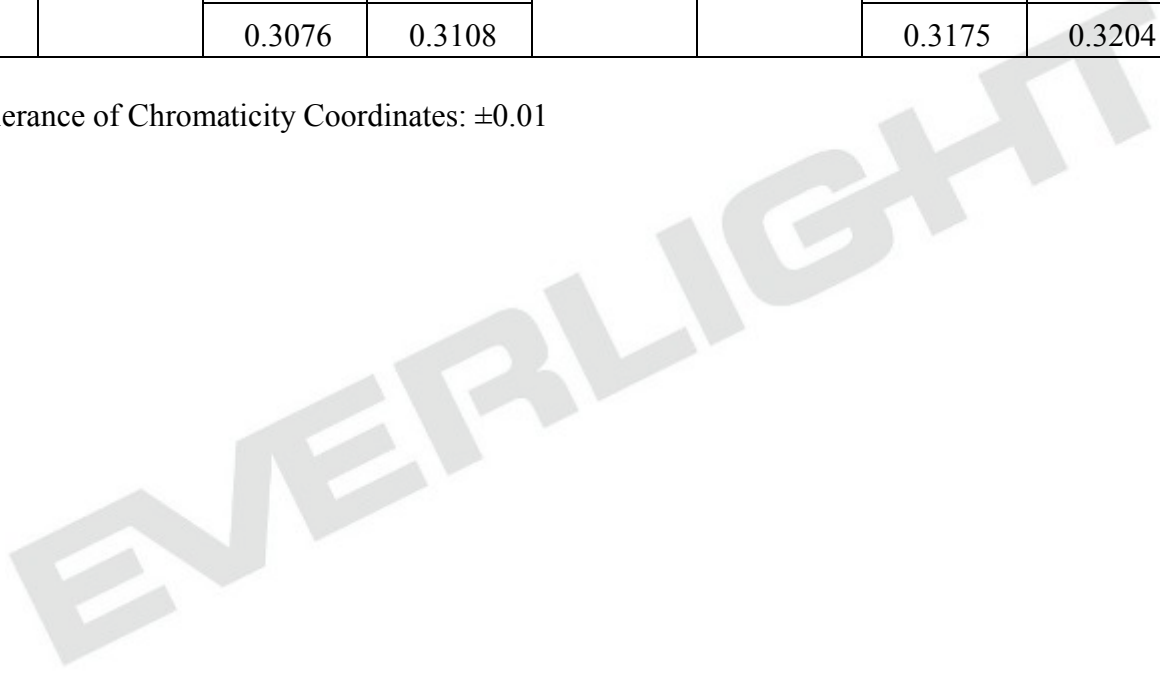
#### 45-21/LK2C-B56702C4CB2/2T

#### Bin Range of Chromaticity Coordinates

$I_f=20\text{mA}$

| CCT             | Bin Code | CIE_x  | CIE_y  | CCT             | Bin Code | CIE_x  | CIE_y  |
|-----------------|----------|--------|--------|-----------------|----------|--------|--------|
| 7000K<br>~6300K | X5       | 0.3031 | 0.3327 | 5650K<br>~6300K | W5       | 0.3148 | 0.3444 |
|                 |          | 0.3148 | 0.3444 |                 |          | 0.3288 | 0.3569 |
|                 |          | 0.3160 | 0.3332 |                 |          | 0.3290 | 0.3451 |
|                 |          | 0.3052 | 0.3224 |                 |          | 0.3160 | 0.3332 |
|                 | X6       | 0.3052 | 0.3224 |                 | W6       | 0.3160 | 0.3332 |
|                 |          | 0.3160 | 0.3332 |                 |          | 0.3290 | 0.3451 |
|                 |          | 0.3175 | 0.3204 |                 |          | 0.3292 | 0.3313 |
|                 |          | 0.3076 | 0.3108 |                 |          | 0.3175 | 0.3204 |

**Note:** Tolerance of Chromaticity Coordinates:  $\pm 0.01$

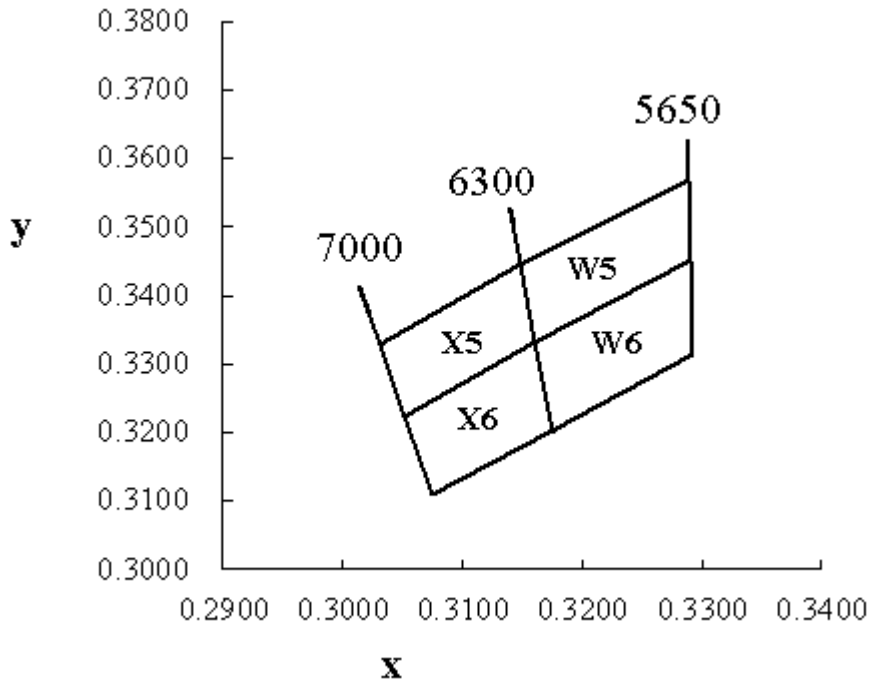


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#### The C.I.E. 1931 Chromaticity Diagram



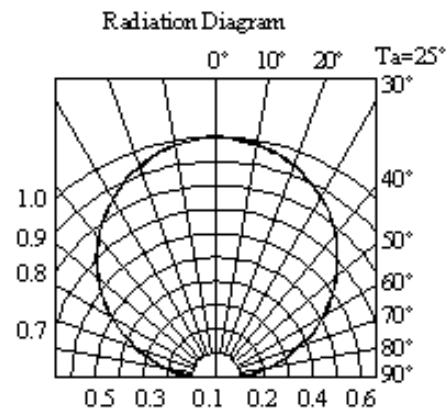
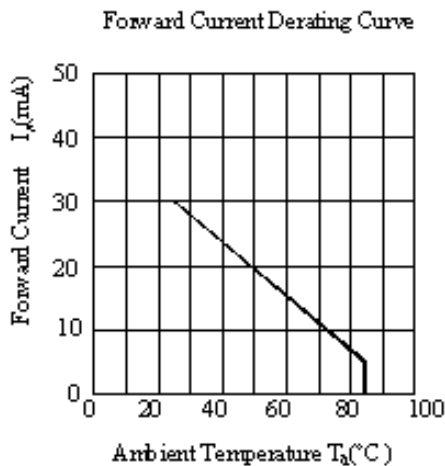
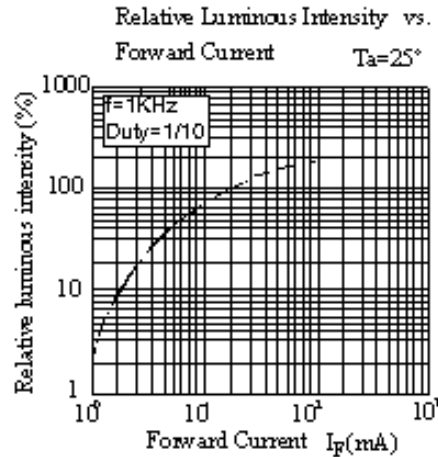
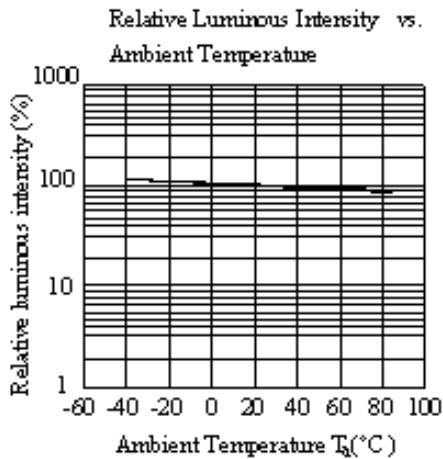
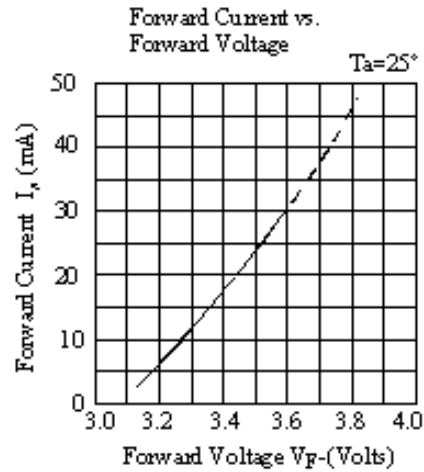
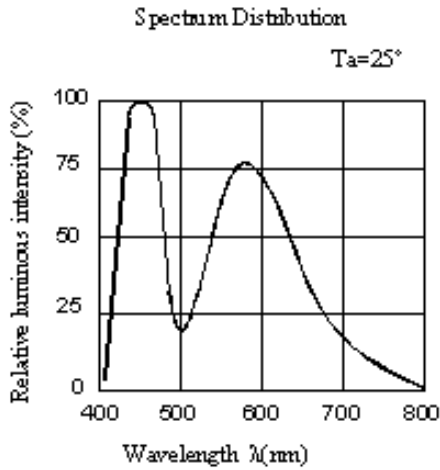
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### 45-21/LK2C-B56702C4CB2/2T

#### Typical Electro-Optical Characteristics Curves



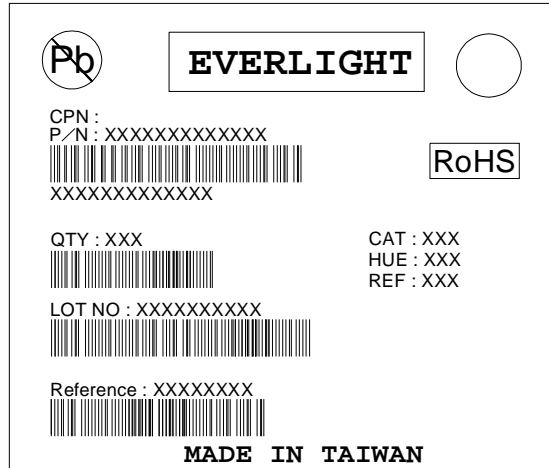
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### Top View LEDs

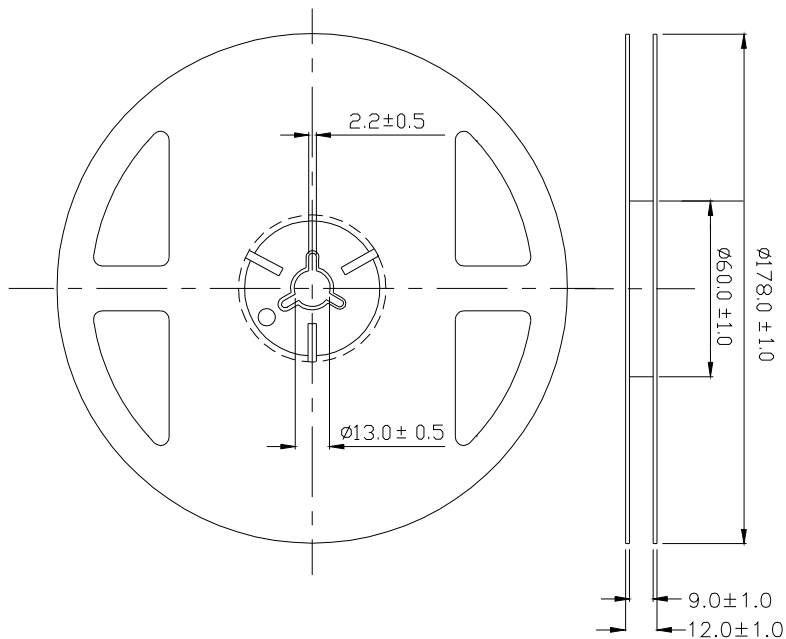
**45-21/LK2C-B56702C4CB2/2T**

#### Label Explanation

CAT: Luminous Intensity Rank  
 HUE: Chromaticity Coordinates  
 REF: Forward Voltage Rank



#### Reel Dimensions



**Note:** Tolerance unless mentioned is  $\pm 0.1$  mm; Unit = mm

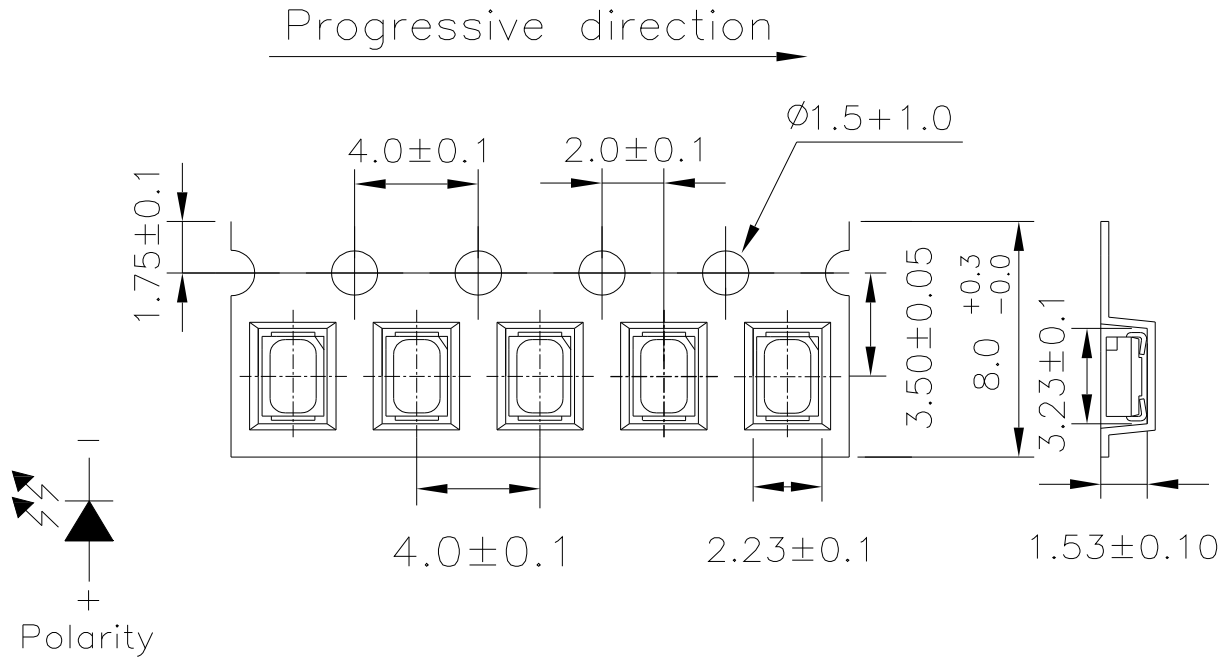


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### Top View LEDs

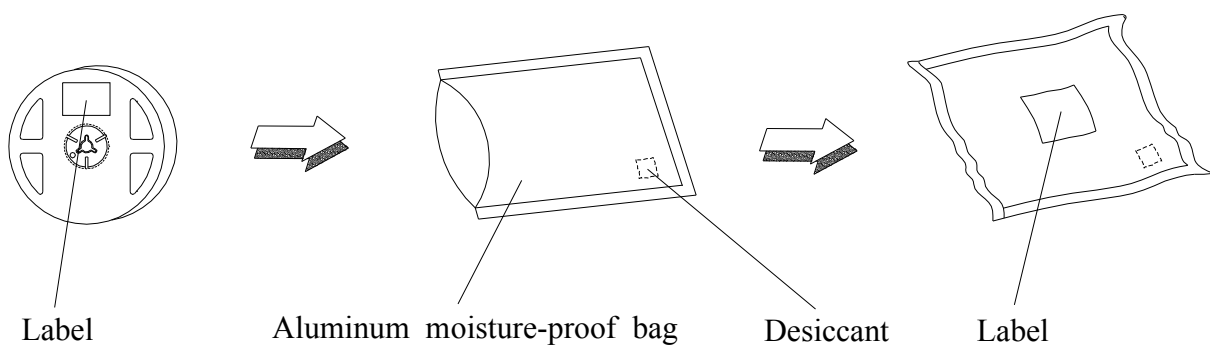
**45-21/LK2C-B56702C4CB2/2T**

**Carrier Tape Dimensions: Loaded Quantity 2000 pcs Per Reel**



**Note:** Tolerance unless mentioned is ±0.1mm; Unit = mm

### Moisture Resistant Packaging



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#### Reliability Test Items and Conditions

The reliability of products shall be satisfied with items listed below.

Confidence level : 90%

LTPD : 10%

| No. | Items                            | Test Condition                             | Test Hours/Cycles | Sample Size | Ac/Re |
|-----|----------------------------------|--|-------------------|-------------|-------|
| 1   | Reflow Soldering                 | Temp. : 260 ±5<br>Min. 10 sec.             | 6 Min.            | 22 PCS      | 0/1   |
| 2   | Temperature Cycle                | H : +100 15min<br>↓ 5 min<br>L : -40 15min | 300 Cycles        | 22 PCS.     | 0/1   |
| 3   | Thermal Shock                    | H : +100 5min<br>↓ 10 sec<br>L : -10 5min  | 300 Cycles        | 22 PCS.     | 0/1   |
| 4   | High Temperature Storage         | Temp. : 100                                | 1000 Hrs.         | 22 PCS.     | 0/1   |
| 5   | Low Temperature Storage          | Temp. : -40                                | 1000 Hrs.         | 22 PCS.     | 0/1   |
| 6   | DC Operating Life                | I <sub>F</sub> = 20 mA / 25                | 1000 Hrs.         | 22 PCS.     | 0/1   |
| 7   | High Temperature / High Humidity | 85 /85%RH                                  | 1000 Hrs.         | 22 PCS.     | 0/1   |

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#### Precautions for Use

##### 1. Over-current-proof

Customer must apply resistors for protection; otherwise slight voltage shift will cause big current change (Burn out will happen).

##### 2. Storage

2.1 Do not open moisture proof bag before the products are ready to use.

2.2 Before opening the package: The LEDs should be used within one year and kept at 30 or less and 70%RH or less.

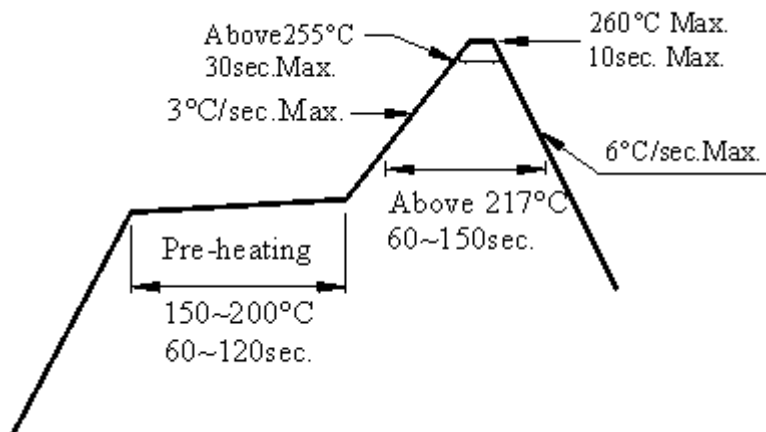
2.3 After opening the package: We recommend that the LED should be soldered quickly (within 3 days). The soldering condition is 30 or less and 60% RH or less. If unused LEDs remain, it should be stored in moisture proof packages.

2.4 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: 60±5 for 24 hours.(One time only)

##### 3. Soldering Condition

##### 3.1 Pb-free solder temperature profile



3.2 Reflow soldering should not be done more than two times.

3.3 When soldering, do not put stress on the LEDs during heating.

3.4 After soldering, do not warp the circuit board.

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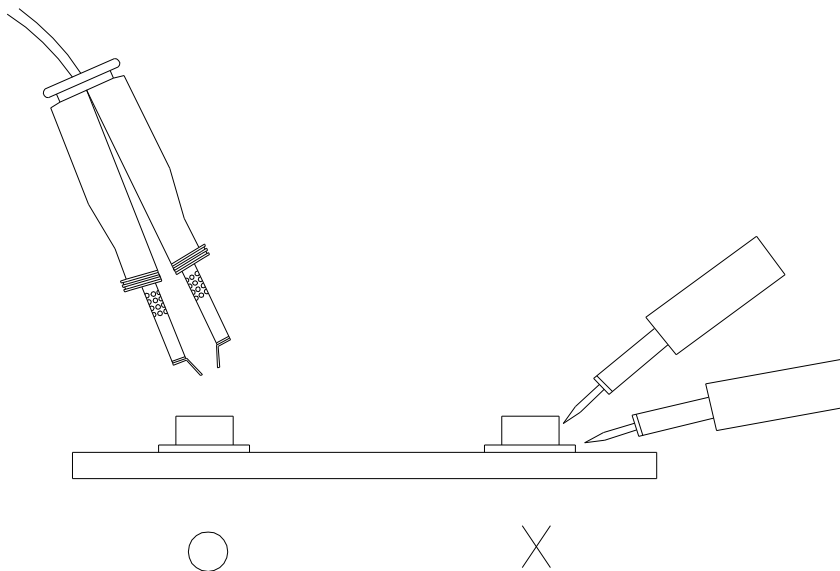
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#### 4. Soldering Iron

Each terminal is to go to the tip of soldering iron temperature less than 350 for 3 seconds within once in less than the soldering iron capacity 25W. Leave two seconds and more intervals, and do soldering of each terminal. Be careful because the damage of the product is often started at the time of the hand solder.

#### 5. Repairing

Repair should not be done after the LEDs have been soldered. When repairing is unavoidable, a double-head soldering iron should be used (as below figure). It should be confirmed beforehand whether the characteristics of the LEDs will or will not be damaged by repairing.



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