

# PRILIMINARY SPECIFICATIONS

## SMD TYPE WHITE POWER LED

Model : AP052□W□N3

Dongbu LED Co., Ltd.

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### 1. General Description

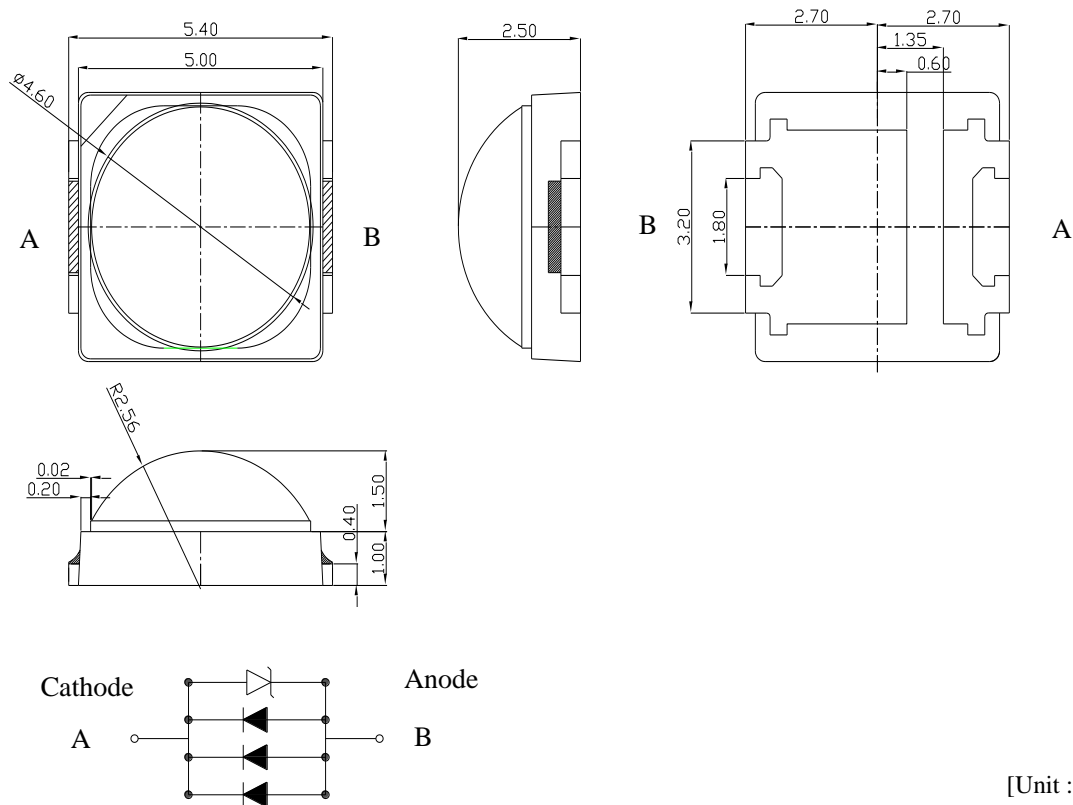
#### (1) Features

- Package Size - 5.4(L) × 5.0(W) × 2.5(T) mm
- White Emission Package (Top View)
- Ideal for backlighting and coupling in light guides
- Wide view angle ( $2\Theta_{1/2}=130\text{deg.}$ )

#### (2) Applications

- General Luminaries
- General Torch
- Architectural Lighting
- Bulb
- Downlights

#### (3) Outline Dimensions



## 2. Specifications

### (1) Absolute Maximum Ratings

| Parameter             | Symbol    | Absolute maximum rating | Unit | Remark |
|-----------------------|-----------|-------------------------|------|--------|
| Power Dissipation     | $P_D$     | 1.32                    | W    |        |
| Forward Current       | $I_F$     | 400                     | mA   |        |
| Reverse Voltage       | $V_R$     | 1.2                     | V    |        |
| Operating Temperature | $T_{OPR}$ | -30 to +85              | °C   |        |
| Storage Temperature   | $T_{STG}$ | -40 to +100             | °C   |        |
| Junction Temperature  | $T_{STG}$ | 120                     | °C   |        |

\* Noted Absolute Maximum Ratings are reference data.

(Guarantee condition will be specified separately on request)

### (2) Initial Electrical/Optical Characteristics

( $T_a=25^\circ\text{C}$ )

| Parameter                            | Symbol   | Condition            | Min.  | Typ. | Max. | Unit |
|--------------------------------------|----------|----------------------|-------|------|------|------|
| Forward Voltage <sup>(1)</sup>       | $V_F$    | $I_F = 350\text{mA}$ | 2.8   | -    | 3.3  | V    |
| Luminous Intensity <sup>(2)</sup>    | $\Phi_V$ | $I_F = 350\text{mA}$ | 140.0 | -    | -    | lm   |
| Color Rendering Index <sup>(3)</sup> | CRI      | $I_F = 350\text{mA}$ | 80.0  | -    | -    | Ra   |

Notes (1) Forward Voltage Measurement allowance is  $\pm 10\%$ .

(2) Luminous Intensity Measurement allowance is  $\pm 10\%$ ,

Measuring equipment : CAS140B(Instrument system)

(3) Color Rendering Index Measurement allowance is  $\pm 3$

\* Initial Electrical/Optical Characteristics data could be changeable if the user use the product in different condition besides above data.

### (3) Characteristics Rank

■ Forward voltage & Luminous intensity rank

( $T_a=25^\circ\text{C}$ )

| Parameter          | Symbol | Condition            | Rank | Min. | Max. | Unit |
|--------------------|--------|----------------------|------|------|------|------|
| Forward Voltage    | $V_F$  | $I_F = 350\text{mA}$ | V28  | 2.8  | 2.9  | V    |
|                    |        |                      | V29  | 2.9  | 3.0  |      |
|                    |        |                      | V31  | 3.1  | 3.2  |      |
|                    |        |                      | V32  | 3.2  | 3.3  |      |
| Luminous Intensity | Flux   | $I_F = 350\text{mA}$ | A1I  | 140  | 145  | lm   |
|                    |        |                      | A1J  | 145  | 150  |      |
|                    |        |                      | A1K  | 150  | 155  |      |
|                    |        |                      | A1L  | 155  | 160  |      |
|                    |        |                      | A1M  | 160  | 165  |      |
|                    |        |                      | A1N  | 165  | 170  |      |

\* Based on the measuring instruments of Dongbu LED

## ■ Color Rank

 (at  $I_f=350\text{mA}$ ,  $T_a=25^\circ\text{C}$ )

|    | 7A     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3028 | 0.3116 | 0.3140 | 0.3055 |
| Cy | 0.3374 | 0.3462 | 0.3330 | 0.3250 |

|    | 7B     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3055 | 0.3140 | 0.3158 | 0.3077 |
| Cy | 0.3250 | 0.3330 | 0.3215 | 0.3145 |

|    | 6A     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3116 | 0.3205 | 0.3215 | 0.3140 |
| Cy | 0.3462 | 0.3547 | 0.3410 | 0.3330 |

|    | 6B     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3140 | 0.3215 | 0.3225 | 0.3158 |
| Cy | 0.3330 | 0.3410 | 0.3275 | 0.3215 |

|    | 6C     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3205 | 0.3290 | 0.3292 | 0.3215 |
| Cy | 0.3547 | 0.3615 | 0.3480 | 0.3410 |

|    | 6D     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3215 | 0.3292 | 0.3295 | 0.3225 |
| Cy | 0.3410 | 0.3480 | 0.3335 | 0.3275 |

|    | 5A     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3290 | 0.3376 | 0.3370 | 0.3292 |
| Cy | 0.3615 | 0.3686 | 0.3550 | 0.3480 |

|    | 5B     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3292 | 0.3370 | 0.3362 | 0.3295 |
| Cy | 0.3480 | 0.3550 | 0.3392 | 0.3335 |

|    | 5C     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3376 | 0.3463 | 0.3450 | 0.3370 |
| Cy | 0.3686 | 0.3758 | 0.3610 | 0.3550 |

|    | 5D     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3370 | 0.3450 | 0.3438 | 0.3362 |
| Cy | 0.3550 | 0.3610 | 0.3455 | 0.3392 |

|    | 5E     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3463 | 0.3550 | 0.3530 | 0.3450 |
| Cy | 0.3758 | 0.3830 | 0.3660 | 0.3610 |

|    | 5F     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3450 | 0.3530 | 0.3508 | 0.3438 |
| Cy | 0.3610 | 0.3660 | 0.3520 | 0.3455 |

|    | 4A     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3551 | 0.3643 | 0.3620 | 0.3530 |
| Cy | 0.3830 | 0.3890 | 0.3730 | 0.3660 |

|    | 4B     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3530 | 0.3620 | 0.3600 | 0.3508 |
| Cy | 0.3660 | 0.3730 | 0.3590 | 0.3520 |

|    | 4C     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3643 | 0.3755 | 0.3720 | 0.3620 |
| Cy | 0.3890 | 0.3960 | 0.3800 | 0.3730 |

|    | 4D     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3620 | 0.3720 | 0.3680 | 0.3600 |
| Cy | 0.3730 | 0.3800 | 0.3640 | 0.3590 |

|    | 4E     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3755 | 0.3871 | 0.3828 | 0.3720 |
| Cy | 0.3960 | 0.4030 | 0.3870 | 0.3800 |

|    | 4F     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3720 | 0.3828 | 0.3780 | 0.3680 |
| Cy | 0.3800 | 0.3870 | 0.3695 | 0.3640 |

|    | 4G     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3871 | 0.4006 | 0.3950 | 0.3828 |
| Cy | 0.4030 | 0.4110 | 0.3950 | 0.3870 |

|    | 4H     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3828 | 0.3950 | 0.3889 | 0.3780 |
| Cy | 0.3870 | 0.3950 | 0.3760 | 0.3695 |

|    | 3A     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.4006 | 0.4150 | 0.4095 | 0.3950 |
| Cy | 0.4110 | 0.4170 | 0.4005 | 0.3950 |

|    | 3B     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.3950 | 0.4095 | 0.4018 | 0.3889 |
| Cy | 0.3950 | 0.4005 | 0.3822 | 0.3760 |

|    | 3C     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.4150 | 0.4299 | 0.4223 | 0.4095 |
| Cy | 0.4170 | 0.4235 | 0.4059 | 0.4005 |

|    | 3D     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.4095 | 0.4223 | 0.4147 | 0.4018 |
| Cy | 0.4005 | 0.4059 | 0.3884 | 0.3822 |

|    | 3E     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.4299 | 0.4431 | 0.4345 | 0.4223 |
| Cy | 0.4235 | 0.4283 | 0.4105 | 0.4059 |

|    | 3F     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.4223 | 0.4345 | 0.4260 | 0.4147 |
| Cy | 0.4059 | 0.4105 | 0.3924 | 0.3884 |

|    | 3G     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.4431 | 0.4562 | 0.4467 | 0.4345 |
| Cy | 0.4283 | 0.4330 | 0.4147 | 0.4105 |

|    | 3H     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.4345 | 0.4467 | 0.4373 | 0.4260 |
| Cy | 0.4105 | 0.4147 | 0.3963 | 0.3924 |

|    | 2A     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.4562 | 0.4688 | 0.4590 | 0.4467 |
| Cy | 0.4330 | 0.4360 | 0.4180 | 0.4147 |

|    | 2B     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.4467 | 0.4590 | 0.4483 | 0.4373 |
| Cy | 0.4147 | 0.4180 | 0.3988 | 0.3963 |

|    | 2C     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.4688 | 0.4813 | 0.4709 | 0.4590 |
| Cy | 0.4360 | 0.4389 | 0.4210 | 0.4180 |

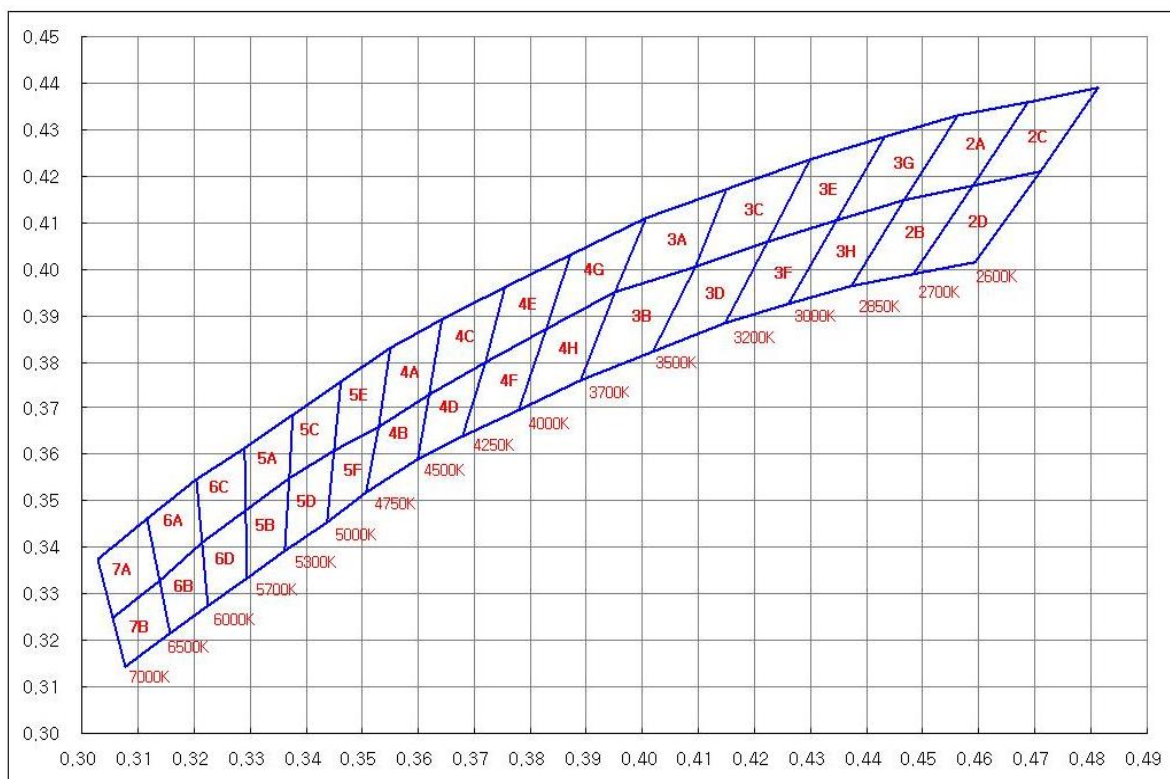
|    | 2D     |        |        |        |
|----|--------|--------|--------|--------|
| Cx | 0.4590 | 0.4709 | 0.4593 | 0.4483 |
| Cy | 0.4180 | 0.4210 | 0.4014 | 0.3988 |

Notes (1) Chromaticity coordinates measurement allowance is  $\pm 0.01$ .

(Based on the measuring instruments of Dongbu LED)

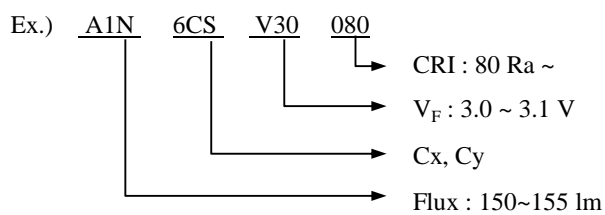
(2) The Chromaticity coordinates refer to CIE 1931 chromaticity diagram.

■ Chromaticity Diagram



3. Rank

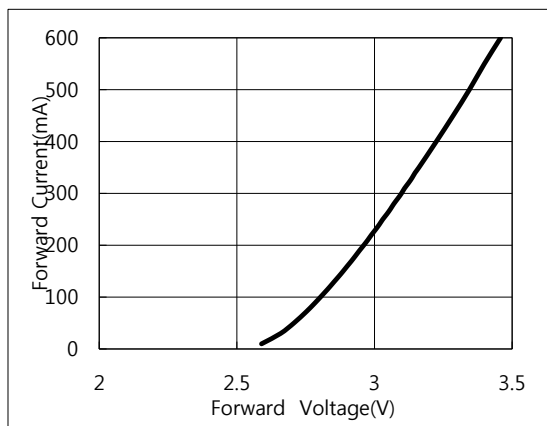
The rank inscription is composed of the follow method.



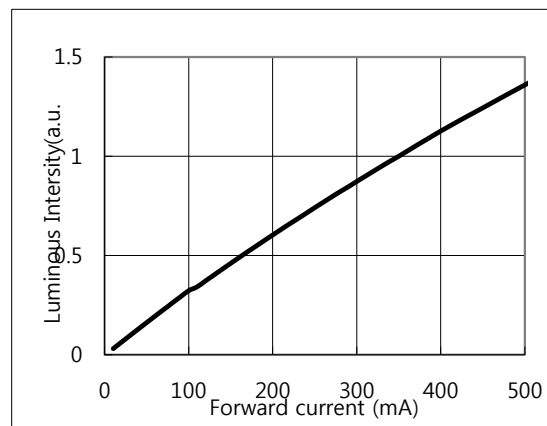
- S : Used 4 rank in one rank
- D : Used 2 vertical rank in one rank
- R : Used 2 horizontal rank in one rank

- ※ Ex) 6CS = 6C,6D,5A,5B
- 6CD = 6C,6D
- 6CR = 6C,5A

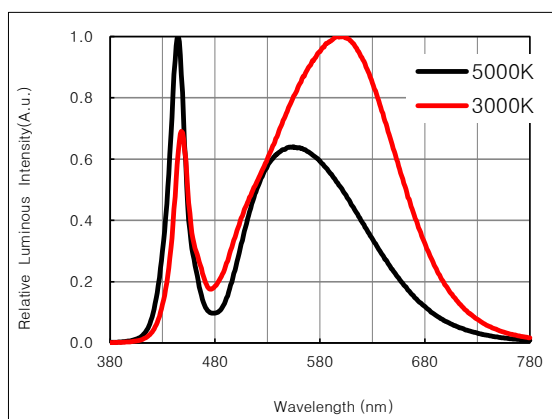
### 4. Characteristics Diagrams



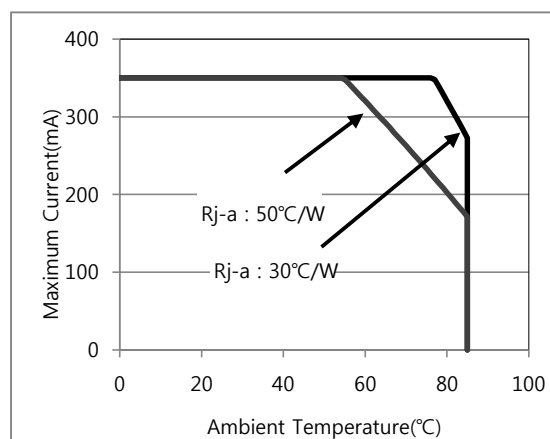
Forward Current vs Forward Voltage



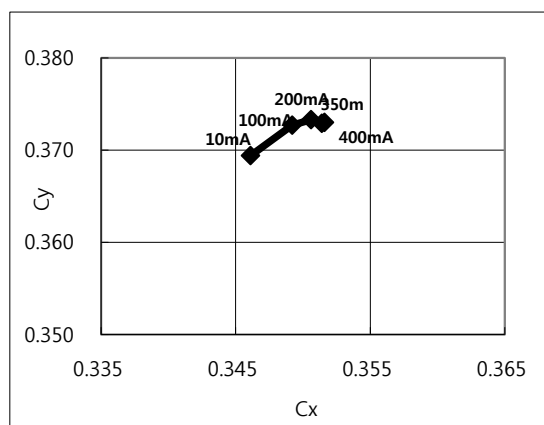
Relative Luminous Intensity vs Forward Current



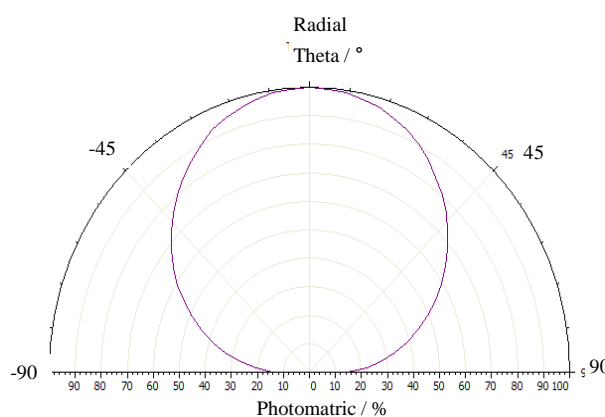
Relative Spectral Emission



Forward Current vs. Ambient Temperature (°C)



Forward Current vs Chromaticity



## 5. Results of Reliability Tests

### (1) Test Items and Results

| Item  | Test Condition  | Notes    | No. of Damaged |
|---|---|----------|----------------|
| Temperature Cycle   | -40 °C ~25 °C ~100 °C ~25 °C<br>(30min~5min~30min~5min)               | 200Cycle | 0/50           |
| Steady State Operating Life                                     | T <sub>a</sub> = 25 °C, I <sub>F</sub> = 350mA                        | 1000hrs. | 0/50           |
| Steady State Operating Life of High Temperature                 | T <sub>a</sub> = 60 °C, I <sub>F</sub> = 350mA                        | 1000hrs  | 0/50           |
| Steady State Operating Life of High Humidity Heat               | T <sub>a</sub> = 85 °C, I <sub>F</sub> = 350mA                        | 1000hrs  | 0/50           |
| High Temperature Storage  | T <sub>a</sub> = 100 °C   | 1000hrs. | 0/50           |
| Steady State Operating Life of High Temperature & High Humidity | T <sub>a</sub> = 85 °C, RH = 85%                                      | 1000hrs. | 0/50           |
| Low Temperature Storage   | T <sub>a</sub> = -40 °C   | 1000hrs. | 0/50           |
| Resistance to Soldering Heat                                    | T <sub>max</sub> =260 °C, 10sec<br>(Pre treatment 30 °C, 70%, 168hrs) | 2 times  | 0/50           |

\* The above reliability data is only for the reference data about the environment test.

### (2) Criteria for Judging the Damage

| Parameter          | Symbol         | Condition              | Criteria for Judgement      |                             |
|--------------------|----------------|------------------------|-----------------------------|-----------------------------|
|                    |                |                        | Min.                        | Max.                        |
| Forward Voltage    | V <sub>F</sub> | I <sub>F</sub> = 350mA | -                           | U.S.L. <sup>(1)</sup> * 1.2 |
| Luminous Intensity | I <sub>v</sub> | I <sub>F</sub> = 350mA | L.S.L. <sup>(2)</sup> * 0.7 | -                           |
| Reverse Current    | I <sub>R</sub> | V <sub>R</sub> = 5V    | -                           | 20μA                        |

Notes (1) U.S.L. : Upper Specification Level

(2) L.S.L. : Lower Specification Level



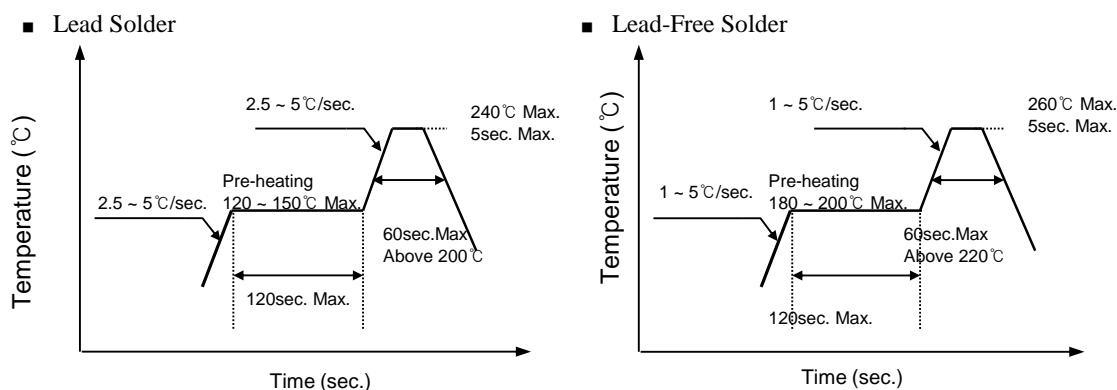
## 6. Soldering Conditions

### (1) Recommended Soldering Conditions

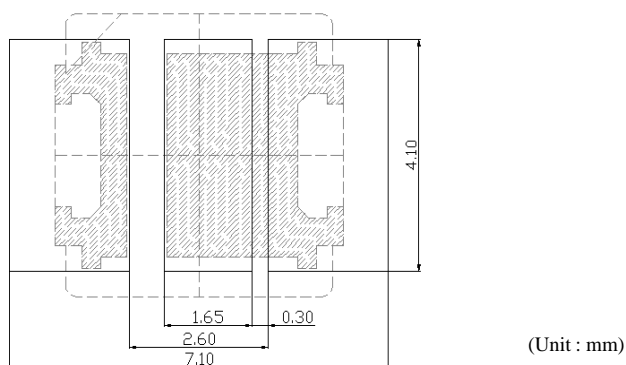
| Reflow Soldering |              |                  | Hand Soldering             |  |
|------------------|--------------|------------------|----------------------------|--|
|                  | Lead Solder  | Lead-Free Solder | Temperature Soldering time | 350°C Max.<br>3 sec. Max.<br>(one time only) |
| Pre-Heating      | 120 ~ 150°C  | 180 ~ 200°C      |                            |  |
| Pre-Heat Time    | 120sec. Max. | 120sec. Max.     |                            |  |
| Peak Temperature | 240°C Max.   | 260°C Max.       |                            |  |
| Soldering Time   | 5sec. Max.   | 5sec. Max.       |                            |  |

\* After reflow soldering, Rapid cooling should be avoided.

### (2) Recommended Reflow Soldering profile



### (3) Recommended Soldering Pattern

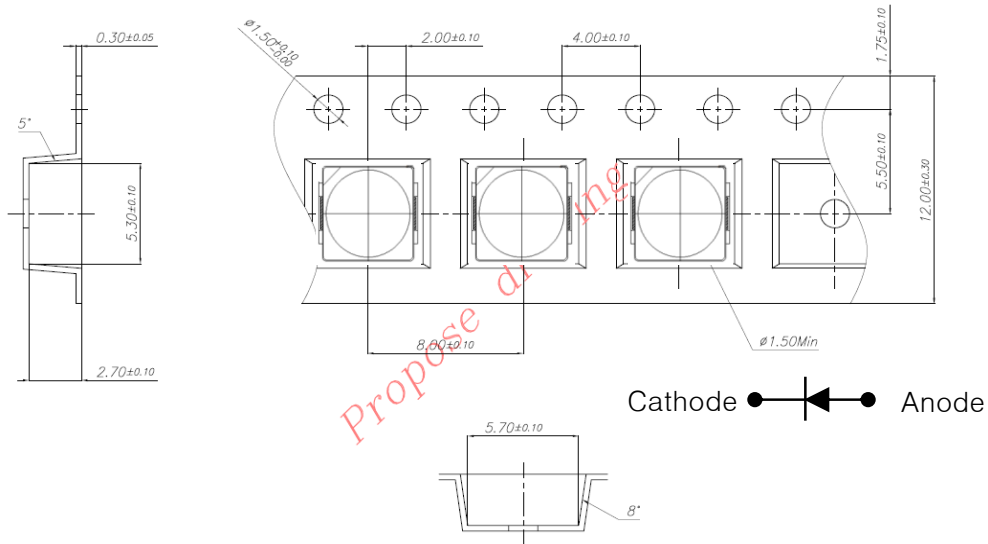


### (4) Soldering Cautions

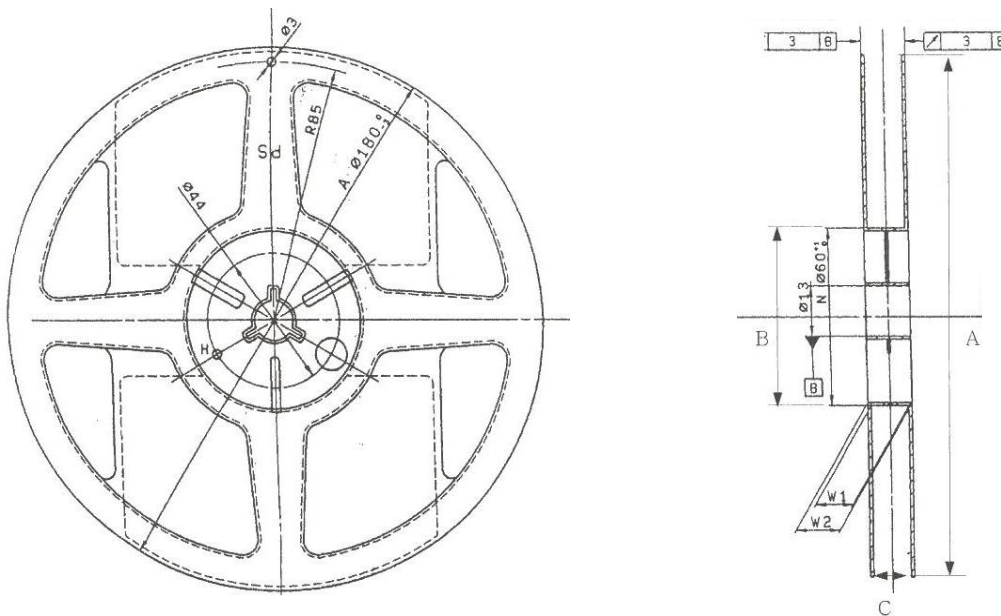
- Because of the zener diode, the isolation pad should not connect the other pad.
- Reflow soldering should not be done more than two times.
- When soldering, do not put stress on the LEDs during heating.
- After soldering, do not wrap the circuit board.
- The LEDs can be soldered on place using the reflow soldering method.
- Occasionally there is a brightness decrease cause by the influence of heat or ambient atmosphere during air reflow. It is recommend that the user use the nitrogen reflow method.
- After complete soldering, the product should be handled after cooling. (required to be handled under 60°C)

## 7. Packing

### (1) Carrier Tape & Carrier Reel Dimensions



#### ■ Carrier Reel



Notes (1) Quantity : 2000pcs/reel

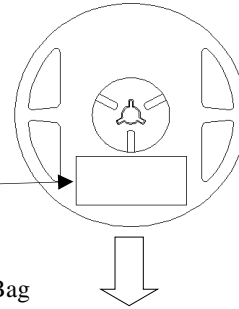
(2) Adhesion strength of cover tape is 0.1 ~ 0.7N(20gf ~60gf) when the cover tape is turned off from the carrier ta

(2) Packing and Packaging

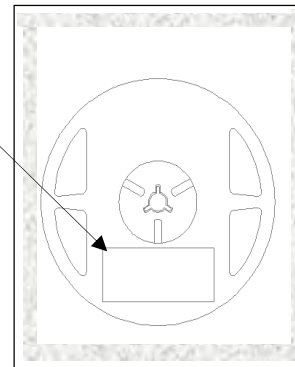
■ Label



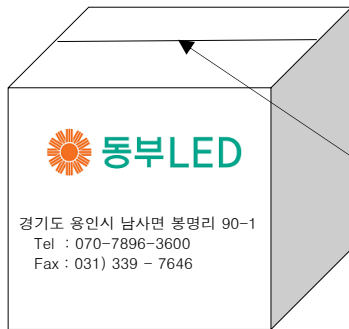
■ Reel



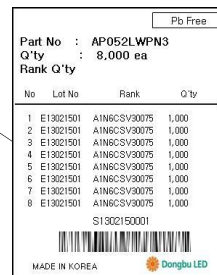
■ Aluminum Bag



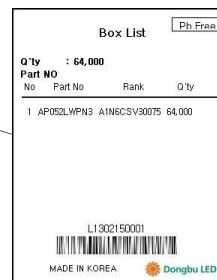
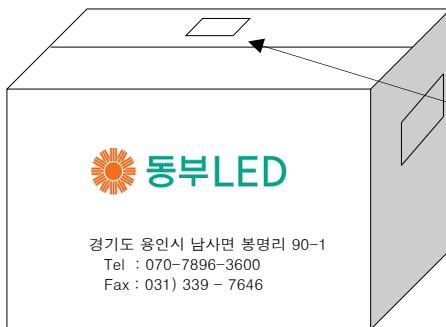
■ Inner Box



■ Box Label



■ Outer Box



| Box Type               | Inner Box | Outer Box |        |
|------------------------|-----------|-----------|--------|
|                        |           | Medium    | Large  |
| Max. Packing Q'ty(pcs) | 8,000     | 32,000    | 64,000 |

(1) The carrier tape winded on the reel are placed into an ESD protected pack with a silicagel and sealed by the thermal pressure sealer. Then this sealed pack is packaged in a cardboard box.

## 8. Precaution

### (1) Static Electricity

These LEDs are highly susceptible to static electricity or surge voltage. So a wrist strap or an anti-electrostatic glove necessarily be used when handling the LEDs. Do not use the equipment that surge voltage is came into existence.

All devices and equipment that measure or mount the LEDs must be properly grounded.

After being assembled LEDs, it should be ascertained a electrical characteristic whether that are damaged by static electricity or not. It is easy to find the damaged LEDs by a light-on or VF test at forward a below 0.15mA current.

### (2) Packing

The moisture that is absorbed into the LED products may cause a badness and damage to the optical characteristics of the LEDs. Therefore the moisture barrier aluminum bag is used to keep moisture in the packing. And a silicagel is inserted into a moisture barrier aluminum bag that sealed by the thermal pressure sealer.

### (3) Cleaning

We greatly recommend IPA(solution) for LED cleaning and it should be limited exposure time for cleaning maximum 1 minute. (We can not guarantee the quality assurance if it has been used to other solution.)

It is recommended that isopropyl alcohol(IPA) be used as a solvent for cleaning the LEDs.

Do not clean the LEDs by the ultrasonic. When it use other solvents or is absolutely necessary ultrasonic, before cleaning, a pre-test should be done to confirm whether the LEDs are any damaged or not

### (4) Storage

In order to avoid the absorption of moisture, it is recommended to store LEDs in the moisture barrier aluminum bag is not opened.

Storage condition before opening the packing :

Temperature : below 30℃

Humidity : 90%RH max

The LEDs should be used within a year.

Storage condition after opening the packing :

Temperature : below 30℃

Humidity : 60%RH max

The products have to be used within one year from the date marked on label which is attached to reel or aluminium bag.

After opening the packing, the LEDs should be used within 168 hours(7days). If unused LEDs remain, they should be stored in the place kept away moisture.

If the LEDs have exceeded the above storage time, it should be used after to bake using the following conditions.

Baking condition : 60±5℃, more than 24 hours

**(5) Pick and Place**

It should be avoided to rub or scratch the surface of resin by any hard material. It is possible that the LEDs are damaged to the optical characteristics.

**(6) Heat**

The LEDs are products that are generated heat. Please consider the heat generation of the LED when it is designed the PCB. After considering the ambient temperature and the heat generation of LEDs, the operating current should be decided

**(7) Others**

If the forward or reverse voltage which exceeds the absolute maximum rating is applied to the LEDs, that will cause the damage to the LEDs. It is possible that the damaged LEDs do not light on at the low current.

Be careful not to look the LEDs that the output power is strongly increased in the face. It is possible that eyesight has been getting weaker.

This specifications of the product may be revised without notice.

Light emitting part should not be exposed by physical contact. It can be the reason of material desquamation and progressive disconnection.

This LED is made for in-door use only. If the user wants the LED for out-door use, it is necessary to take some additional treatment on the product after surface mounting technology(SMT).

This specification could be changed without a notice to the customer because of the inside circumstance of the company.