

**SPECIFICATIONS FOR NICHIA WHITE LED**

**MODEL : NSPW500BS**

**NICHIA CORPORATION**

## 1.SPECIFICATIONS

### (1) Absolute Maximum Rating

(Ta=25 )

| Item                       | Symbol | Absolute Maximum Rating | Unit |
|----------------------------|--------|-------------------------|------|
| Forward Current            | IF     | 30                      | mA   |
| Pulse Forward Current      | IFP    | 100                     | mA   |
| Reverse Voltage            | VR     | 5                       | V    |
| Power Dissipation          | PD     | 120                     | mW   |
| Operating Temperature      | Topr   | - 30 ~ + 85             |      |
| Storage Temperature        | Tstg   | - 40 ~ + 100            |      |
| Lead Soldering Temperature | Tsol   | 260 ± 5 for 5sec.       |      |

IFP Conditions : Pulse Width 10msec. and Duty 1/10

### (2) Initial Electrical/Optical Characteristics

(Ta=25 )

| Item               |        | Symbol         | Condition              | Min. | Typ. | Max. | Unit |
|--------------------|--------|----------------|------------------------|------|------|------|------|
| Forward Voltage    |        | V <sub>F</sub> | I <sub>F</sub> =20[mA] | -    | 3.6  | 4.0  | V    |
| Reverse Current    |        | I <sub>R</sub> | V <sub>R</sub> = 5[V]  | -    | -    | 50   | μ A  |
| Luminous Intensity | Rank S | I <sub>v</sub> | I <sub>F</sub> =20[mA] | 6800 | 8000 | 9500 | mcd  |
|                    | Rank R | I <sub>v</sub> | I <sub>F</sub> =20[mA] | 4800 | 5600 | 6800 | mcd  |
|                    | Rank Q | I <sub>v</sub> | I <sub>F</sub> =20[mA] | 3400 | 4000 | 4800 | mcd  |

Measurement Uncertainty of the Luminous Intensity : ± 10%

One delivery will include three different ranks of products. The quantity-ratio of the three ranks is decided by Nichia.

#### Color Ranks

(IF=20mA,Ta=25 )

|   | Rank a0 |       |       |       |
|---|---------|-------|-------|-------|
| x | 0.280   | 0.264 | 0.283 | 0.296 |
| y | 0.248   | 0.267 | 0.305 | 0.276 |

|   | Rank b1 |       |       |       |
|---|---------|-------|-------|-------|
| x | 0.287   | 0.283 | 0.330 | 0.330 |
| y | 0.295   | 0.305 | 0.360 | 0.339 |

|   | Rank b2 |       |       |       |
|---|---------|-------|-------|-------|
| x | 0.296   | 0.287 | 0.330 | 0.330 |
| y | 0.276   | 0.295 | 0.339 | 0.318 |

|   | Rank c0 |       |       |       |
|---|---------|-------|-------|-------|
| x | 0.330   | 0.330 | 0.361 | 0.356 |
| y | 0.318   | 0.360 | 0.385 | 0.351 |

Measurement Uncertainty of the Color Coordinates : ± 0.02

One delivery will include the consecutive two ranks of products. The quantity-ratio of the two ranks is decided by Nichia.

#### Luminous Intensity

| Ranking by Luminous Intensity |  | Q | R | S |
|-------------------------------|--|---|---|---|
| Ranking by Color Coordinates  |  |   |   |   |
| a0                            |  |   |   |   |
| b1                            |  |   |   |   |
| b2                            |  |   |   |   |
| c0                            |  |   |   |   |

Shaded ranks are available.

## 2.TYPICAL INITIAL OPTICAL/ELECTRICAL CHARACTERISTICS

Please refer to figure's page.

## 3.OUTLINE DIMENSIONS AND MATERIALS

Please refer to figure's page.

Material as follows ; Resin : Epoxy  
 Leadframe : Ag plating Copper alloy

## 4.PACKAGING

Please refer to figure's page.

The label on the minimum packing unit bag shows;

Part Number , Lot Number , Quantity , Ranking

## 5.LOT NUMBER

The first six digits number shows **lot number**.

The lot number is composed of the following characters;

- × × × × -
- Year ( 9 for 1999, 0 for 2000 )
  - Month ( 1 for Jan., 9 for Sep., A for Oct., B for Nov. )
- × × × × -
- Nichia's Product Number
  - Ranking by Color Coordinates
  - Ranking by Luminous Intensity

## 6.RELIABILITY

### (1) TEST ITEMS AND RESULTS

| Test Item                                   | Standard Test Method  | Test Conditions  | Note                 | Number of Damaged |
|---|-----------------------|--|----------------------|-------------------|
| Resistance to Soldering Heat                | JIS C 7021 (1977)A-1  | Tsol=260 ± 5 , 10sec.<br>3mm from the base of the epoxy bulb | 1 time               | 0/100             |
| Solderability                               | JIS C 7021 (1977)A-2  | Tsol=235 ± 5 , 5sec.<br>(using flux)                         | 1 time<br>over 95%   | 0/100             |
| Heat Shock                                  | JIS C 7021 (1977)A-3  | 0 ~ 100<br>5sec. 15sec.                                      | 100 cycles           | 0/100             |
| Temperature Cycle                           | JIS C 7021 (1977)A-4  | -40 ~ 25 ~ 100 ~ 25<br>30min. 5min. 30min. 5min.             | 100 cycles           | 0/100             |
| High Humidity Heat Cycle                    | JIS C 7021 (1977)A-5  | 30 ~ 65 ~ -10<br>90%RH 24hrs./1cycle                         | 10 cycles            | 0/100             |
| Mechanical Strength of Terminal (bend test) | JIS C 7021 (1977)A-11 | Load 2.5N (0.25kgf)<br>0° ~ 90° ~ 0° bend 3 times            | No noticeable damage | 0/100             |
| Mechanical Strength of Terminal (pull test) | JIS C 7021 (1977)A-11 | Load 10N (1kgf)<br>30 ± 1 sec.                               | No noticeable damage | 0/100             |
| High Temperature Storage                    | JIS C 7021 (1977)B-10 | Ta=100   | 1000hrs.             | 0/100             |
| Humidity Heat Load                          | JIS C 7021 (1977)B-11 | Ta=60 , RH=90%   | 1000hrs.             | 0/100             |
| Low Temperature Storage                     | JIS C 7021 (1977)B-12 | Ta=-40   | 1000hrs.             | 0/100             |
| Life Test                                   | JIS C 7035 (1985)     | Ta=25 , If=30mA  | 1000hrs.             | 0/100             |
| High Humidity Heat Life Test                |                       | 60 , RH=90%, If=20mA   | 500hrs.              | 0/100             |
| Low Temperature Life Test                   |                       | Ta=-30 , If=20mA   | 1000hrs.             | 0/100             |

### (2) CRITERIA FOR JUDGING THE DAMAGE

| Item               | Symbol         | Test Conditions    | Criteria for Judgement |                |
|--------------------|----------------|--------------------|------------------------|----------------|
|                    |                |                    | Min.                   | Max.           |
| Forward Voltage    | V <sub>F</sub> | If=20mA            | -                      | U.S.L.*) × 1.1 |
| Reverse Current    | I <sub>R</sub> | V <sub>R</sub> =5V | -                      | U.S.L.*) × 2.0 |
| Luminous Intensity | I <sub>v</sub> | If=20mA            | L.S.L.***) × 0.7       | -              |

\*) U.S.L. : Upper Standard Level

\*\*) L.S.L. : Lower Standard Level

## 7.CAUTIONS

White LEDs are devices which are materialized by combining Blue LEDs and special phosphors. Consequently, the color of White LEDs is changed a little by an operating current. Care should be taken after due consideration when using LEDs.

### (1) Lead Forming

- When forming leads, the leads should be bent at a point at least 3mm from the base of the epoxy bulb. Do not use the base of the leadframe as a fulcrum during lead forming.
- Lead forming should be done before soldering.
- Do not apply any bending stress to the base of the lead. The stress to the base may damage the LED's characteristics or it may break the LEDs.
- When mounting the LEDs onto a printed circuit board, the holes on the circuit board should be exactly aligned with the leads of the LEDs. If the LEDs are mounted with stress at the leads, it causes deterioration of the epoxy resin and this will degrade the LEDs.

### (2) Soldering Conditions

- The leadframes of Nichia LEDs are made of copper-allay by special considering of heat conductance, so that very careful attention must be paid for the handling when soldering the LEDs.
- Solder the LEDs no closer than 3mm from the base of the epoxy bulb. Soldering the LEDs beyond the tie-bar is recommended.
- Maximum Allowable Soldering Conditions

| Soldering   | Solder Dipping   |
|---|--|
| Soldering Iron : 30W Max.                                       | Pre-Heat : 100 Max.  |
| Temperature : 300 Max.  | Pre-Heat Time : 60 seconds Max.  |
| Soldering Time : 3 seconds Max.                                 | Solder Bath Temperature : 260 Max.                                     |
| Position : No closer than 3 mm from the base of the epoxy bulb. | Dipping Time : 5 seconds Max.  |
|   | Dipping Position : No lower than 3 mm from the base of the epoxy bulb. |

- Do not apply any stress to the lead particularly when heated.
- The LEDs must not be repositioned after soldering.
- After soldering the LEDs, the epoxy bulb should be protected from mechanical shock or vibration until the LEDs return to room temperature.
- Direct soldering onto a PC board should be avoided. Mechanical stress to the resin may be caused from warping of the PC board or from the clinching and cutting of the lead frames. When it is absolutely necessary, the LEDs may be mounted in this fashion but the User will assume responsibility for any problems. Direct soldering should only be done after testing has confirmed that no damage such as wire bond failure or resin deterioration will occur. Nichia's LEDs should not be soldered directly to double sided PC boards because the heat will deteriorate the epoxy resin.
- When it is necessary to clamp the LEDs to prevent soldering failure, it is important to minimize the mechanical stress on the LEDs.
- Cut the LED leadframes at room temperature. Cutting the leadframes at high temperature may cause failure of the LEDs.

### (3) Heat Generation

- Heat generation must be taken into design consideration when using the LEDs. The coefficient of temperature increase per input electric power at room temperature is about 0.5 degrees C/mW at the LED's active layer. This temperature gets higher when the LEDs are densely mounted. It is necessary to design the circuit so that the operating conditions are within the absolute maximum ratings.
- The operating current should be decided after considering the ambient maximum temperature when the LEDs are illuminating.

(4) Static Electricity

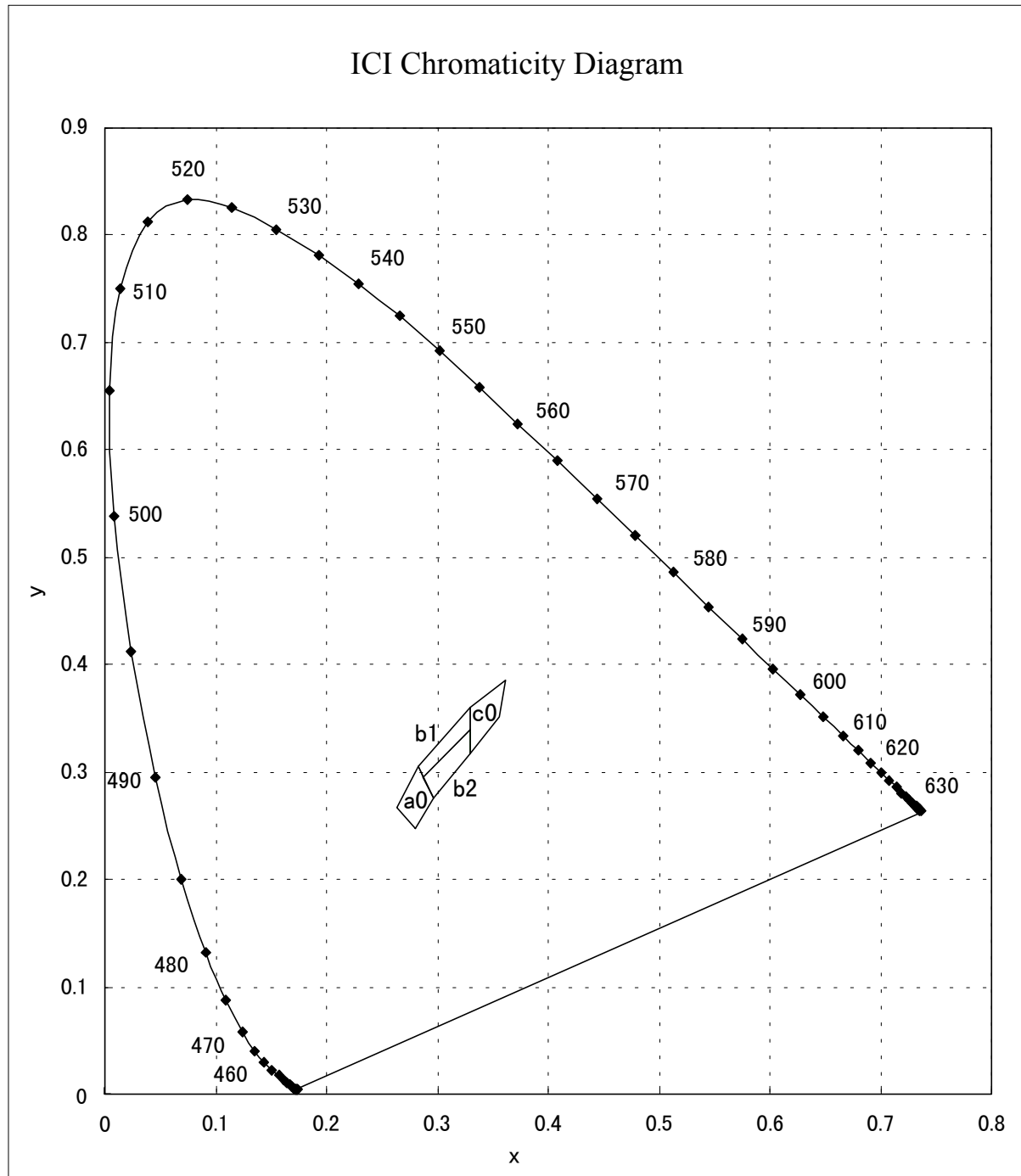
- Static electricity and surge will damage the LEDs. It is recommended to use a wrist band or anti-electrostatic glove when handling the LEDs.
- All devices, equipment and machinery must be properly grounded .
- When inspecting own final products on which LEDs were mounted, it is recommended to check also whether the mounted LEDs are damaged by static electricity or not. It is easy to find static-damaged LEDs by light emission test at lower current (below 1mA is recommended).
- Damaged LEDs will show some unusual characteristics such as leak current remarkably increases, starting forward voltage becomes lower, or the LEDs get unlighted at the low current.

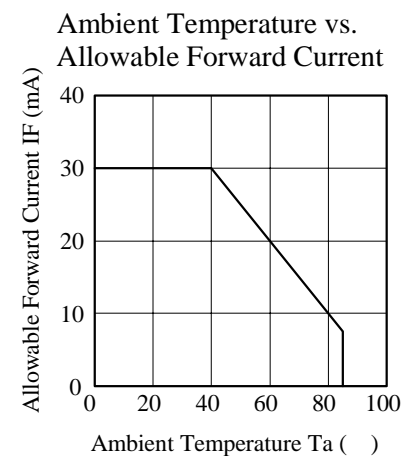
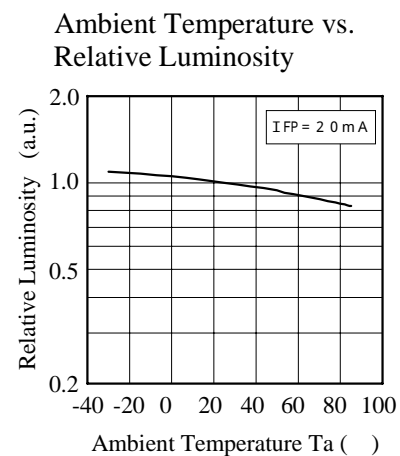
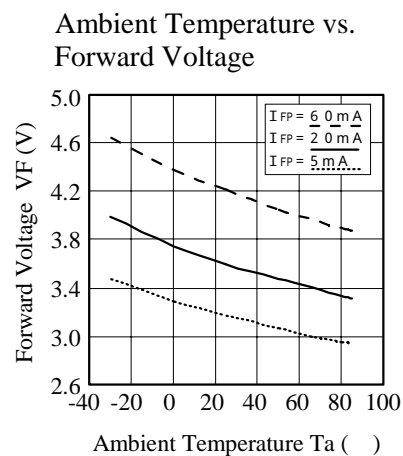
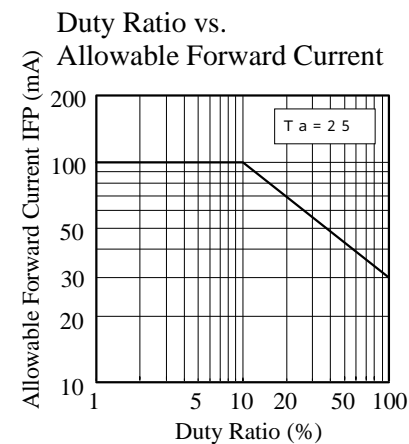
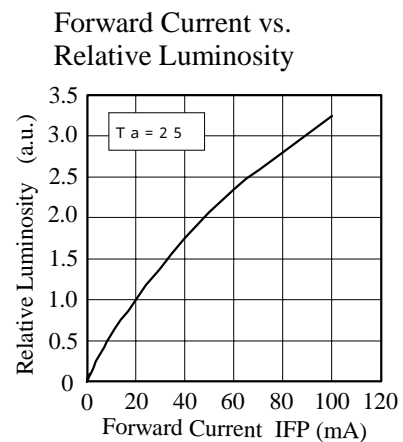
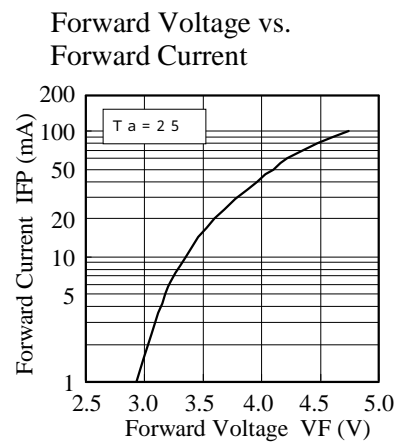
(5) Cleaning

- Avoid exposure to chemicals as they may attack the LED epoxy and cause discoloration. When washing is required, isopropyl alcohol should be used.
- The influence of ultrasonic cleaning on the LEDs differs depending on factors such as oscillator output and how the LEDs are mounted. Before cleaning by ultrasonic wave, testing should be performed to ensure this will not cause damage to the LEDs.

(6) Others

- Care must be taken so that reverse voltage will not exceed the absolute maximum rating when using LEDs with matrix drive.
- The leads are plated with silver. They will become discolored by contact with hydrogen sulfide and other gaseous chemicals. Precautions must be taken to maintain a clean storing atmosphere. Also, if the LEDs are stored for 3 months or more after being shipped from Nichia, a sealed container with a nitrogen atmosphere should be used for storage.
- 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.
- These LEDs described in this brochure are intended to be used for ordinary electronic equipment (such as office equipment, communications equipment, measurement instruments and household appliances). Consult Nichia's sales staff in advance for information on the applications in which exceptional quality and reliability are required, particularly when the failure or malfunction of the LEDs may directly jeopardize life or health (such as for airplanes, aerospace, automobiles, traffic control equipment, life support systems and safety devices.)
- User shall not reverse engineer by disassembling or analysis of the LEDs without having the prior written consent of Nichia. When defective LEDs are found, User shall inform to Nichia directly before disassembling or analysis.
- The formal specifications must be exchanged and signed by both parties before large volume purchase begins.
- The appearance and specifications of the product may be modified for improvement without notice.

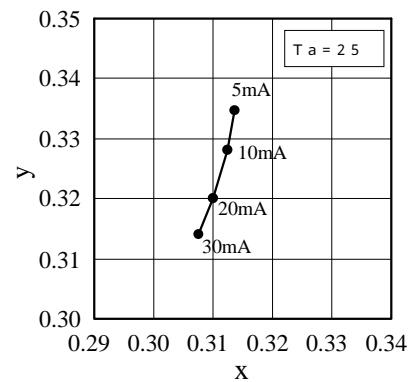




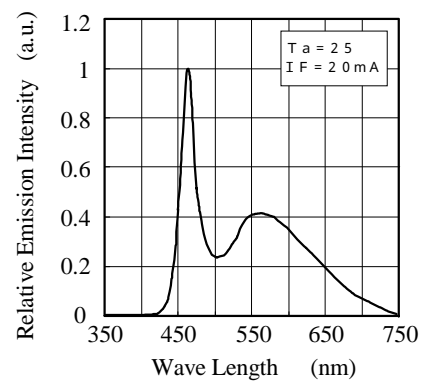
NICHIA CORPORATION

|       |                     |
|-------|---------------------|
| Model | NSPWxxxx            |
| Title | TYP.CHARACTERISTICS |
| No.   | 000728906042        |

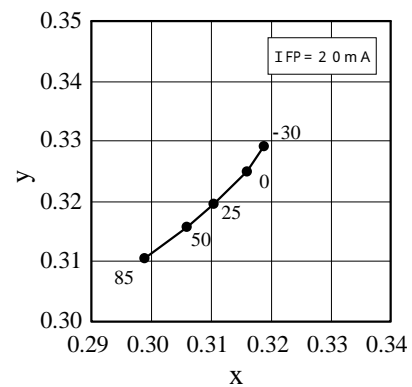
Forward Current vs.  
Chromaticity diagram



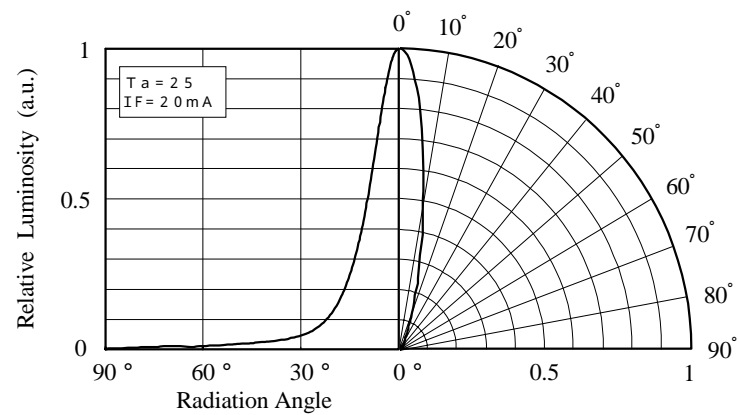
Spectrum



Ambient Temperature vs.  
Chromaticity diagram

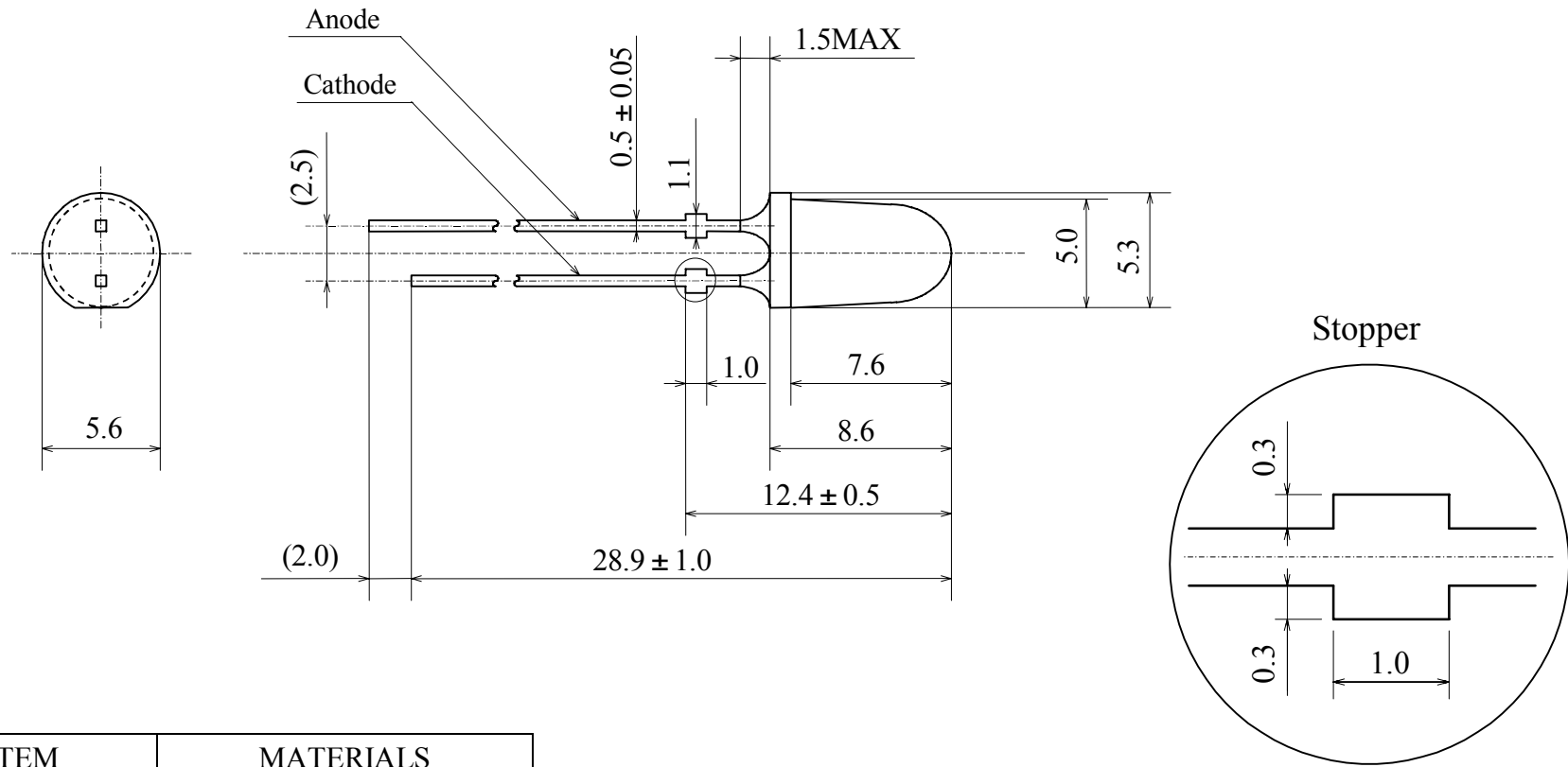


Directivity (NSPW500BS)



|                    |       |                     |
|--------------------|-------|---------------------|
| NICHIA CORPORATION | Model | NSPW500BS           |
|                    | Title | TYP.CHARACTERISTICS |
|                    | No.   | 000728906082        |



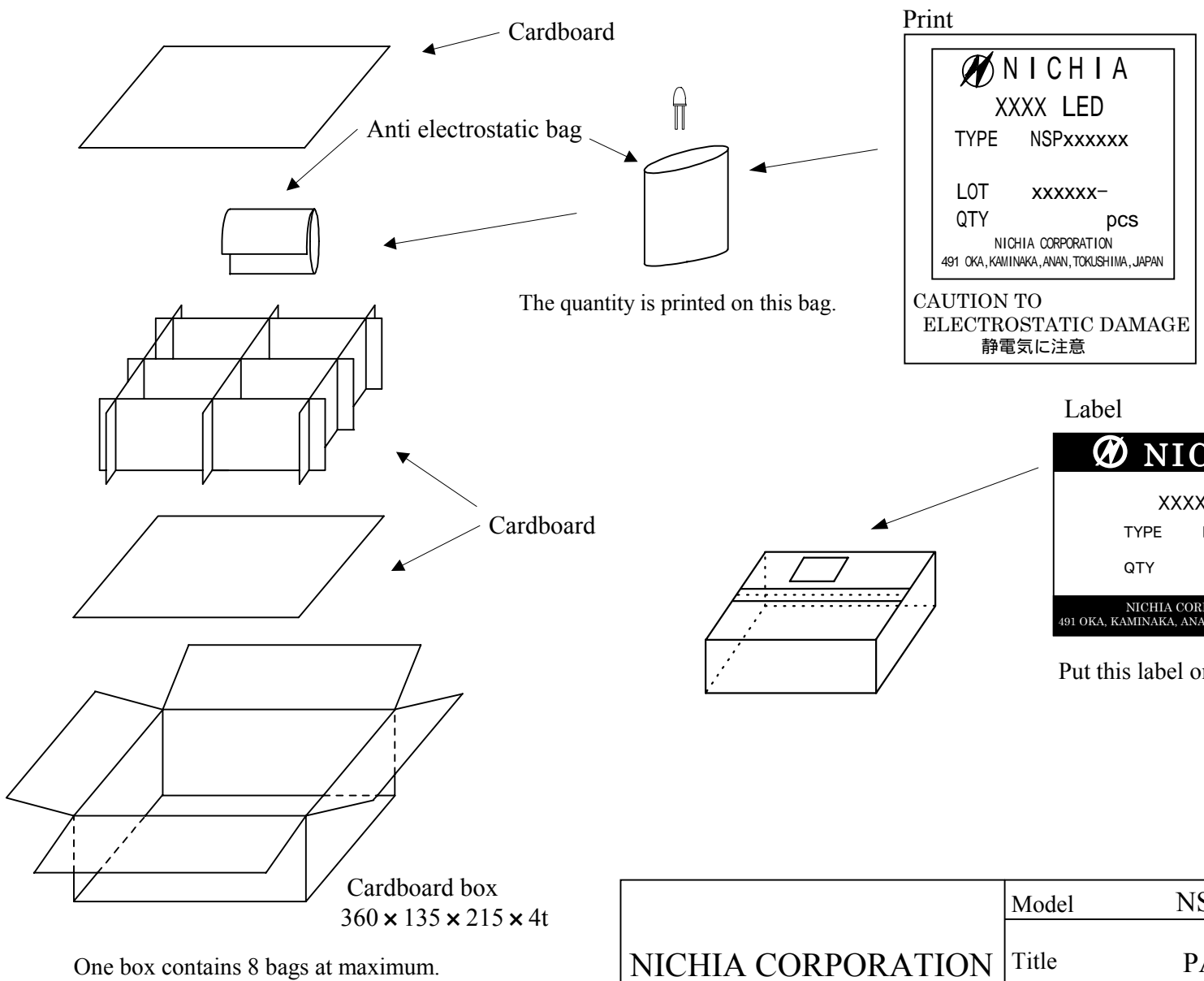


| ITEM        | MATERIALS               |
|-------------|-------------------------|
| RESIN(MOLD) | Epoxy                   |
| LEAD FRAME  | Ag Plating Copper alloy |

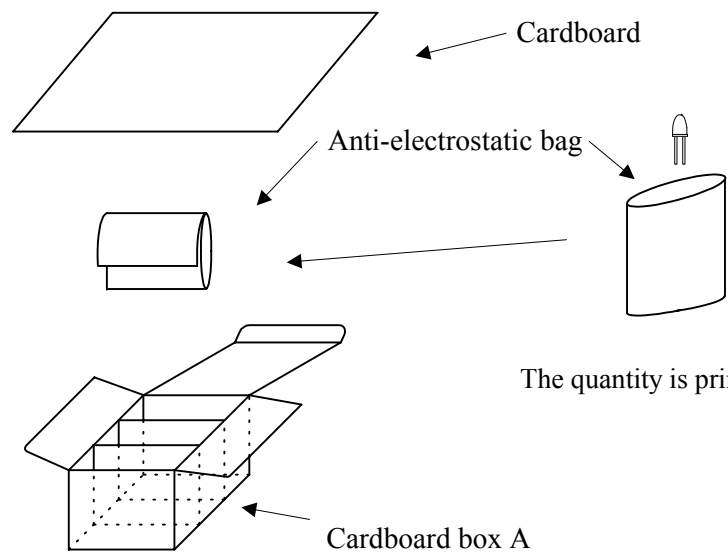
Remark:

Bare copper alloy is exposed at tie-bar portion after cutting.  
The lamps have sharp and hard points that may injure human eyes or fingers etc. ,so please pay enough care in the handling.

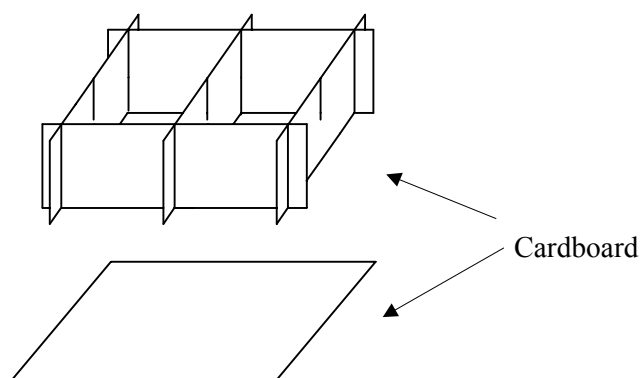
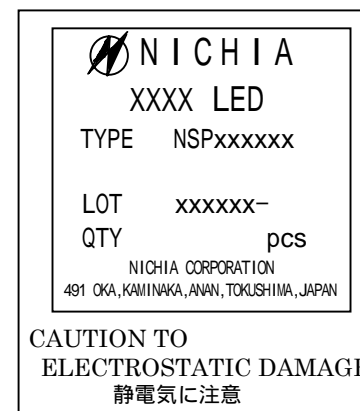
|                    |       |                    |                    |
|--------------------|-------|--------------------|--------------------|
| NICHIA CORPORATION | Model | NSPW500BS          | Unit<br>mm         |
|                    | Title | OUTLINE DIMENSIONS | 3/1<br>Scale       |
|                    | No.   | 000728908091       | Allow<br>$\pm 0.2$ |



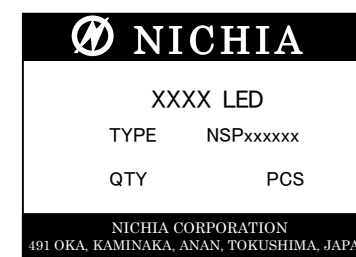
|                    |       |              |  |
|--------------------|-------|--------------|--|
| NICHIA CORPORATION | Model | NSPxxxxxx    |  |
|                    | Title | PACKING      |  |
|                    | No.   | 000728801062 |  |



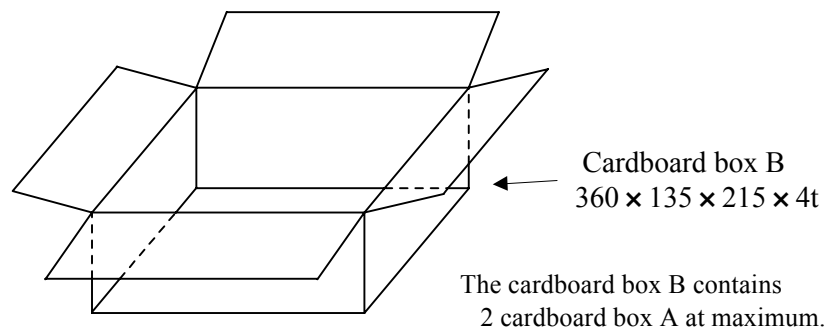
Print



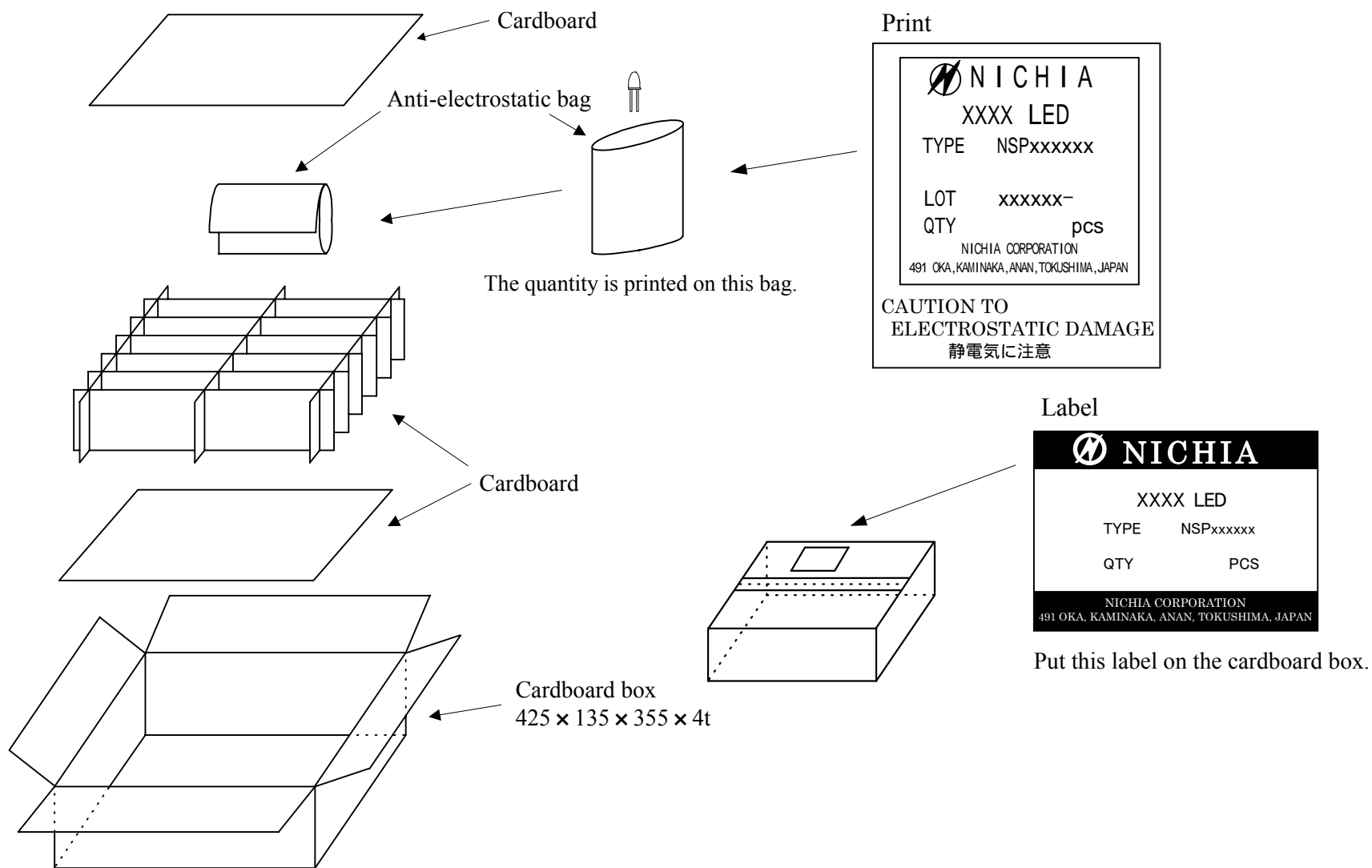
Label



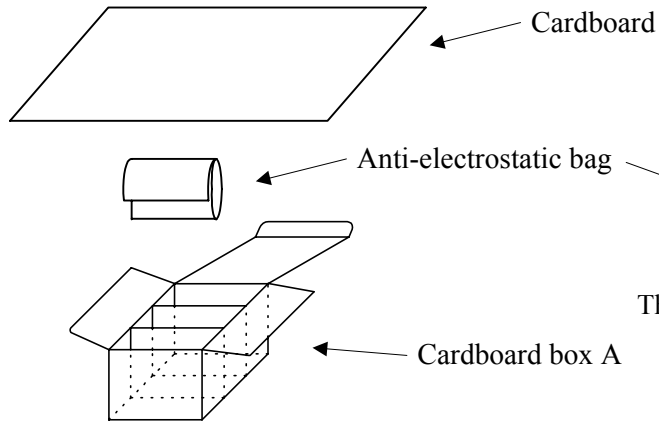
Put this label on the cardboard box B.



|                    |       |              |  |
|--------------------|-------|--------------|--|
| NICHIA CORPORATION | Model | NSPxxxxxx    |  |
|                    | Title | PACKING      |  |
|                    | No.   | 000728801052 |  |



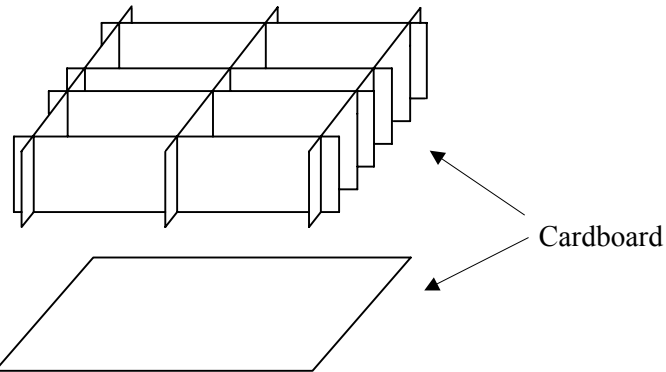
|                    |       |              |  |
|--------------------|-------|--------------|--|
| NICHIA CORPORATION | Model | NSPxxxxxx    |  |
|                    | Title | PACKING      |  |
|                    | No.   | 000728800982 |  |



The quantity is printed on this bag.

Print

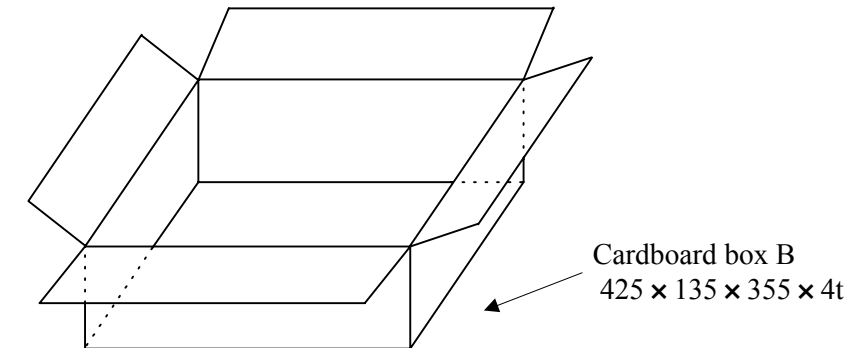
|  |           |
|--|-----------|
|  |           |
| XXXX LED                                     |           |
| TYPE   | NSPxxxxxx |
| LOT  | xxxxxx-   |
| QTY  | pcs       |
| NICHIA CORPORATION                           |           |
| 491 OKA, KAMINAKA, ANAN, TOKUSHIMA, JAPAN    |           |
| CAUTION TO<br>ELECTROSTATIC DAMAGE<br>静電気に注意 |           |



Label

|   |           |
|---|-----------|
|   |           |
| XXXX LED                                  |           |
| TYPE                                      | NSPxxxxxx |
| QTY                                       | PCS       |
| NICHIA CORPORATION                        |           |
| 491 OKA, KAMINAKA, ANAN, TOKUSHIMA, JAPAN |           |

Put this label on the cardboard box B.



The cardboard box B contains 4 cardboard box A at maximum.

|                    |       |              |  |
|--------------------|-------|--------------|--|
| NICHIA CORPORATION | Model | NSPxxxxxx    |  |
|                    | Title | PACKING      |  |
|                    | No.   | 000728801132 |  |