

No. STSE-CB7115A

<Cat.No.070626>

**SPECIFICATIONS FOR NICHIA BLUE LED**

**MODEL : NGPBR70ASS**

**NICHIA CORPORATION**

## 1.SPECIFICATIONS

### (1) Absolute Maximum Ratings (Ta=25°C)

| Item                      | Symbol | Absolute Maximum Rating | Unit |
|---------------------------|--------|-------------------------|------|
| Forward Current           | IF     | 120                     | mA   |
| Pulse Forward Current     | IFP    | 250                     | mA   |
| Allowable Reverse Current | IR     | 85                      | mA   |
| Power Dissipation         | PD     | 432                     | mW   |
| Operating Temperature     | Topr   | -30 ~ + 85              | °C   |
| Storage Temperature       | Tstg   | -40 ~ +100              | °C   |
| Dice Temperature          | Tj     | 110                     | °C   |
| Soldering Temperature     | Tsld   | 265°C for 5sec.         |      |

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

### (2) Initial Electrical/Optical Characteristics (Ta=25°C)

| Item                     | Symbol   | Condition  | Typ.       | Max.  | Unit |   |
|--------------------------|----------|------------|------------|-------|------|---|
| Forward Voltage          | VF       | IF=100[mA] | (3.3)      | 3.6   | V    |   |
| Luminous Flux            | $\phi_v$ | IF=100[mA] | (5)        | -     | lm   |   |
| Chromaticity Coordinate* | x        | -          | IF=100mA   | 0.133 | -    | - |
|                          | y        | -          | IF=100[mA] | 0.075 | -    | - |

\* Please refer to CIE 1931 chromaticity diagram.

### (3) Ranking (Ta=25°C)

| Item          | Symbol  | Condition  | Min. | Max. | Unit |
|---------------|---------|------------|------|------|------|
| Luminous Flux | Rank P1 | IF=100[mA] | 5.4  | 6.4  | lm   |
|               | Rank P0 |            | 4.5  | 5.4  |      |
|               | Rank Pz |            | 3.8  | 4.5  |      |
|               | Rank Py |            | 3.2  | 3.8  |      |

\* Luminous Flux Measurement allowance is  $\pm$  10%.

### Color Rank (IF=100mA, Ta=25°C)

|   | Rank W |      |      |      |
|---|--------|------|------|------|
| x | 0.11   | 0.11 | 0.15 | 0.15 |
| y | 0.04   | 0.10 | 0.10 | 0.04 |

\* Color Coordinates Measurement allowance is  $\pm$  0.01.

## 2.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(Mold) : Epoxy Resin (over Diffused)  
Leadframe : Ag plating Copper Alloy

#### 4.PACKAGING

- The LEDs are packed in cardboard boxes after packaging in stick.  
Please refer to figure's page.  
The label on the packing unit shows ; Part Number, Lot Number, Ranking, Quantity
- In order to protect the LEDs from mechanical shock, we pack them in cardboard boxes for transportation.
- The LEDs may be damaged if the boxes are dropped or receive a strong impact against them,  
so precautions must be taken to prevent any damage.
- The boxes are not water resistant and therefore must be kept away from water and moisture.
- When the LEDs are transported, we recommend that you use the same packing method as Nichia.

#### 5.LOT NUMBER

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

The lot number is composed of the following characters;

○□×××× - △■

○ - Year ( 6 for 2006, 7 for 2007 )

□ - Month ( 1 for Jan., 9 for Sep., A for Oct., B for Nov. )

×××× - Nichia's Product Number

△ - Ranking by Color Coordinates

■ - Ranking by Luminous Flux

## 6.RELIABILITY

### (1) TEST ITEMS AND RESULTS

| Test Item   | Standard Test Method     | Test Conditions   | Note                         | Number of Damaged |
|---|--------------------------|---|------------------------------|-------------------|
| Resistance to Soldering Heat                      | JEITA ED-4701<br>300 302 | Tsld=260 ± 5°C, 5sec.<br>1.6mm from the base of the stopper<br>(Pre treatment 30°C,70%,168hrs.) | 1 time                       | 0/22              |
| Solderability                                     | JEITA ED-4701<br>300 303 | Tsld=235 ± 5°C, 5sec.<br>(using flux)   | 1 time<br>over 95%           | 0/22              |
| Temperature Cycle                                 | JEITA ED-4701<br>100 105 | -40°C ~ 25°C ~ 100°C ~ 25°C<br>30min. 5min. 30min. 5min.  | 100 cycles                   | 0/50              |
| Moisture Resistance Cyclic                        | JEITA ED-4701<br>200 203 | 25°C ~ 65°C ~ -10°C<br>90%RH 24hrs./1cycle  | 10 cycles                    | 0/50              |
| Terminal Strength (bending test)                  | JEITA ED-4701<br>400 401 | Load 5N (0.5kgf)<br>0° ~ 90° ~ 0° bend 2 times  | No noticeable damage         | 0/50              |
| Terminal Strength (pull test)                     | JEITA ED-4701<br>400 401 | Load 10N (1kgf)<br>10 ± 1 sec.  | No noticeable damage         | 0/50              |
| High Temperature Storage                          | JEITA ED-4701<br>200 201 | Ta=100°C  | 1000hrs.                     | 0/50              |
| Temperature Humidity Storage                      | JEITA ED-4701<br>100 103 | Ta=60°C, RH=90%   | 1000hrs.                     | 0/50              |
| Low Temperature Storage                           | JEITA ED-4701<br>200 202 | Ta=-40°C  | 1000hrs.                     | 0/50              |
| Steady State Operating Life                       |                          | Ta=25°C, IF=120mA<br>Tested with Nichia standard circuit board.*                                | 1000 hrs.                    | 0/50              |
| Steady State Operating Life of High Humidity Heat |                          | 60°C, RH=90%, IF=100mA<br>Tested with Nichia standard circuit board.*                           | 500 hrs.                     | 0/50              |
| Steady State Operating Life of Low Temperature    |                          | Ta=-30°C, IF=100mA<br>Tested with Nichia standard circuit board.*                               | 1000 hrs.                    | 0/50              |
| Electrostatic Discharges                          | JEITA ED-4701<br>300 304 | R=1.5kΩ, C=100pF<br>Test Voltage=2kV  | 3 times<br>Negative/Positive | 0/22              |

\* Thermal resistance of LED with Nichia standard circuit board :  $R_{ja} \cong 125^{\circ}\text{C}/\text{W}$   
Nichia standard circuit board : FR4, t=1.6mm, Copper foil, t=0.07mm

### (2) CRITERIA FOR JUDGING DAMAGE

| Item            | Symbol         | Test Conditions | Criteria for Judgement |                     |
|-----------------|----------------|-----------------|------------------------|---------------------|
|                 |                |                 | Min.                   | Max.                |
| Forward Voltage | V <sub>F</sub> | IF=100mA        | -                      | Initial Level × 1.1 |
| Luminous Flux   | φ <sub>v</sub> | IF=100mA        | Initial Level × 0.7    | -                   |

\* The test is performed after the board is cooled down to the room temperature.

## 7.CAUTIONS

### (1) Storage

#### · Storage Conditions

Before opening the package :

The LEDs should be kept at 30°C or less and 90%RH or less. The LEDs should be used within a year. When storing the LEDs, moisture proof packaging with absorbent material (silica gel) is recommended.

After opening the package :

The LEDs should be kept at 30°C or less and 70%RH or less. The LEDs should be soldered within 168 hours (7days) after opening the package. If unused LEDs remain, they should be stored in moisture proof packages, such as sealed containers with packages of moisture absorbent material (silica gel). It is also recommended to return the LEDs to the original moisture proof bag and to reseal the moisture proof bag again.

- 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 85°C

- Nichia LED leadframes are silver plated copper alloy. The silver surface may be affected by environments which contain corrosive substances. Please avoid conditions which may cause the LED to corrode, tarnish or discolor. This corrosion or discoloration may cause difficulty during soldering operations. It is recommended that the LEDs be used as soon as possible.
- Please avoid rapid transitions in ambient temperature, especially, in high humidity environments where condensation can occur.

### (2) Static Electricity

- Static electricity or surge voltage damages 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 precautions 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 forward voltage becomes lower, or the LEDs do not light at the low current.

Criteria : ( $V_F > 2.0V$  at  $I_F=0.5mA$ )

### (3) Soldering Conditions

- Nichia LEDs uses a copper alloy lead frame which provides a high thermal conductivity. Thermal stress such as soldering heat may reduce the reliability of the product; particular caution should be used to avoid damage prior to and during soldering. The recommended soldering conditions are listed in the following table.
- Solder the LED no closer than 1.6mm from the base of the stopper.
- The mechanical stress by clinching will cause degradation of the reliability on the LEDs. It is important to minimize the mechanical stress on the LEDs. It should be confirmed beforehand that it will not cause any problem when using it.
- Recommended soldering conditions

| Dip Soldering           |  | Hand Soldering |   |
|-------------------------|--|----------------|---|
| Pre-Heat                | 120°C Max.   | Temperature    | 350°C Max.  |
| Pre-Heat Time           | 60 seconds Max.                                    | Soldering Time | 3 seconds Max.                                      |
| Solder Bath Temperature | 260°C Max.   | Position       | No closer than 1.6 mm from the base of the stopper. |
| Dipping Time            | 5 seconds Max.                                     |                |   |
| Dipping Position        | No lower than 1.6 mm from the base of the stopper. |                |   |

- Although the recommended soldering conditions are specified in the above table, dip or hand soldering at the lowest possible temperature is desirable for the LEDs.
- A rapid-rate process is not recommended for cooling the LEDs down from the peak temperature.
- Dip soldering should not be done more than one time.
- Hand soldering should not be done more than one time.
- 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 leadframes. 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 temperatures may cause failure of the LEDs.

### (4) Cleaning

- It is recommended that isopropyl alcohol be used as a solvent for cleaning the LEDs. When using other solvents, it should be confirmed beforehand whether the solvents will dissolve the resin or not. Freon solvents should not be used to clean the LEDs because of worldwide regulations.
- Do not clean the LEDs by the ultrasonic. When it is absolutely necessary, the influence of ultrasonic cleaning on the LEDs depends on factors such as ultrasonic power and the assembled condition. Before cleaning, a pre-test should be done to confirm whether any damage to the LEDs will occur.

#### (5) Heat Generation

- Thermal design of the end product is of paramount importance. Please consider the heat generation of the LED when making the system design. The coefficient of temperature increase per input electric power is affected by the thermal resistance of the circuit board and density of LED placement on the board, as well as other components. It is necessary to avoid intense heat generation and operate within the maximum ratings given in this specification.
- Please determine the operating current with consideration of the ambient temperature local to the LED and refer to the plot of Ambient temperature vs. Allowable Forward Current on CHARACTERISTICS in this specifications. Please also take measures to remove heat from the area near the LED to improve the operational characteristics of the LED.
- The equation ① indicates correlation between T<sub>j</sub> and T<sub>a</sub>, and the equation ② indicates correlation between T<sub>j</sub> and T<sub>s</sub>.

$$T_j = T_a + R_{ja} \cdot W \quad \text{..... ①} \quad T_j = T_s + R_{js} \cdot W \quad \text{..... ②}$$

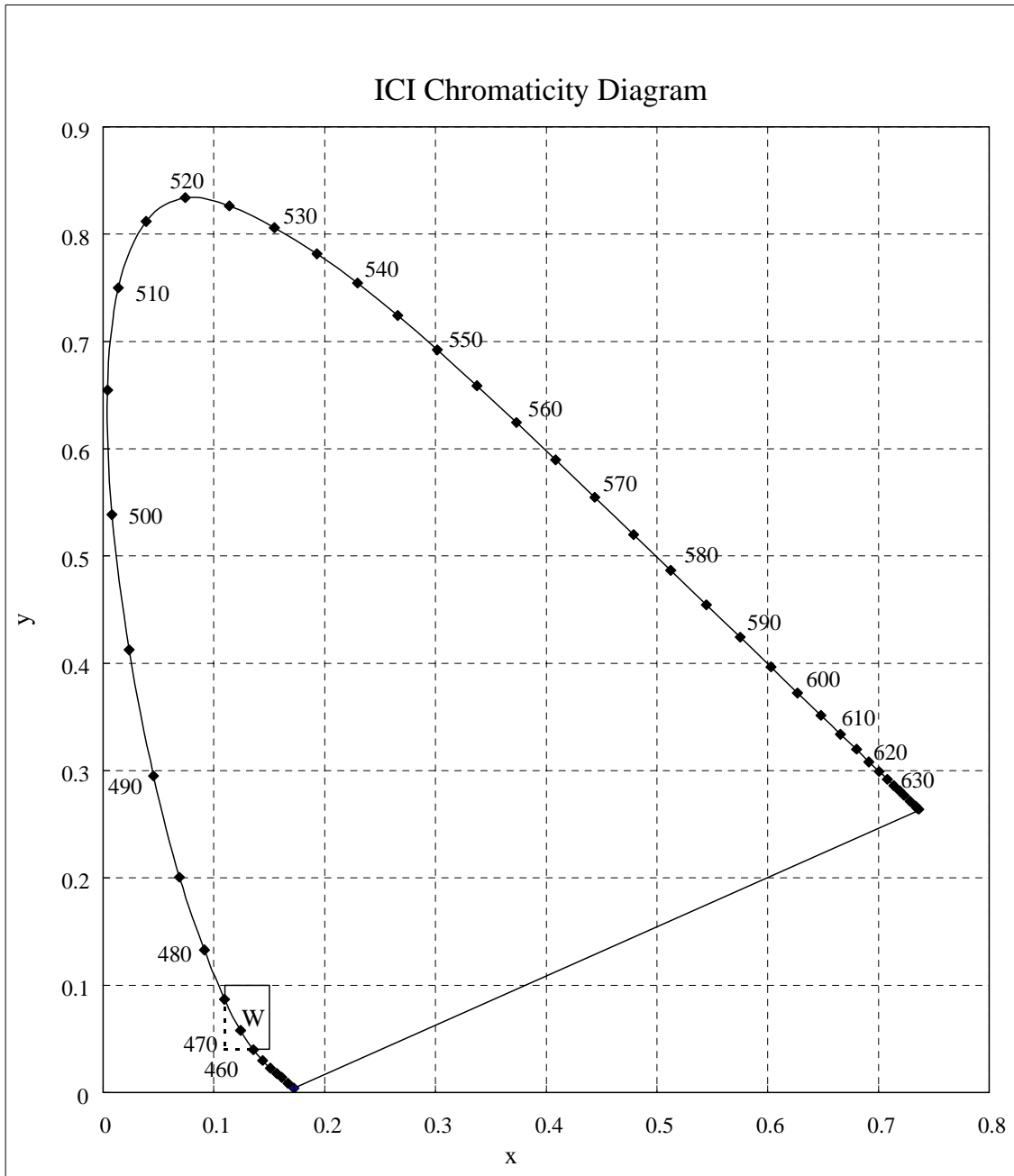
\*T<sub>j</sub> = Dice Temperature : °C, T<sub>a</sub> = Ambient Temperature : °C,  
T<sub>s</sub> = Solder Temperature (Cathode Side) : °C,  
R<sub>ja</sub> = Heat resistance from Dice to Ambient temperature : °C /W,  
R<sub>js</sub> = Heat resistance from Dice to T<sub>s</sub> measuring point ≒ 60°C /W,  
W = Inputting Power (I<sub>F</sub> × V<sub>F</sub>) : W

#### (6) Safety Guideline for Human Eyes

- In 1993, the International Electric Committee (IEC) issued a standard concerning laser product safety (IEC 825-1). Since then, this standard has been applied for diffused light sources (LEDs) as well as lasers. In 1998 IEC 60825-1 Edition 1.1 evaluated the magnitude of the light source. In 2001 IEC 60825-1 Amendment 2 converted the laser class into 7 classes for end products. Components are excluded from this system. Products which contain visible LEDs are now classified as class 1. Products containing UV LEDs are class 1M. Products containing LEDs can be classified as class 2 in cases where viewing angles are narrow, optical manipulation intensifies the light, and/or the energy emitted is high. For these systems it is recommended to avoid long term exposure. It is also recommended to follow the IEC regulations regarding safety and labeling of products.

#### (7) Others

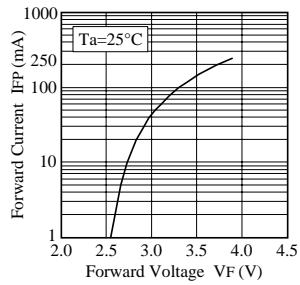
- NGPBR70AS complies with RoHS Directive.
- Flashing lights have been known to cause discomfort in people; you can prevent this by taking precautions during use. Also, people should be cautious when using equipment that has had LEDs incorporated into it.
- The LEDs described in this brochure are intended to be used for ordinary electronic equipment (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, submersible repeaters, nuclear reactor control systems, automobiles, traffic control equipment, life support systems and safety devices).
- User shall not reverse engineer by disassembling or analysis of the LEDs without having prior written consent from Nichia. When defective LEDs are found, the User shall inform 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.



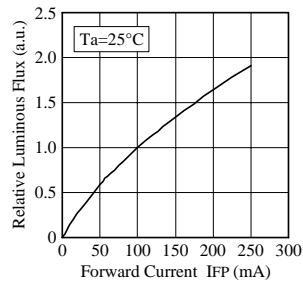
\* Color Coordinates Measurement allowance is  $\pm 0.01$ .



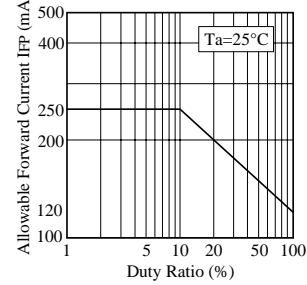
■ Forward Voltage vs. Forward Current



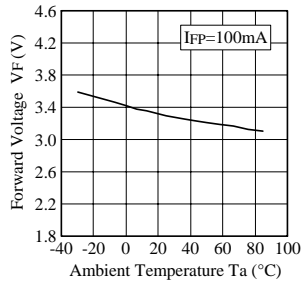
■ Forward Current vs. Relative Luminous Flux



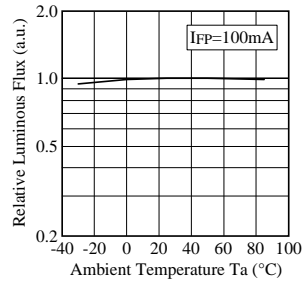
■ Duty Ratio vs. Allowable Forward Current



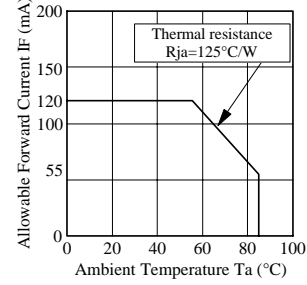
■ Ambient Temperature vs. Forward Voltage



■ Ambient Temperature vs. Relative Luminous Flux

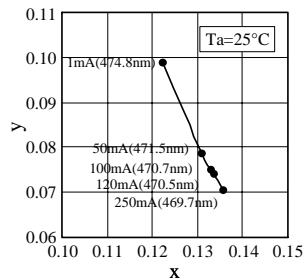


■ Ambient Temperature vs. Allowable Forward Current

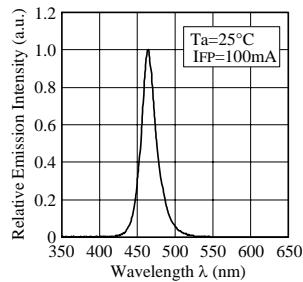


|                    |       |                 |
|--------------------|-------|-----------------|
| NICHIA CORPORATION | Model | NGPBR70AS       |
|                    | Title | CHARACTERISTICS |
|                    | No.   | 070614766911    |

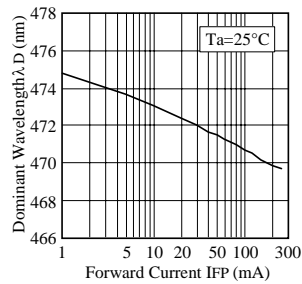
■ Forward Current vs. Chromaticity Coordinate ( $\lambda, D$ )



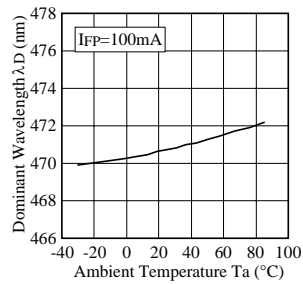
■ Spectrum



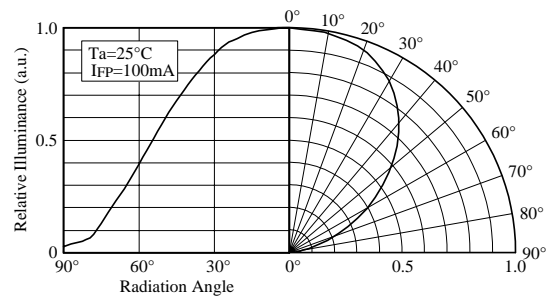
■ Forward Current vs. Dominant Wavelength



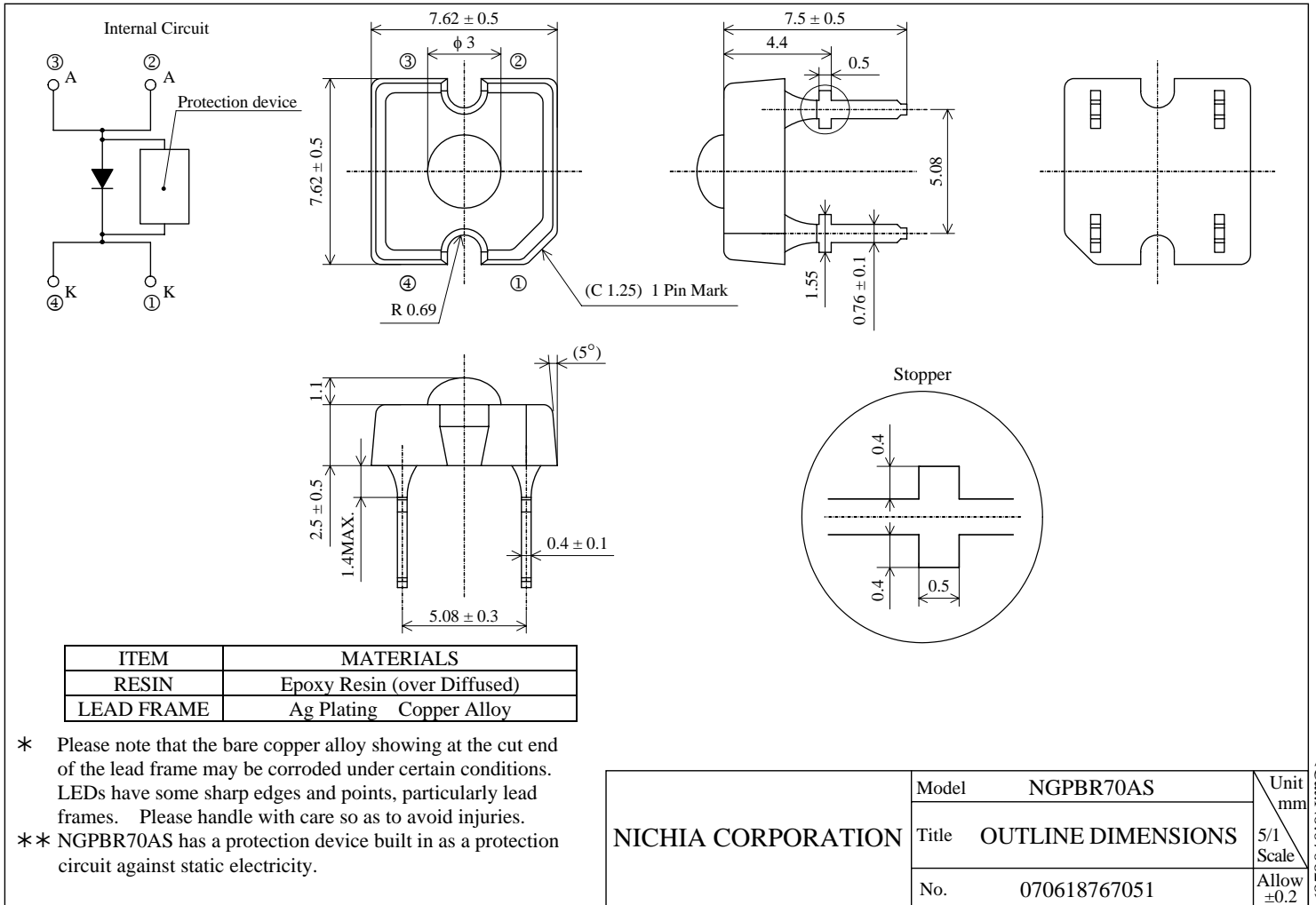
■ Ambient Temperature vs. Dominant Wavelength



■ Directivity

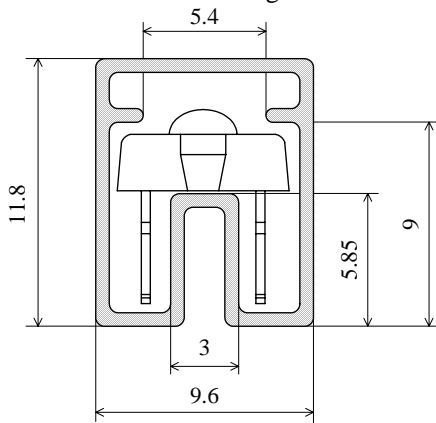


|                    |       |                 |
|--------------------|-------|-----------------|
| NICHIA CORPORATION | Model | NGPBR70AS       |
|                    | Title | CHARACTERISTICS |
|                    | No.   | 070614766921    |



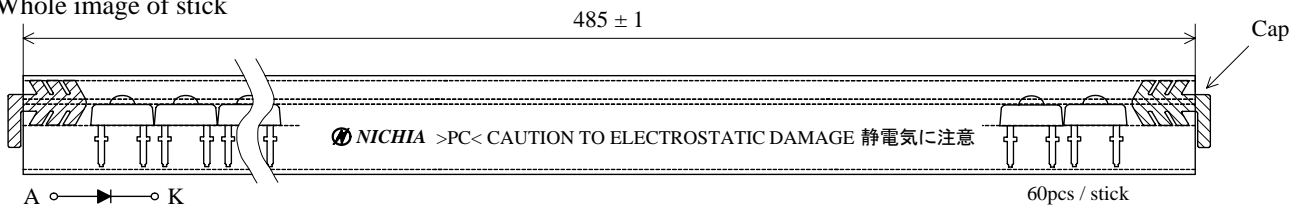
Nichia STSE-CB7115A  
Cat.No.070626

Cross Sectional image of stick



\*1 t = 0.6 ± 0.1mm  
 \*2 Warp : 1mm Max.

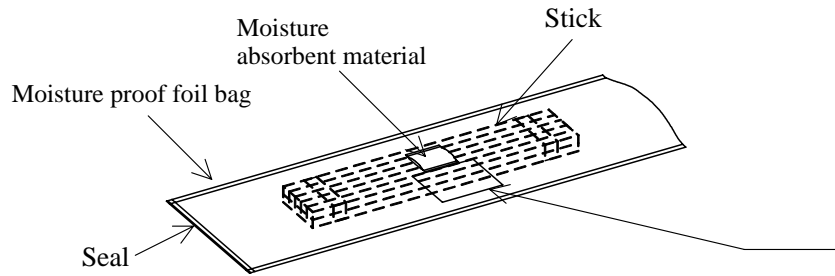
Whole image of stick



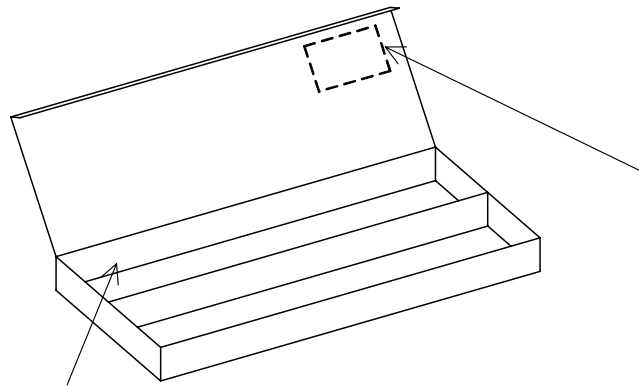
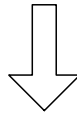
|                    |       |                  |               |
|--------------------|-------|------------------|---------------|
| NICHIA CORPORATION | Model | NxPxR70xSS       | Unit<br>mm    |
|                    | Title | STICK DIMENSIONS | Scale         |
|                    | No.   | 061117436073     | Allow<br>±0.2 |

Nichia STSE-CB7115A  
 <math>\text{Cat.No.070626}>

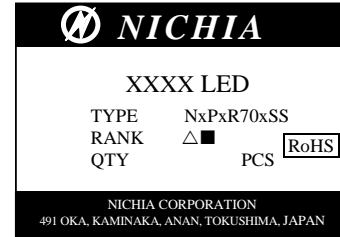
The stick and moisture absorbent material are put in the moisture proof foil bag and then heat sealed.



Label



Label



Empty space in the box is filled with cushion material.

Packing unit

|                         | Stick/bag     | Quantity/bag (pcs) |
|-------------------------|---------------|--------------------|
| Moisture proof foil bag | 10 stick Max. | 600 MAX.           |

| Cardboard box      | Dimensions (mm) | Stick/box      | Quantity/box (pcs) |
|--------------------|-----------------|----------------|--------------------|
| Cardboard box M    | 590×277×120×4t  | 100 stick MAX. | 6,000 MAX.         |
| Cardboard box 1/2L | 613×298×268×7t  | 200 stick MAX. | 12,000 MAX.        |
| Cardboard box L    | 613×298×518×7t  | 400 stick MAX. | 24,000 MAX.        |

|                           |       |              |   |
|---------------------------|-------|--------------|---|
| <b>NICHIA CORPORATION</b> | Model | NxPxR70xSS   | / |
|                           | Title | PACKING      |   |
|                           | No.   | 070601436085 |   |