

SPECIFICATIONS FOR NICHIA **WHITE** LED

MODEL : **NSPWR70CSS-K1**

NICHIA CORPORATION

1. SPECIFICATIONS

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

| Item | Symbol | Absolute Maximum Rating | Unit |
|---------------------------|------------------|-------------------------|------|
| Forward Current | I _F | 60 | mA |
| Pulse Forward Current | I _{FP} | 180 | mA |
| Allowable Reverse Current | I _R | 85 | mA |
| Power Dissipation | P _D | 210 | mW |
| Operating Temperature | T _{opr} | -30 ~ + 85 | °C |
| Storage Temperature | T _{stg} | -40 ~ +100 | °C |
| Dice Temperature | T _j | 100 | °C |
| Soldering Temperature | T _{sld} | 265°C for 5sec. | |

I_{FP} Conditions : Pulse Width ≤ 10msec. and Duty ≤ 1/10

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

| Item | Symbol | Condition | Typ. | Max. | Unit |
|---------------------------|----------------|------------------------|--------|------|------|
| Forward Voltage | V _F | I _F =50[mA] | (3.1) | 3.5 | V |
| Luminous Flux* | φ _v | I _F =50[mA] | (20.0) | - | lm |
| Chromaticity Coordinate** | x | I _F =50[mA] | 0.344 | - | - |
| | y | I _F =50[mA] | 0.355 | - | - |

* Luminous flux value is traceable to the CIE 127:2007-compliant national standards.

** Please refer to CIE 1931 chromaticity diagram.

(3) Ranking (Ta=25°C)

| Item | Symbol | Condition | Min. | Max. | Unit |
|---------------|---------|------------------------|------|------|------|
| Luminous Flux | Rank P9 | I _F =50[mA] | 21.4 | 25.5 | lm |
| | Rank P8 | | 18.0 | 21.4 | |
| | Rank P7 | | 15.1 | 18.0 | |

* Luminous Flux Measurement allowance is ± 10%.

Color Ranks

(I_F=50mA, Ta=25°C)

| Rank b3 | | | | |
|---------|-------|-------|-------|-------|
| x | 0.287 | 0.283 | 0.304 | 0.307 |
| y | 0.295 | 0.305 | 0.330 | 0.315 |

| Rank b4 | | | | |
|---------|-------|-------|-------|-------|
| x | 0.307 | 0.304 | 0.330 | 0.330 |
| y | 0.315 | 0.330 | 0.360 | 0.339 |

| Rank b5 | | | | |
|---------|-------|-------|-------|-------|
| x | 0.296 | 0.287 | 0.307 | 0.311 |
| y | 0.276 | 0.295 | 0.315 | 0.294 |

| Rank b6 | | | | |
|---------|-------|-------|-------|-------|
| x | 0.311 | 0.307 | 0.330 | 0.330 |
| y | 0.294 | 0.315 | 0.339 | 0.318 |

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

* Color Coordinates Measurement allowance is ± 0.01.

* Basically, a shipment shall consist of the LEDs of a combination of the above ranks.

The percentage of each rank in the shipment shall be determined by Nichia.

Correspondence table of Color Coordinates – Luminous Flux ranks

| Ranking by Luminous Flux \ Ranking by Color Coordinates | P7 | P8 | P9 |
|---|----|----|----|
| b3, b4, b5, b6 | | | |
| c0 | | | |

* Shaded ranks are available.

2.INITIAL OPTICAL/ELECTRICAL CHARACTERISTICS

Please refer to “CHARACTERISTICS” on the following pages.

3.OUTLINE DIMENSIONS AND MATERIALS

Please refer to “OUTLINE DIMENSIONS” on the following page.

4.PACKAGING

- The LEDs are packed in cardboard boxes after packaging in stick.
Please refer to “STICK DIMENSIONS” and “PACKING” on the following pages.
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 (8 for 2008, 9 for 2009)

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

(2) CRITERIA FOR JUDGING DAMAGE

| Item | Symbol | Test Conditions | Criteria for Judgement | |
|-----------------|----------------|----------------------|------------------------|----------------|
| | | | Min. | Max. |
| Forward Voltage | V _F | I _F =50mA | - | U.S.L.*) × 1.1 |
| Luminous Flux | φ _v | I _F =50mA | L.S.L.***) × 0.7 | - |

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

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

7. CAUTIONS

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

(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.

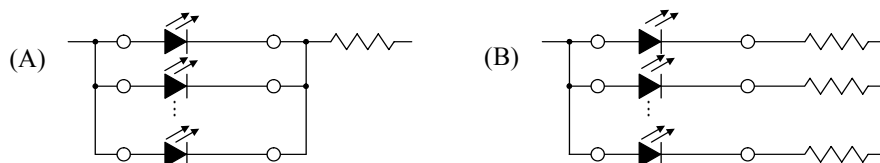
- If the moisture absorbent material (silica gel) has faded away or the LEDs have exceeded the storage time, baking treatment should be performed using the following conditions.

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) Recommended circuit

- In designing a circuit, the current through each LED must not exceed the absolute maximum rating specified for each LED. It is recommended to use Circuit B which regulates the current flowing through each LED. In the meanwhile, when driving LEDs with a constant voltage in Circuit A, the current through the LEDs may vary due to the variation in forward voltage (V_F) of the LEDs. In the worst case, some LED may be subjected to stresses in excess of the absolute maximum rating.



- This product should be operated in forward bias. A driving circuit must be designed so that the product is not subjected to either forward or reverse voltage while it is off. In particular, if a reverse voltage is continuously applied to the product, such operation can cause migration resulting in LED damage.

(3) 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 : (VF > 2.0V at IF=0.5mA)

(4) 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 customer 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.

(5) 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.

(6) 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_j and T_a, and the equation ② indicates correlation between T_j and T_{s1}.

$$T_j = T_a + R_{ja} \cdot W \quad \text{.....} \quad \text{①} \qquad T_j = T_{s1} + R_{js1} \cdot W \quad \text{.....} \quad \text{②}$$

*T_j = Dice Temperature : °C, T_a = Ambient Temperature : °C,

T_{s1} = Solder Temperature (Cathode Side) : °C,

R_{ja} = Heat resistance from Dice to Ambient temperature : °C /W,

R_{js1} = Heat resistance from Dice to T_{s1} measuring point : °C /W,

W = Inputting Power (I_F × V_F) : W

(7) Safety Guideline for Human Eyes

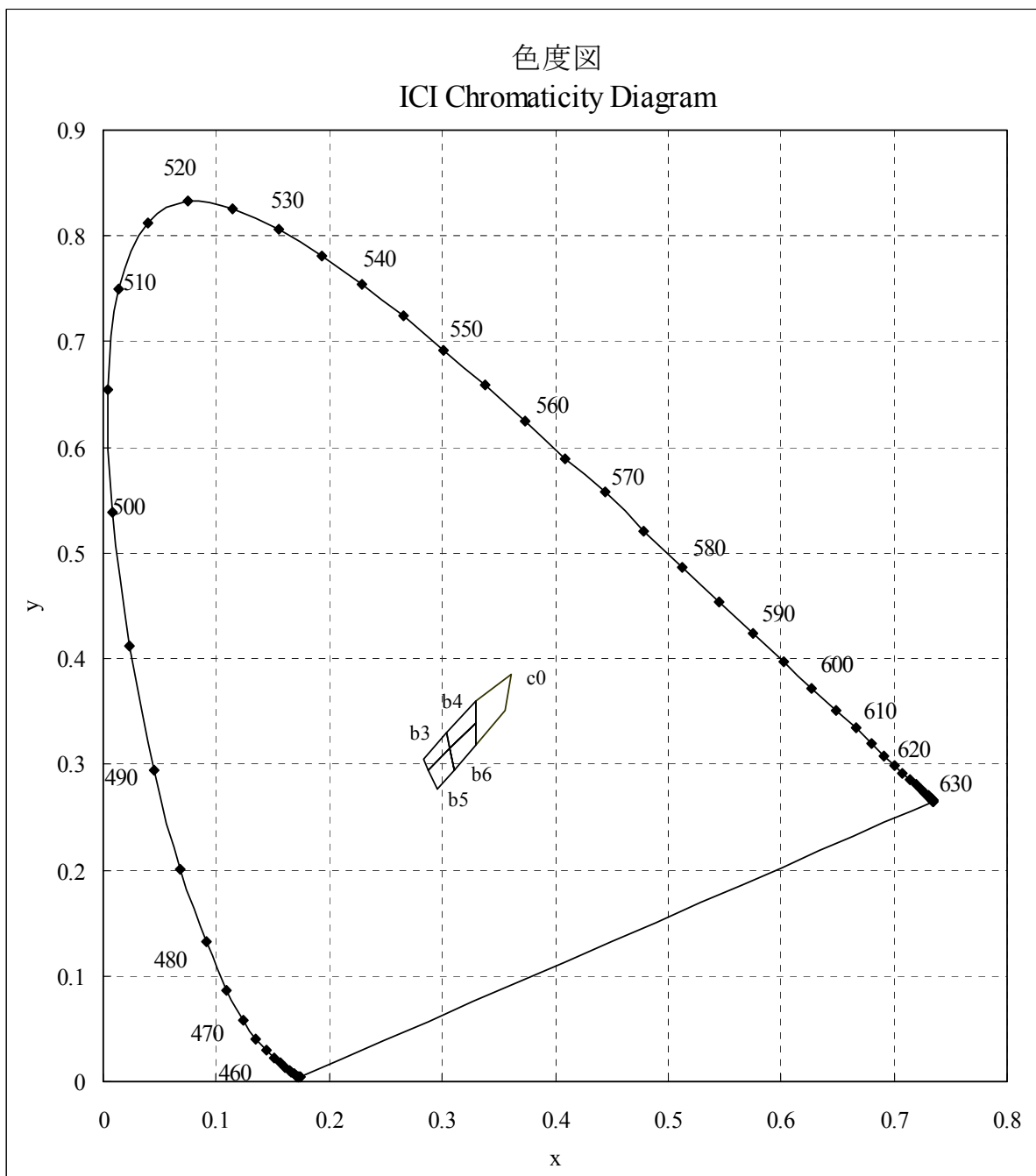
- The International Electrical Commission (IEC) published in 2006 IEC 62471:2006 *Photobiological safety of lamps and lamp systems* which includes LEDs within its scope. Meanwhile LEDs were removed from the scope of the IEC 60825-1:2007 laser safety standard, the 2001 edition of which included LED sources within its scope. However, keep in mind that some countries and regions have adopted standards based on the IEC laser safety standard IEC 60825-1:2001 which includes LEDs within its scope.

Following IEC 62471:2006, most of Nichia LEDs can be classified as belonging to either Exempt Group or Risk Group 1. Optical characteristics of a LED such as output power, spectrum and light distribution are factors that affect the risk group determination of the LED. Especially a high-power LED, that emits light containing blue wavelengths, may be in Risk Group 2.

Great care should be taken when viewing directly the LED driven at high current or the LED with optical instruments, which may greatly increase the hazard to your eyes.

(8) Others

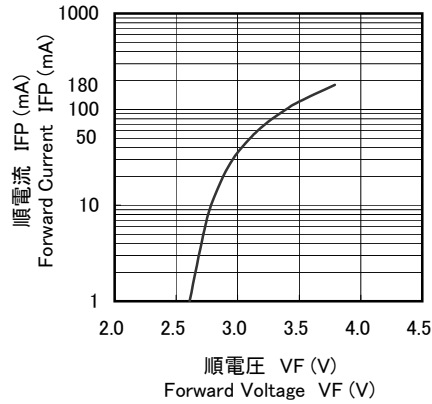
- NSPWR70CS-K1 complies with RoHS Directive.
- Flashing lights have been known to cause discomfort in people; you can prevent this by taking precautions during use. Also, people should be cautious when using equipment that has had LEDs incorporated into it.
- The LEDs described in this brochure are intended 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).
- The customer shall not reverse engineer by disassembling or analysis of the LEDs without having prior written consent from Nichia. When defective LEDs are found, the customer 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 ± 0.01 .

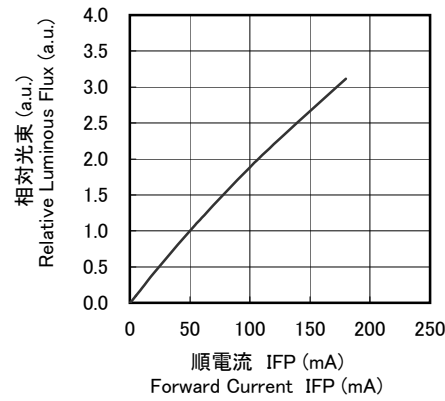
■ 順電圧-順電流特性
Forward Voltage vs.
Forward Current

Ta=25°C



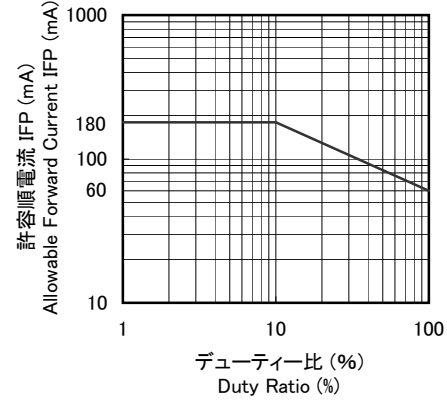
■ 順電流-相対光束特性
Forward Current vs.
Relative Luminous Flux

Ta=25°C



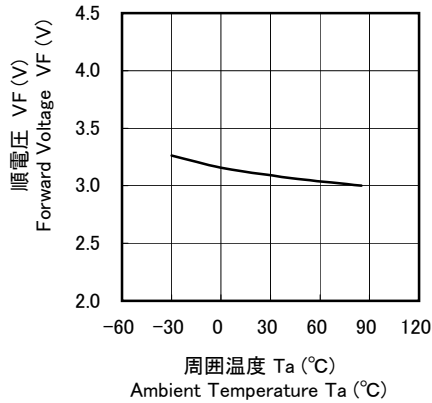
■ デューティー比-許容順電流特性
Duty Ratio vs.
Allowable Forward Current

Ta=25°C



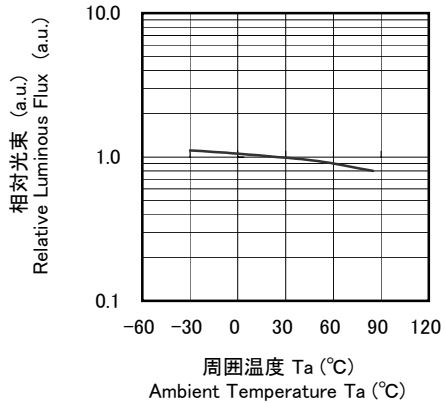
■ 周囲温度-順電圧特性
Ambient Temperature vs.
Forward Voltage

IFP=50mA

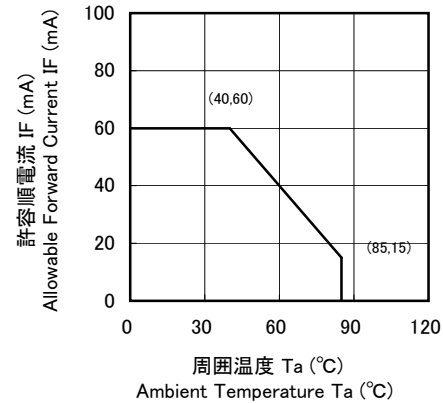


■ 周囲温度-相対光束特性
Ambient Temperature vs.
Relative Luminous Flux

IFP=50mA

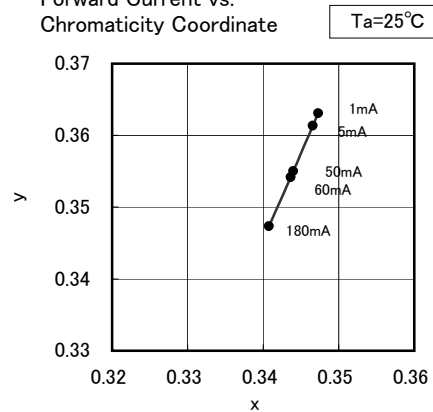


■ 周囲温度-許容順電流特性
Ambient Temperature vs.
Allowable Forward

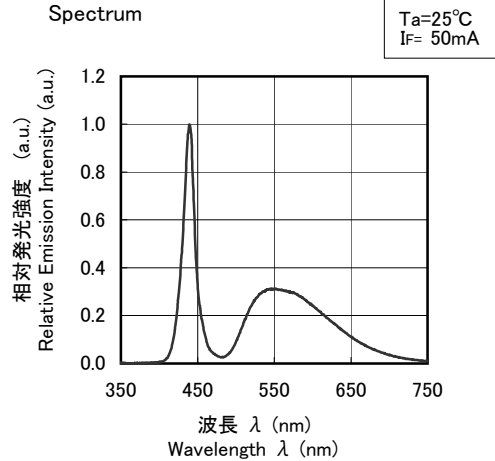


| | |
|----------------------------------|---|
| 型名 Model NSPWR70CS-K1 | 名称 Title 初期電気/光学特性 CHARACTERISTICS |
| 日亜化学工業 (株) NICHIA CORPORATION | 管理番号 No. 090331 939311 |

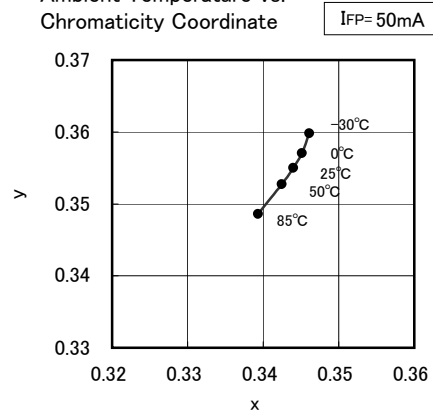
■ 順電流-色度特性
Forward Current vs.
Chromaticity Coordinate



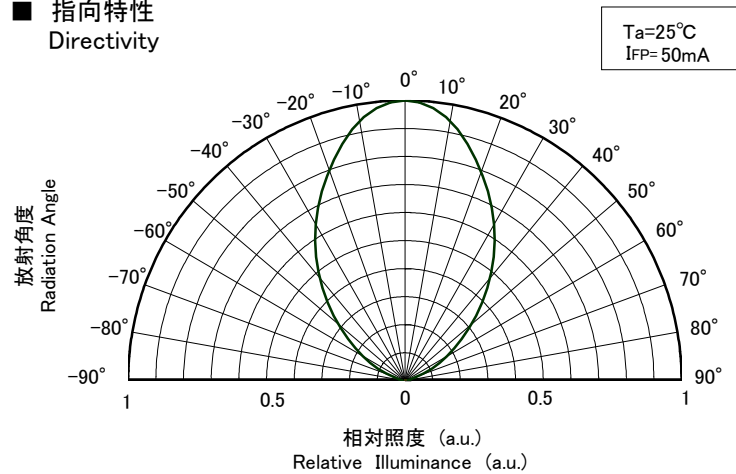
■ 発光スペクトル
Spectrum



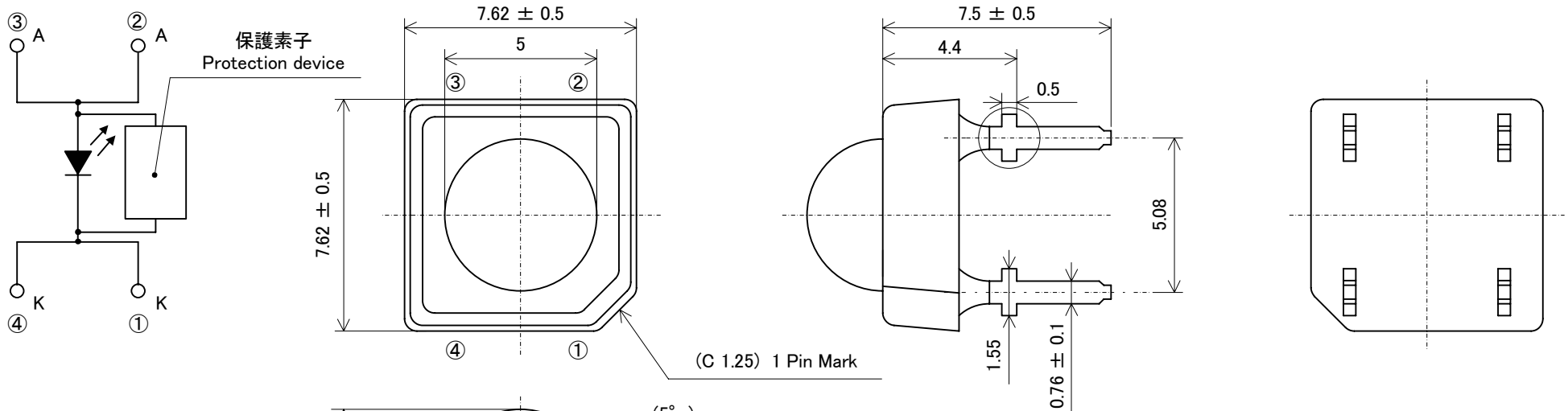
■ 周囲温度-色度特性
Ambient Temperature vs.
Chromaticity Coordinate



■ 指向特性
Directivity

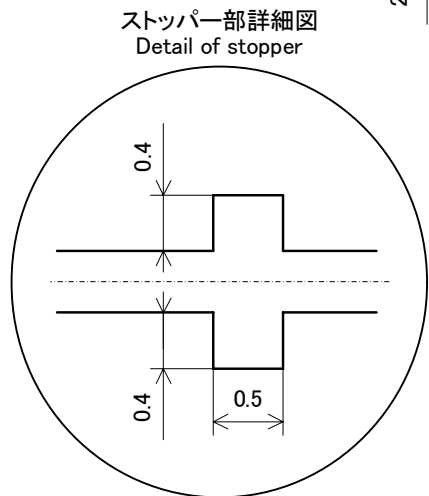


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|---|---|
| 型名 Model NSPWR70CS-K1 | 名称 Title 初期電気/光学特性 CHARACTERISTICS |
| 日亜化学工業 (株) NICHIA CORPORATION | 管理番号 No. 090331939321 |



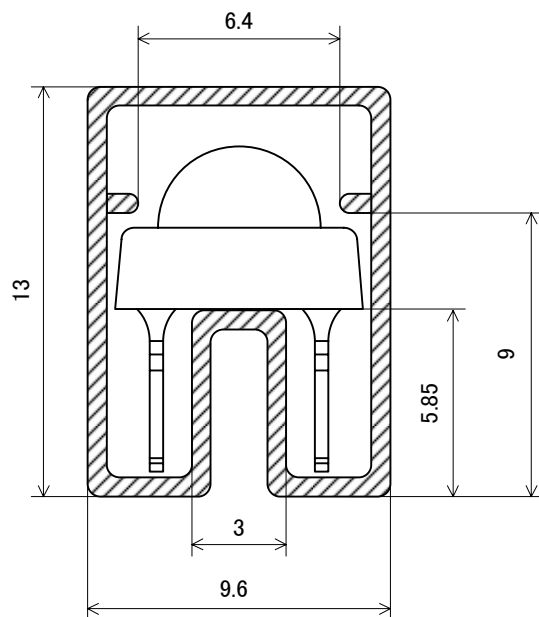
| 項目 Item | 材質 Materials |
|-------------------|--|
| 樹脂 Resin | エポキシ樹脂 (一部拡散剤+蛍光体入り) Epoxy Resin (over Diffused + Phosphor) |
| リードフレーム Leadframe | 銅合金+銀メッキ Ag Plating Copper Alloy |

- (注1) タイバーを切り取った部分は銅合金が露出しております。またLEDには鋭利な部分があります。特にリード部分は、人体を傷つけることがありますので、取り扱いに際しては十分注意して下さい。
- (NOTE1) Please note that the bare copper alloy showing at the cut end of the lead frame may be corroded under certain conditions. LEDs have some sharp edges and points, particularly lead frames. Please handle with care so as to avoid injuries.
- (注2) 本製品には静電気に対する保護素子が内蔵されています。
- (NOTE2) NSPWR70CS-K1 has a protection device built in as a protection circuit against static electricity.



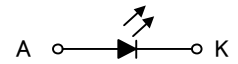
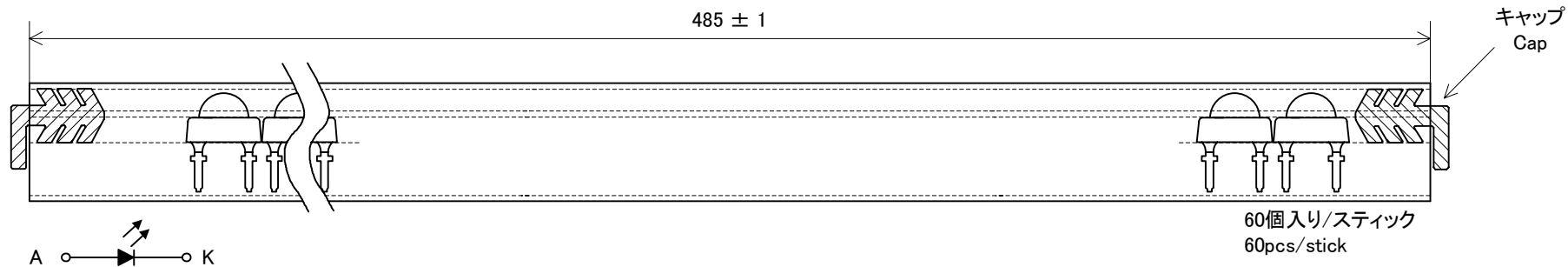
| | | |
|----------------------------------|---|------------------|
| 型名 Model NSPWR70CS-K1 | 名称 外形寸法図 Title OUTLINE DIMENSIONS | 単位 Unit mm |
| 日亜化学工業 (株) NICHIA CORPORATION | 管理番号 No. 090331939331 | 公差 Allow ±0.2 |

スティック断面図 Cross Sectional image of stick



* $t=0.6 \pm 0.1\text{mm}$
 ** 反り: 1mm以下
 Warp: 1mm Max.

スティック全体図 Whole image of stick

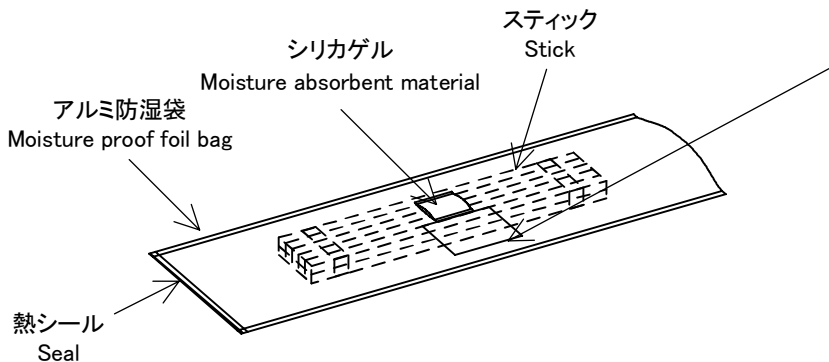


| | | |
|----------------------------------|---|------------------|
| 型名 Model NSPWR70CSS-K1 | 名称 Title スティック仕様図 STICK DIMENSIONS | 単位 Unit mm |
| 日亜化学工業 (株) NICHIA CORPORATION | 管理番号 No. 090331939341 | 公差 Allow ±0.2 |

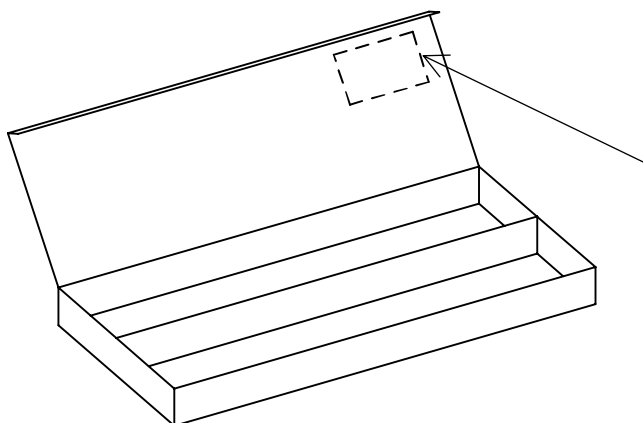
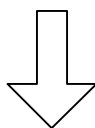
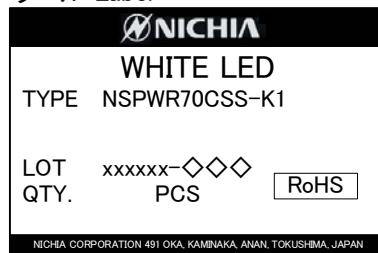
Nichia STS-DA1-0230C
 <Cat.No.090428>

シリカゲルとともにスティックをアルミ防湿袋に入れ、熱シールにより封をする。

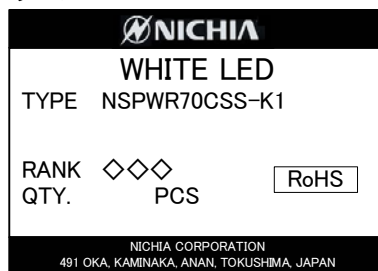
The stick and moisture absorbent material are put in the moisture proof foil bag and then heat sealed.



ラベル Label



ラベル Label



基本梱包単位 Packing Unit

| | スティック数 Stick/bag | 個数 Quantity/bag(pcs) |
|-----------------------------------|---------------------|-------------------------|
| アルミ防湿袋 Moisture proof foil bag | 10 stick Max. | 600 MAX. |

| 梱包箱(段ボール) Cardbord box | 箱の寸法 Dimensions(mm) | スティック数 Stick/box | 個数 Quantity/box(pcs) |
|---------------------------|------------------------|---------------------|-------------------------|
| M | 590 × 277 × 120 × 4t | 100 stick MAX. | 6,000 MAX. |
| 1/2L | 613 × 298 × 268 × 7t | 200 stick MAX. | 12,000 MAX. |
| L | 613 × 298 × 518 × 7t | 400 stick MAX. | 24,000 MAX. |

| | |
|----------------------------------|-------------------------------------|
| 型名 Model NSPWR70CSS-K1 | 名称 Title 梱包仕様図 PACKING |
| 日亜化学工業(株) NICHIA CORPORATION | 管理番号 No. 090331939351 |