SPECIFICATIONS FOR NICHIA UV LED

MODEL : **NSHU591A**

NICHIA CORPORATION

1.SPECIFICATIONS

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

Item	Symbol	Absolute Maximum Rating	Unit
Forward Current	I_F	25	mA
Pulse Forward Current	I_{FP}	80	mA
Allowable Reverse Current	I_R	85	mA
Power Dissipation	P_D	100	mW
Operating Temperature	T_{opr}	-30 ~ + 85	°C
Storage Temperature	T_{stg}	-40 ~ +100	°C
Soldering Temperature	T_{sld}	265°C for 10sec.	

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

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

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage		V_F	I_F=20[mA]	-	(3.6)	4.0	V
Peak Wavelength	Rank Ub	λ_P	I_F=20[mA]	370	375	380	nm
Spectrum Half Width		△λ	I_F=20[mA]	-	(15)	-	nm
Radiant flux*	Rank 4	ϕe	I_F=20[mA]	2360	-	3330	μW
	Rank 5	ϕe	I_F=20[mA]	3330	-	4720	μW
	Rank 6	ϕe	I_F=20[mA]	4720	-	6660	μW

∗ Radiant flux Values are traceable to the CIE 127:2007-compliant national standards.

∗∗ Radiant flux Measurement allowance is ±10%.

∗∗∗ Peak Wavelength Measurement allowance is ±3nm.

∗∗∗∗ 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.

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 anti-electrostatic bags.
Please refer to “PACKING” on the following page.
The label on the minimum 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 Wavelength, Ranking by Radiant 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, 10sec. 3mm from the base of the lead	1 time	0/50
Solderability	JEITA ED-4701 303 303A	Tsld=245 ± 5°C, 5sec. using flux Lead-free Solder (Sn-3.0Ag-0.5Cu)	1 time over 95%	0/50
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, I_F=25mA	500hrs.	0/50
Steady State Operating Life of High Humidity Heat		60°C, RH=90%, I_F=15mA	500hrs.	0/50
Steady State Operating Life of Low Temperature		Ta=-30°C, I_F=20mA	1000hrs.	0/50

(2) CRITERIA FOR JUDGING DAMAGE

Item	Symbol	Test Conditions	Criteria for Judgement	
			Min.	Max.
Forward Voltage	V_F	I_F=20mA	-	U.S.L.*)× 1.1
Radiant flux	ϕe	I_F=20mA	L.S.L.**)× 0.7	-

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

7.CAUTIONS

(1) Cautions

· The devices are UV light LEDs. The LED during operation radiates intense UV light, which precautions must be taken to prevent looking directly at the UV light with unaided eyes. Do not look directly into the UV light or look through the optical system. When there is a possibility to receive the reflection of light, protect by using the UV light protective glasses so that light should not catch one's eye directly.

· Put the caution label on the cardboard box.

(2) Lead Forming

· When forming leads, the leads should be bent at a point at least 3mm from the base of the lead. 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 lead and this will degrade the LEDs.

(3) Storage

· The LEDs should be stored at 30°C or less and 70%RH or less after being shipped from Nichia and the storage life limits are 3 months. If the LEDs are stored for 3 months or more, they can be stored for a year in a sealed container with a nitrogen atmosphere and moisture absorbent material.

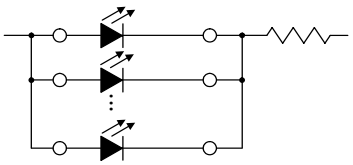
· Nichia LED leads are gold plated Iron alloy. The gold surface may be affected by environments which contain corrosive substances. Please avoid conditions which may cause the LED to corrode, tarnish or discolor. This corrosion or discoloration may cause difficulty during soldering operations. It is 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.

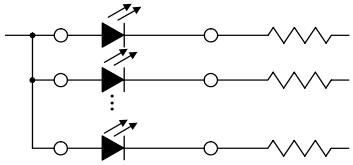
(4) Recommended circuit

· 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.

(A)



(B)



· 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.

(5) 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 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). The LEDs should be used the light detector etc. when testing the light-on. Do not stare into the LEDs when testing.

· 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)

(6) Soldering Conditions

· Solder the LED no closer than 3mm from the base of the lead.

· 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 3 mm from the base of the lead.
Dipping Time	10 seconds Max.		
Dipping Position	No lower than 3 mm from the base of the lead.		

· 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 lead 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 leads at room temperature. Cutting the leads at high temperatures may cause failure of the LEDs.

(7) 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.

· The operating current should be decided after considering the ambient maximum temperature of LEDs.

(8) 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 glass 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.

(9) Safety Guideline for Human Eyes

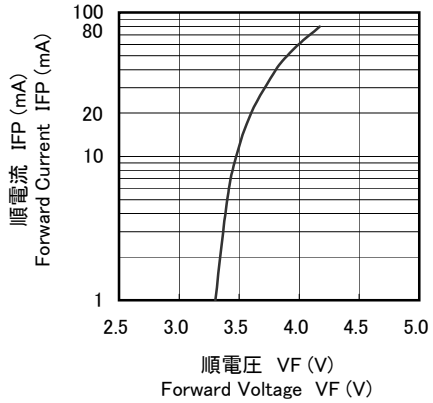
· The International Electrical Commission (IEC) published in 2006 IEC 62471:*2006 Photobiological safety of lamps and lamp systems* which includes LEDs within its scope. Meanwhile LEDs were removed from the scope of the IEC 60825-1:2007 laser safety standard, the 2001 edition of which included LED sources 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 radiant flux, 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.

(10) Others

· NSHU591A complies with RoHS Directive.
· This LED also emits visible light. Please take notice of visible light spectrum, in case you use this LED as light source of sensors etc.
· 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.

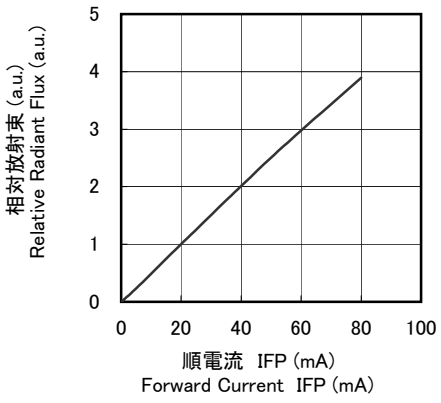
■ 順電圧－順電流特性
Forward Voltage vs.
Forward Current

Ta=25℃



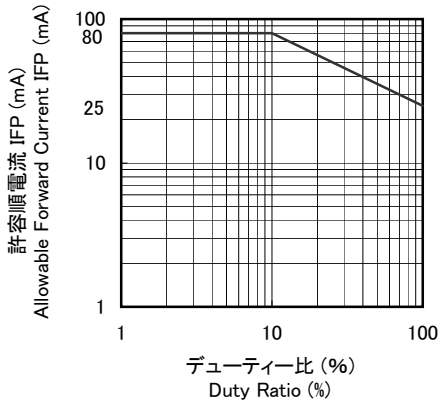
■ 順電流-相対放射束特性
Forward Current vs.
Relative Radiant Flux

Ta=25℃



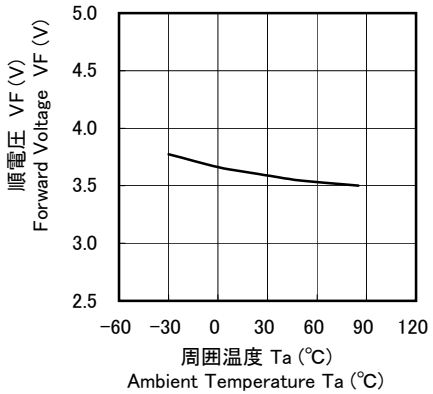
■ デューティー比－許容順電流特性
Duty Ratio vs.
Allowable Forward Current

Ta=25℃



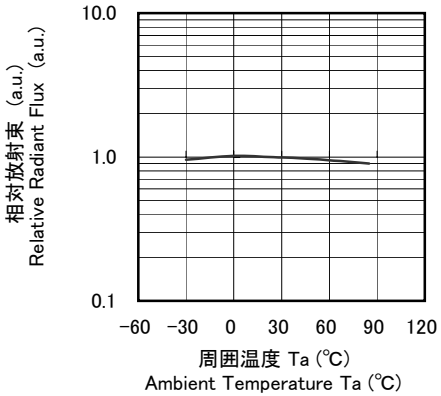
■ 周囲温度-順電圧特性
Ambient Temperature vs.
Forward Voltage

IFP= 20mA

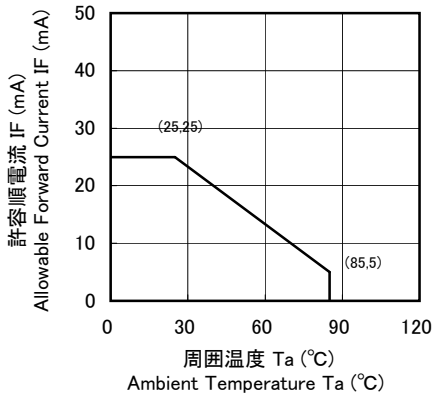


■ 周囲温度-相対放射束特性
Ambient Temperature vs.
Relative Radiant Flux

IFP= 20mA



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

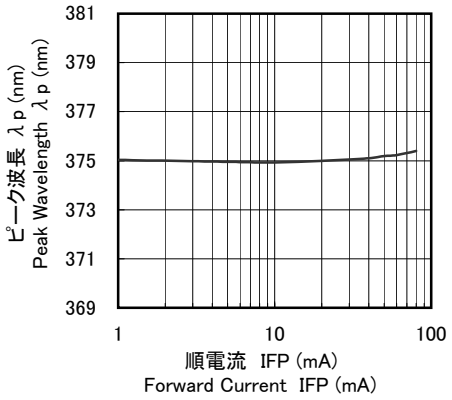


型名 Model	名称 Title
NSHUxxxx	初期電気/光学特性 CHARACTERISTICS
日亜化学工業（株） NICHIA CORPORATION	管理番号 No. 090410940351

Nichia STS-DA1-0772
<Cat.No.090427>

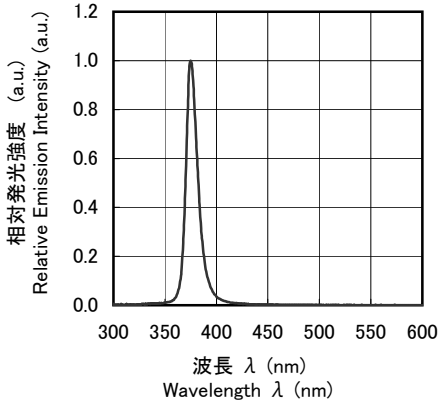
■ 順電流-ピーク波長特性
Forward Current vs.
Peak Wavelength

Ta=25℃



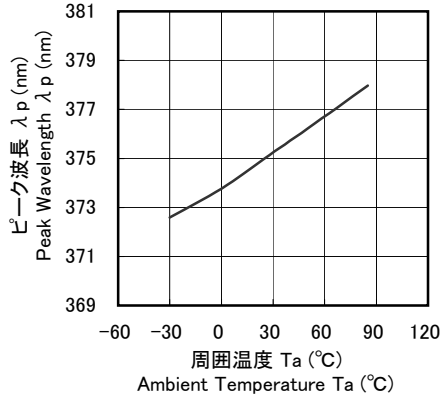
■ 発光スペクトル
Spectrum

Ta=25℃
IF= 20mA



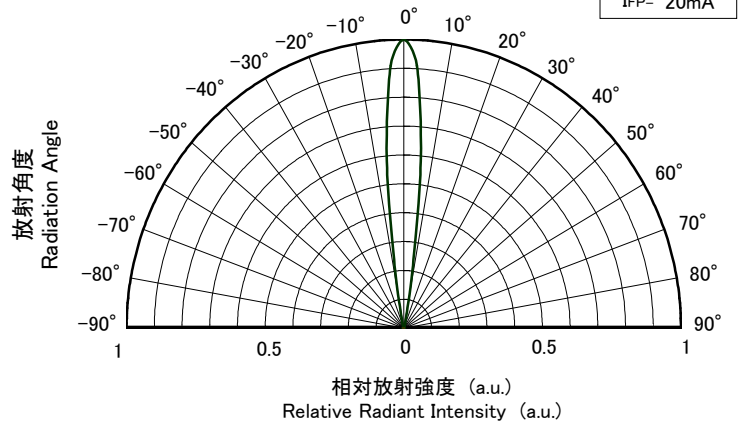
■ 周囲温度-ピーク波長特性
Ambient Temperature vs.
Peak Wavelength

IFP= 20mA



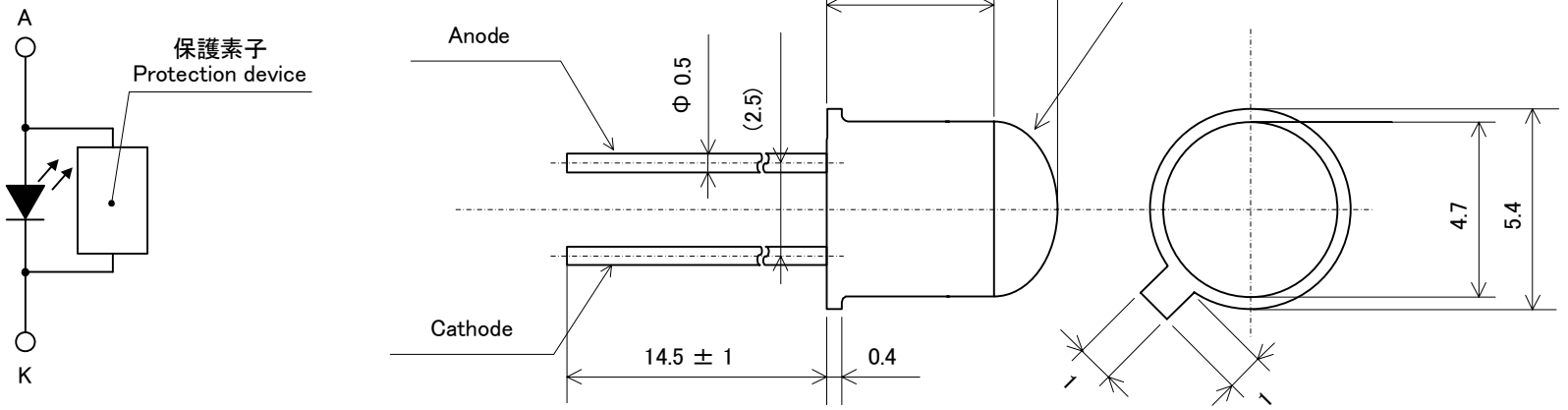
■ 指向特性
Directivity

Ta=25℃
IFP= 20mA



型名 Model	名称 Title
NSHU591A	初期電気/光学特性 CHARACTERISTICS
日亜化学工業（株） NICHIA CORPORATION	管理番号 No. 090410940421

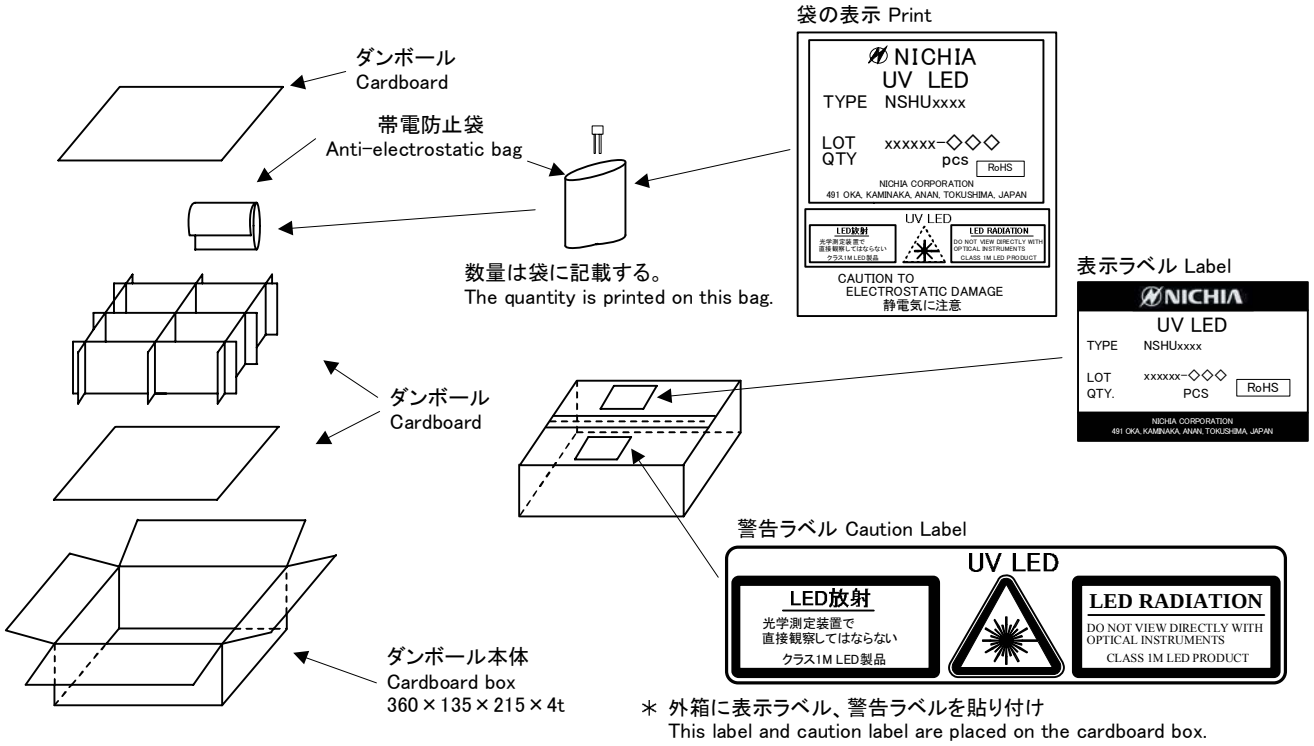
Nichia STS-DA1-0772
<Cat.No.090427>



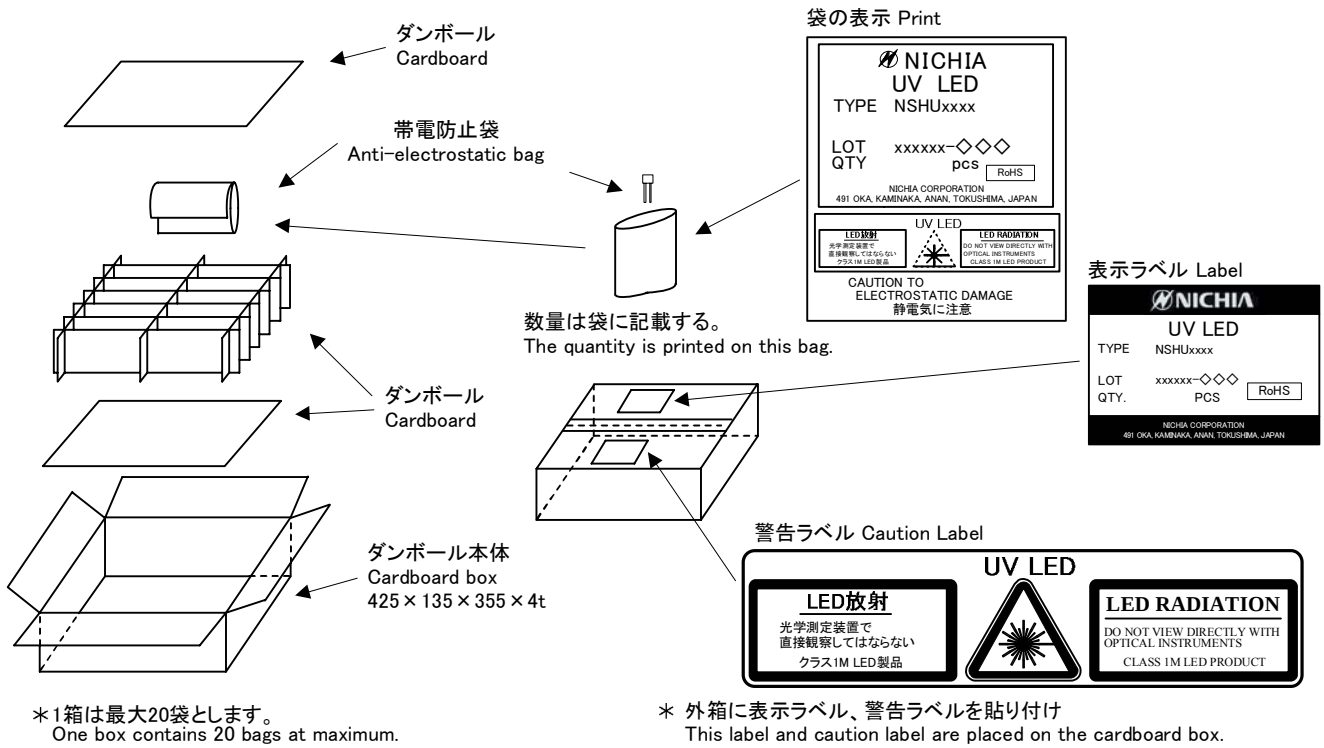
項目 Item	材質 Materials
ガラスレンズ Glass	硬質ガラス Hard Glass
キャップ Cap	鉄合金＋ニッケルメッキ Ni Plating　Iron Alloy
リード Lead	鉄合金＋金メッキ Au Plating　Iron Alloy

（注）　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。
(NOTE) NSHU591x has a protection device built in as a protection circuit against static electricity.

型名 Model	名称 Title	単位 Unit
NSHU591x	外形寸法図 OUTLINE DIMENSIONS	mm
日亜化学工業（株） NICHIA CORPORATION	管理番号 No. 090731940432	公差 Allow ±0.2



型名 Model	名称 Title
NSHUxxxx	梱包仕様図 PACKING
日亜化学工業（株） NICHIA CORPORATION	管理番号 No. 090410940381



型名 Model	名称 Title
NSHUxxxx	梱包仕様図 PACKING
日亜化学工業（株） NICHIA CORPORATION	管理番号 No. 090410940391