Product Specifications

Product Code: NFPD6C

Product	Surface Mount Type UV-LED 280 nm
Title	Product Specifications
Document No.	NFPD6C-01
Version	1.0
Issue Date	Jul 08, 2024

福機裝股份有限公司
NKFG Corporation.

NFPD6C-01

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1. Product Description: Surface mount type, high-power deep-ultraviolet light emitting diode

2. Intended Use : Deep-ultraviolet light source.
   Caution: This product can only be used as a deep-ultraviolet light source.

3. Product Code

Peak Wavelength	Product Code	
280 nm	Taiwan	NFPD6C

4. Absolute Maximum Ratings

Parameter	Symbol	Unit	Absolute Maximum Ratings	Remark
Forward Current	I_F	mA	150	*1
Operating Temperature	T_{opr}	deg C	-10 to 55	*2
Storage Temperature	T_{stg}	deg C	-30 to 85	*3
Junction Temperature	T_j	deg C	100	*4

*1 Please drive this product within the range specified by the derating curve on the graph in Chapter "7. Reference Data and Derating Curve".

*2 Operating Temperature refers to solder point temperature, Ts.
Please use this product at temperature within the range specified by the derating curve on the graph in Chapter "7. Reference Data and Derating Curve",
and see Chapter 9, Section "(A) Thermal Management".

*3 Storage Temperature refers to ambient temperature, Ta.

*4 Please see Chapter 9, Section "(A) Thermal Management".

5. Electrical and Optical Characteristics (I_F = 350 mA, Ts = 25 deg C)

Parameter	Symbol	Unit	Min.	Typ.	Max.
Forward Voltage	V_F	V	4.5	5.1	7.0
Peak Wavelength	λ_P	nm	275	280	285
Radiant Flux	P_O	mW	20	28	-
Spectrum Half Width (FWHM)	$\Delta\lambda$	nm	-	11.5	20
Viewing Angle	$2\theta 1/2$	deg.	-	130 (Side to side)	-
Thermal Resistance	$R_{J \cdot S}$	deg C / W	-	26	30

*Forward Voltage Tolerance: ±0.1 V

*Peak Wavelength Tolerance: ±3 nm

*Radiant Flux Tolerance: ±10 %

6. Electrostatic Discharge (ESD) Protection

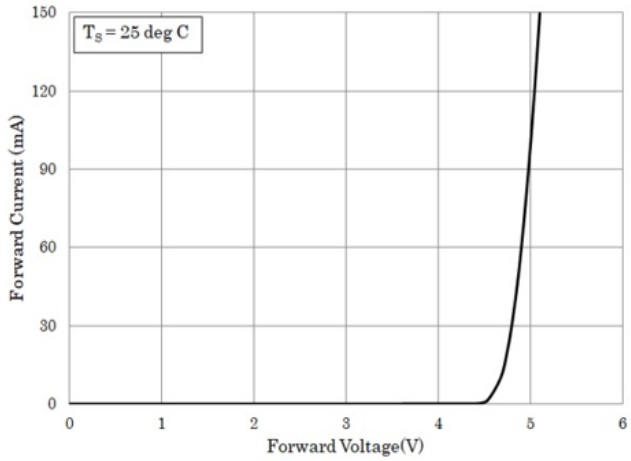
ESD protection device is built in this product.

ESD Protection Voltage Level: ±2.0 kV (HBM, 1.5 kΩ, 100 pF)

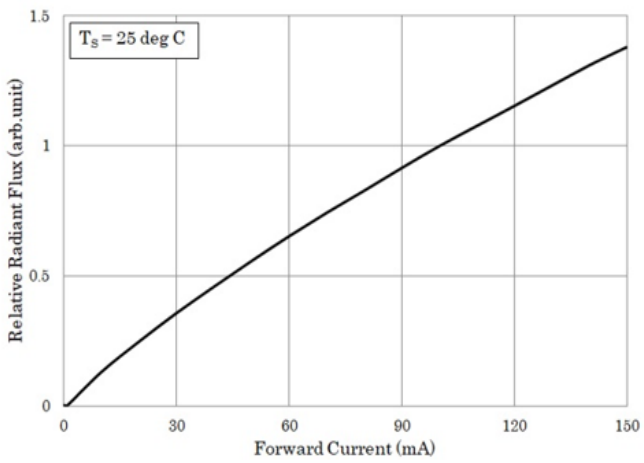
7. Reference Data and Derating Curve

Note: All characteristics shown in this section are for reference only and are not guaranteed.

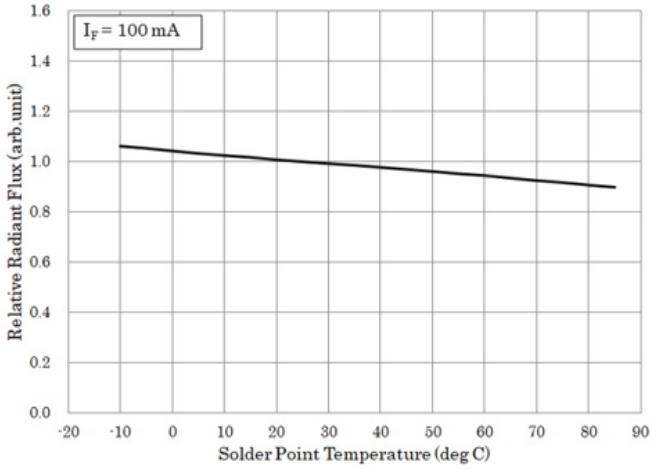
■Forward Current vs Relative Radiant Flux



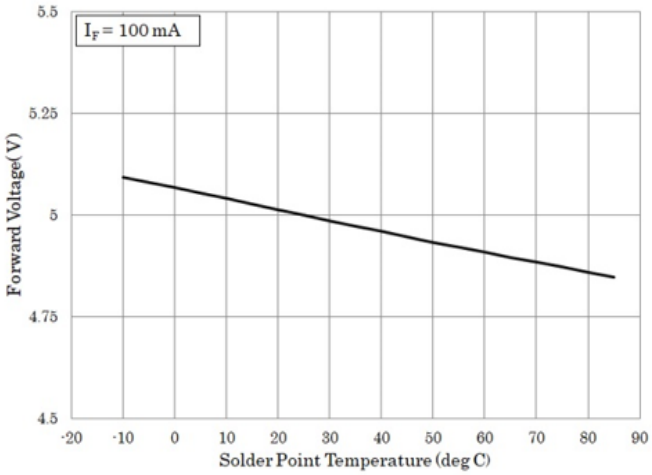
■Forward Voltage vs Forward Current



■Solder Point Temperature
vs Relative Radiant flux



■Solder Point Temperature vs Forward Voltage



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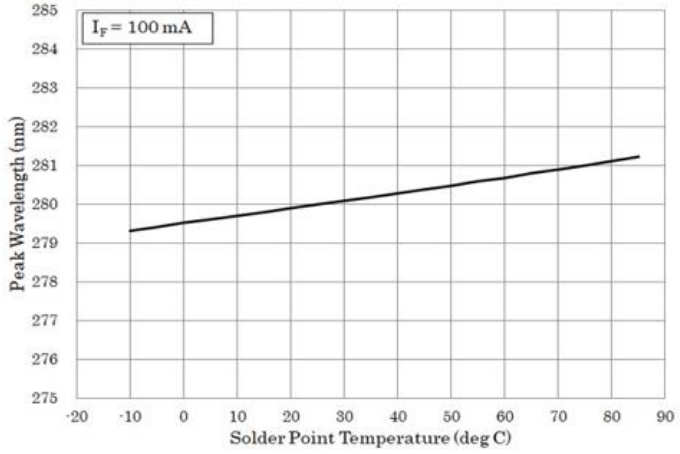
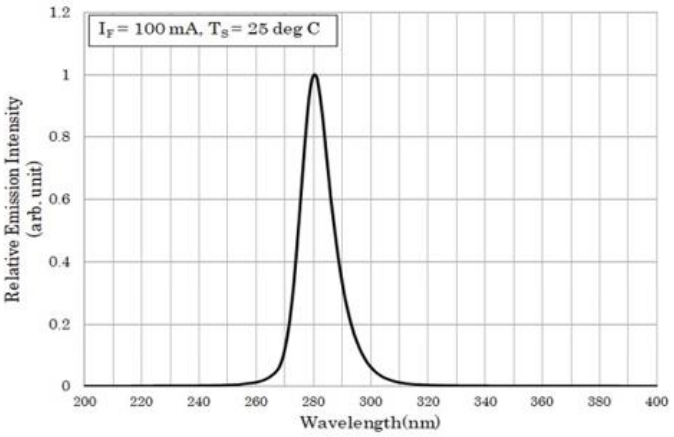
Rm. 1111, 11F., No. 54, Sec. 4, Minsheng E. Rd., Songshan Dist., Taipei City 105 , Taiwan (R.O.C.)

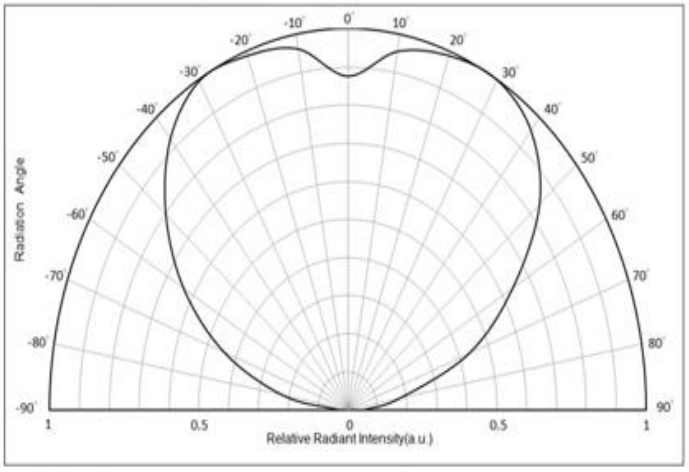
■Solder Point Temperature vs Peak Wavelength

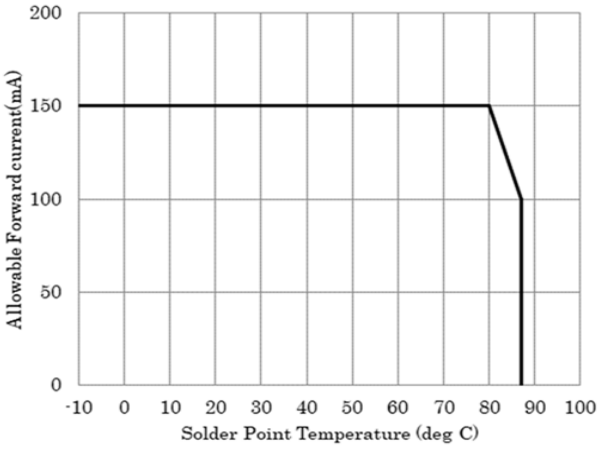


■Spectrum



Directivity(side to side direction)

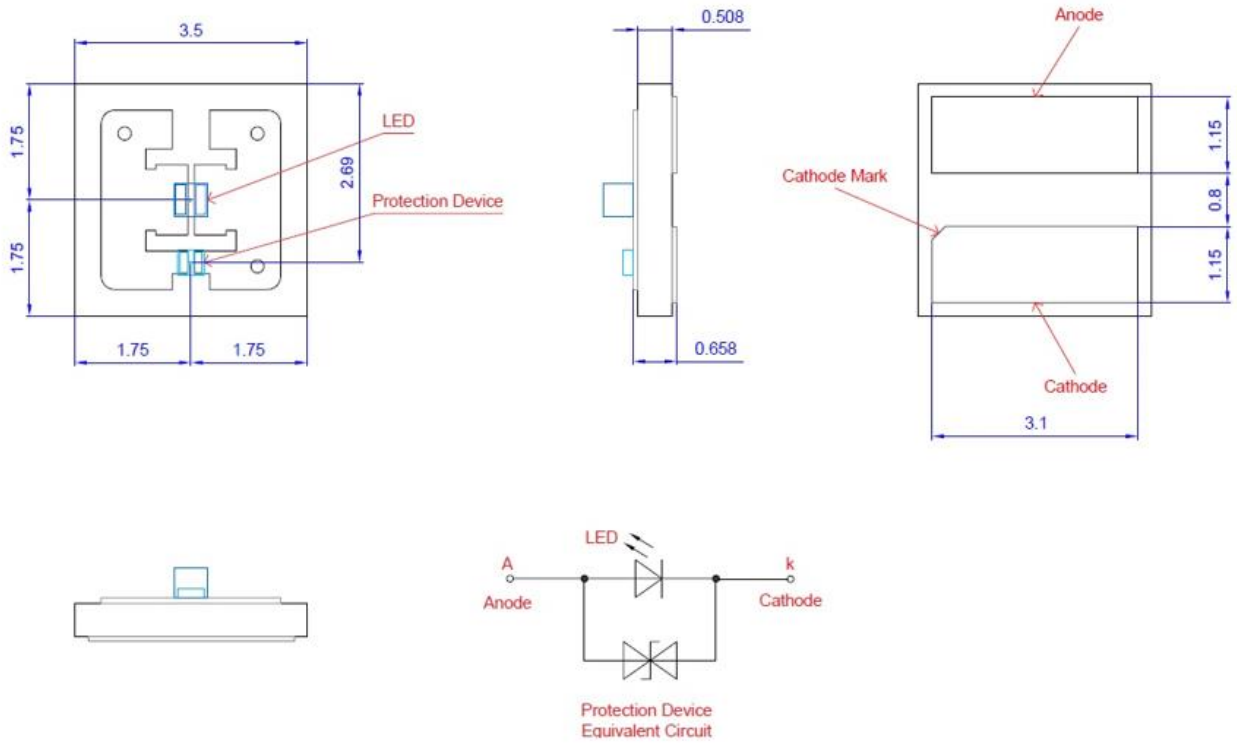




8. Outline Dimensions, Main Materials and Electric Circuit

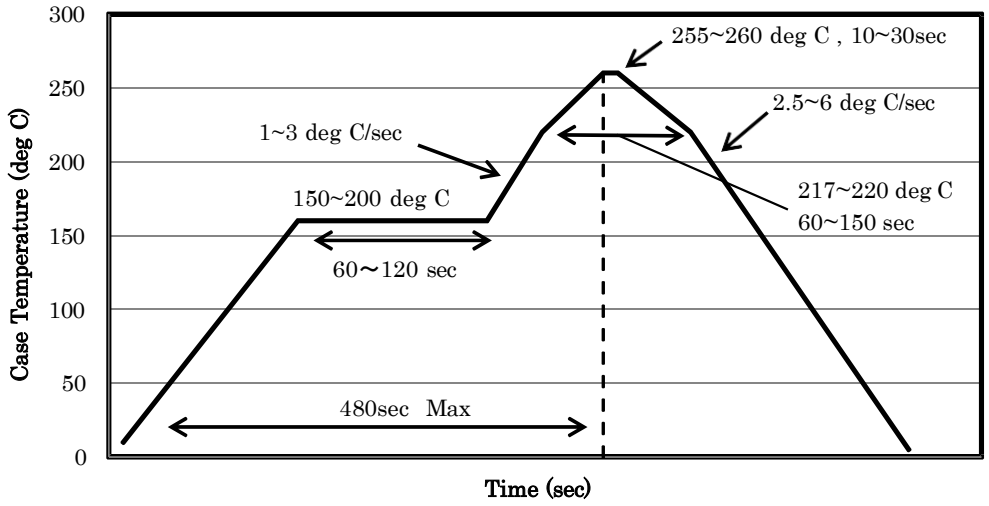
Items	Materials
Package Materials	Ceramics
Electrodes Materials	Au-sn

(Unit: mm, Tolerance: ±0.2)



NOTE: This product should be operated in forward current.

9. Recommended Reflow Soldering Condition (Lead-Free Solder)



NOTES:

1) REFLOW SOLDERING ONLY. This product is not applicable to flow or hand soldering.
2) Do not rework by melting the solder again.
3) Allowable Reflow Cycles: 2
4) When the products are handled by surface mounters, the suction collet and suction force should be adjusted appropriately to avoid mechanical stress on the product.
5) Carefully control the ramp-up rate of the reflow process. When using reflow soldering equipment that heats the whole product, temperature difference between the solder point and the product surface may occur. If the heating is too rapid, non-uniform temperature rise and non-uniform thermal expansion may cause damage to the product.
6) The peak temperature shown in the figure is the maximum and must not be exceeded.
7) Inappropriate soldering operation may result in insufficient solder connection.
8) Excessive amount of solder paste causes much more mechanical stress, which may lead to the solder crack. Be sure to confirm the proper amount of solder paste.
9) Insufficient amount of solder causes less bonding strength, which may lead to the detachment of the product from the board.
10) Be sure that the storage time and conditions after opening the moisture barrier bag are within the range specified in "Cautions" chapter below.
11) Carefully make sure that the products can be properly soldered before using the products expiring the maximum storage period.
12) Avoid rapid cooling from the peak temperature.
13) Halogen free solder flux is recommended. Make sure to prevent the contamination of the light-emitting face of the product.
14) Nitrogen reflow soldering is recommended.

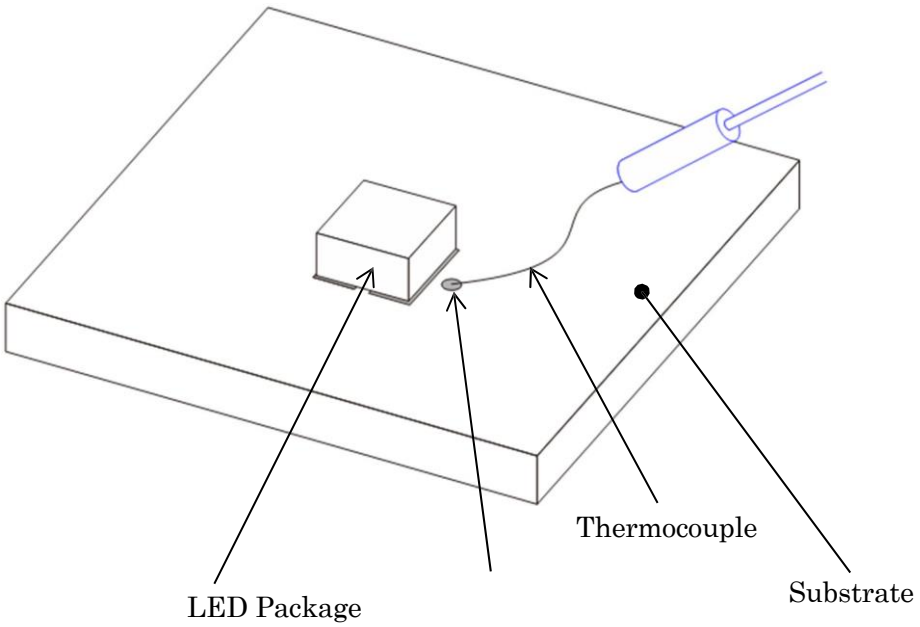
15) Use grounded soldering equipment.

(A) Thermal Management

1) The junction temperature that exceeds the absolute maximum ratings conditions in this document may lead to the failure of this product, even if it happened for a short period of time. Also, this product is not designed to work at the absolute maximum ratings conditions for extended periods, and we do not guarantee the product reliability that is operating at the absolute maximum ratings conditions. The junction temperature is affected by the solder point temperature, which is determined by the PCB's thermal resistance and the ambient temperature. Measure the solder point temperature to ensure that the junction temperature described as below does not exceed the maximum junction temperature.

Junction Temperature: T_j (deg C)=T_S (deg C)+I_F (A)×V_F (V)×$R_{J\text{-}S}$ (deg C / W)

Determine the drive current according to the solder point temperature and take appropriate measures for heat dissipation.



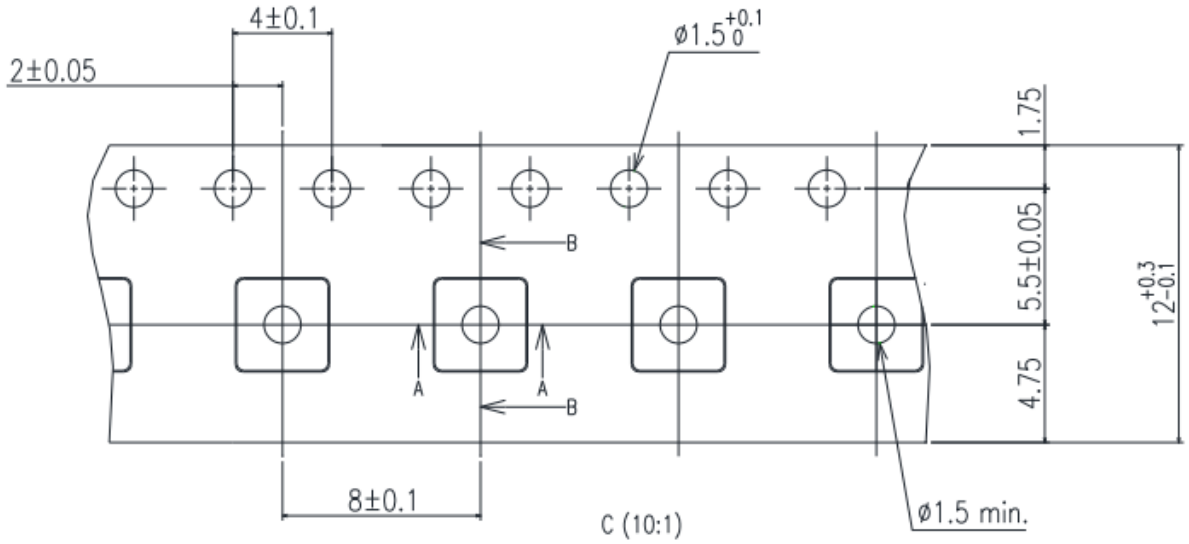
Solder Point

REFERENCE DRAWING: Measurement of Solder Point Temperature (Ts)

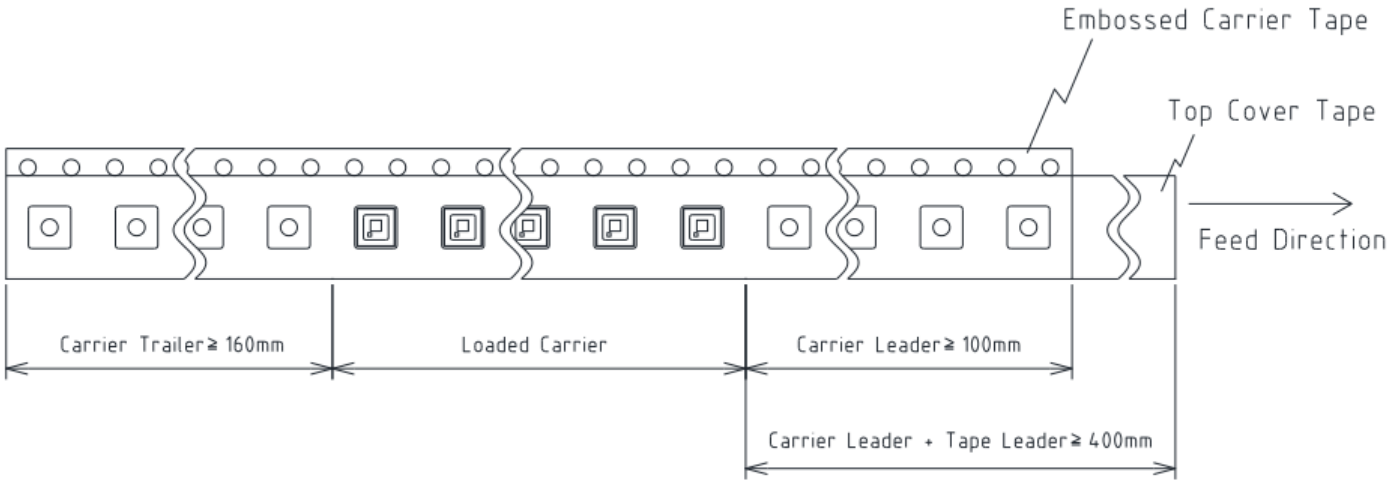
10.Tape and Reel Packaging

Tape

(A) Tape Dimensions
(Unit: mm)

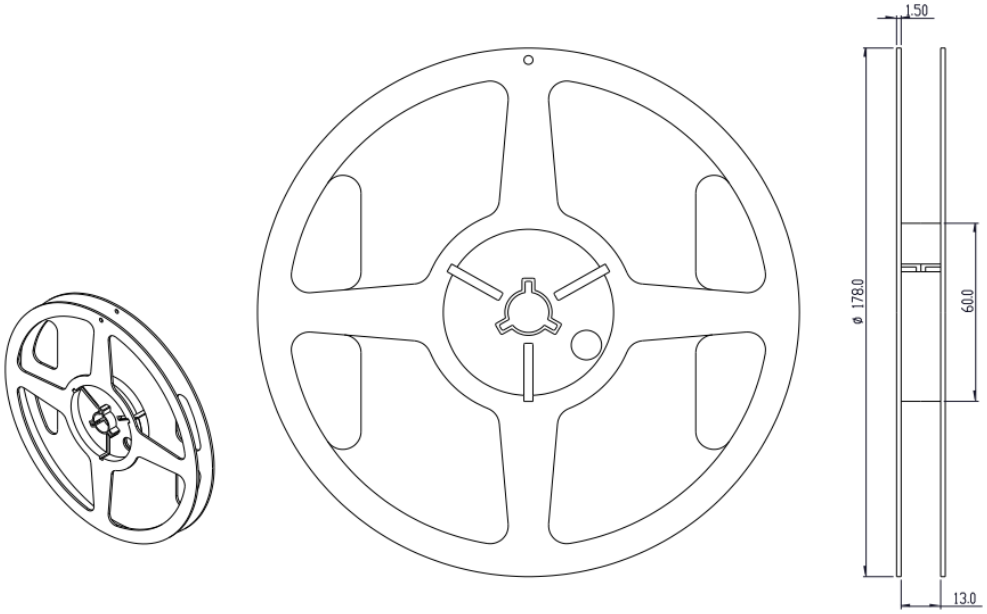


(B) Trailer and Leader



Reel

(Unit: mm)

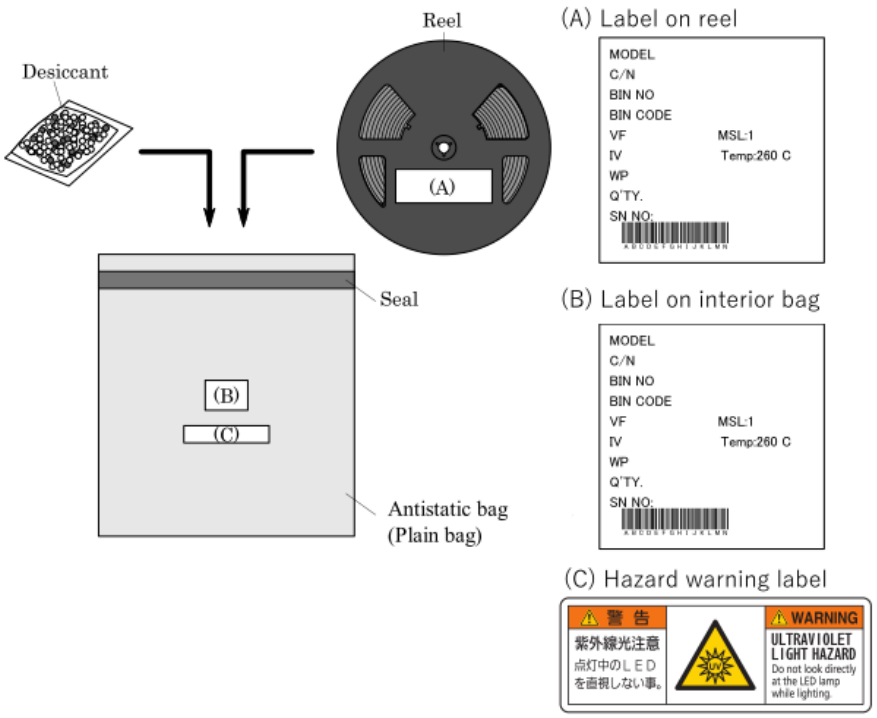


NOTES

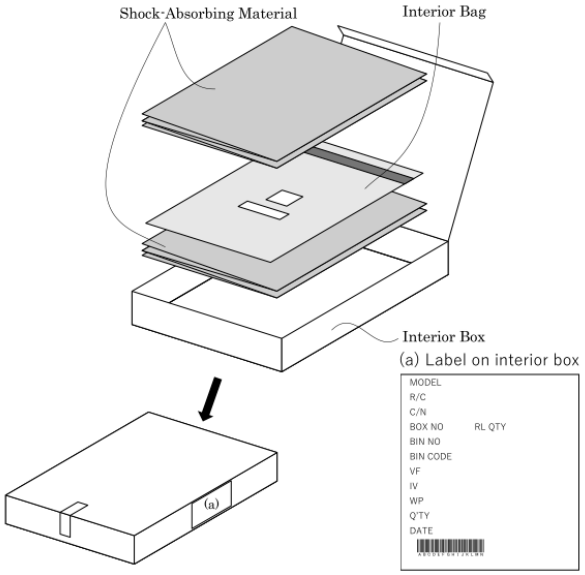
- Reel Size: 300 pcs or 1,000 pcs
- When the tape is rewound due to work interruptions, no more than 10 N should be applied to the embossed carrier tape.

Packaging

(A) Interior Bag

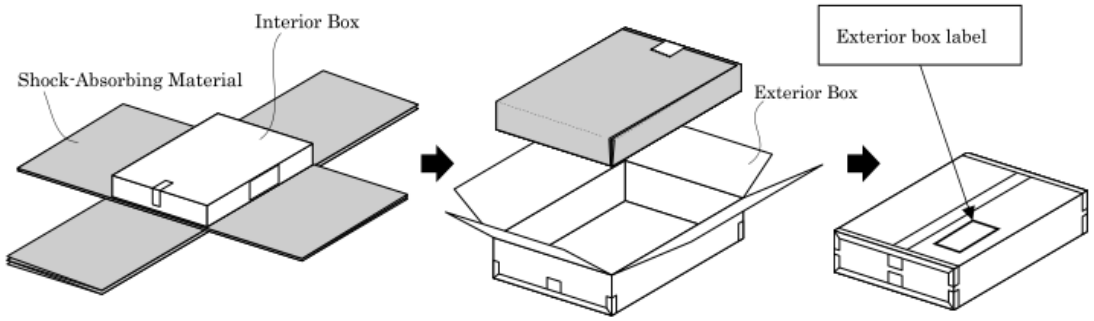


(B) Interior Box



Interior Box		Capacity	
		For Reel	For Tray
size	270x235x46mm	2 Reels (MAX)	4 Trays (MAX)

(C) Exterior Box



Exterior box label

Ex.

UV LED

P/L : D2170009

NO	品名	RUN_CARD	BOX_NO	QTY
1	NFPD6C	ANK1270031	01	2000
2	NFPD6C	ANK1270031	02	2000
3	NFPD6C	ANK1270031	03	2000
4	NFPD6C	ANK1270031	04	2000
5	NFPD6C	ANK1270031	05	2000
6				
7				
8				
9				
10				

Packing Date : 07/28/2021 Total : 20000

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Exterior Box		Capacity
size	500x290x266mm	10 Interior Boxs (MAX)

10. Cautions

1) The specifications described in this document are subject to change without prior notice.
2) Both the customer and NKFG will agree on the official specifications of supplied product before the volume production begins.

(A) Transportation

1) To avoid water condensation, do not expose the products to large temperature fluctuations.
2) Do not expose the cardboard box to water. It is not water-resistant.
3) In transportation, packing equivalent to that of our original shipment is recommended, in order to preserve the product quality.
4) Do not drop or expose the shipping box to external forces as it may damage the products inside.

(B) Storage

1) This product is classified as Moisture Sensitivity Level 1 (MSL 1). For the details of MSL, please refer to the standard JEDEC J-STD-020.
2) The required storage conditions are as follows:

Storage	Storage Condition	Period
Before opening moisture barrier bag	15 degC ≤ T ≤ 30 degC RH ≤ 85 %RH	Within 1 year after arrival date
After opening moisture barrier bag	15 degC ≤ T ≤ 30 degC RH ≤ 85 %RH	Within 1 year after arrival date AND within 3 months after opening the bag first. The product must be vacuum-sealed in a moisture barrier bag within 24 hours from opening.

3) In a hot and humid environment that exceeds the conditions described above, the electrodes may be oxidized and have difficulties in soldering. The dicing tape may also be damaged.
4) Before using the products expiring the maximum storage period, carry out the sampling test to make sure that the solderability and the performance of the products from this stock are sufficient for intended application.
5) The maximum rating of storage temperature refers to the allowable limit in circumstances where the products are exposed to a high/low temperature for a brief period (in transportation etc.) and does not ensure long-term storage. For reflow soldering, refer to "Recommended Reflow Soldering Condition (Lead-Free Solder)" section above and do not exceed the maximum peak temperature.
6) Storage conditions that exceed the recommended storage conditions may affect the characteristics of the products.
7) Exposure to corrosive atmosphere may change the surface state of the electrodes, leading to the bad solderability. Carefully control the storage conditions.
8) Do not store the products in a dusty environment.

9) Do not expose the products to direct sunlight or an environment where the temperature is higher than the normal room temperature for an extended period.
10) When storing, take care that a load is not applied to the products.

(C) Electrostatic Discharge (ESD)

1) Although it contains a built-in ESD protection device, this product is vulnerable to static electricity or surge voltage. Do not handle the products with bare hands and take appropriate measures against electrostatic discharge such as a grounded wrist strap and anti-static gloves.
2) Make sure that the voltage on the equipments, people, and tools to handle this product is 100 V or less.

(D) Handling

1) Operating conditions outside the absolute maximum ratings may cause the products to degrade, leading to the decreased product reliability. Set the operating conditions so as not to go over the derating curve even for a moment.
2) Do not handle the products with bare hands. It will contaminate the product surface and may affect the optical characteristics.
3) Do not stack assembled PCBs together. The impact may cause the products to be scratched, chipped, delaminated and/or deformed, affecting the optical characteristics. In the worst case, it may cause an open circuit and complete failure of the products.
4) When handling the product, touch only the side of the ceramic substrate and do not apply excessive force. Wear safety glasses to prevent damage to the eyes from the chipped or broken product.
5) Insufficient flux cleaning will leave flux residue, which will absorb moisture during prolonged use and may cause leakage current or corrosion of electrodes.
6) Higher junction temperature may cause lowering product performance and/or product failure. Well-designed PCBs must be selected to properly dissipate the heat from the products.
7) Do not place the shipping box upside down. Keeping the products in the wrong orientation may cause unwanted force and destroy the product.
8) Throwing or dropping the shipping box may cause the product inside to be broken.
9) Be careful when carrying the product after unboxing. Vibration or impact may cause damage to the product.
10) To protect the products from the electrostatic charge generated by vibration in transportation, use anti-static bags or cases. Anti-static measures must be taken even for a brief period/distance transportation.
11) The products may be exposed to a tough environment in shipment. Please take appropriate measures against moisture, mechanical impact and vibration, such as moisture barrier bags, hermetic containers and shock-absorbing materials.

12) Exposure to water or saltwater may cause a short circuit. The electrodes may also corrode leading to failure of the products.
13) Exposure to corrosive atmosphere may cause the detachment of the product from the board, lighting failure, and so on.
14) Since the product temperature may rise due to the self-heating, do not touch the product during operation or just after shutting down.
15) Since the heat from this product may heat up the surrounding objects, heat-resistive materials are recommended to be used in the equipment including this product.
16) When using several LEDs at the same time, design the circuit so that each LED will not operate with a condition over the absolute maximum ratings. It is recommended that each LED be operated with constant current.
17) This product also emits visible light, which may be a hindrance for certain applications. Make sure before the usage that this does not cause a problem.
18) When operating the product outdoors, carefully carry out the operation verification tests considering the climatic shift at the point of use.
19) Do not wipe the product as the product could be damaged.
20) Do not use ultrasonic cleaning.
21) Please use this product in an airtight environment to prevent moisture from increasing.

(E) Installation on PCBs

When you install this product in your equipment or system, you must follow the items listed below.

1) Use of Cu-based PCB is recommended. Inappropriate size, array density, or layout of the product could damage the product. Check in advance that the designed PCB can be properly used.
2) Separation of PCBs installed with this product or other parts must be performed in a way that any flexure or torsional stress is not applied to the PCBs. The layout of this product must be carefully designed to avoid the stress onto this product.
3) Separation of PCBs must be performed using PCB separators or special jigs to avoid tensile stress.
4) This product is subject to the stress from the PCB since it's installed directly on the PCB. Inappropriate amount of solder paste could lead to solder crack or product detachment.
5) Materials of PCBs could be metal, fiber-reinforced plastics, phenolic paper, ceramics, and so on. PCBs must be designed from the viewpoint of thermal expansion, mechanical properties, and thermal management. Metal-based PCBs are often used for its high thermal conductivity. On the other hand, its large thermal expansion coefficient causes the large stress on this product. Carefully design the PCB to avoid damage to the product.
6) Large soldering pad pattern requires more solder paste, which increases the potential for solder crack. Refer to the recommended soldering pad pattern described in "Outline Dimensions, Main Materials and Electric Circuit" section above.

7) Use a vacuum suction device (vacuum tweezers) when handling this product. Do not touch the ceramic substrate electrodes, LED chips, or LED protection device. Failure to follow these instructions may result in damage to this product.
8) Unpack or handle this product in the cleanroom with the cleanliness level of Class 1,000 or higher to avoid a short circuit caused by dust on the wiring.
9) Unpack or handle this product after confirming that the work environment is classified from A to S1 of the JEITA standards IT-1004 to avoid corrosion of the wiring.
10) Unpack or handle this product in the environment with the temperature from 20 degC to 30 degC, and the relative humidity from 40 %RH to 60%RH.
11) Design your final product so that this product is operated in a dry air environment with the dew point of -10 degC or lower. If used in other environment, the initial performance and reliablity of this product may be significantly degraded.

(F) Ultraviolet (UV)

1) Do not look directly into the operating deep-ultraviolet LED as it may cause damage to the eyes. If looking into the operating LED is necessary, be sure to wear ultraviolet light protective glasses.
2) IEC62471 “Photobiological Safety of Lamps and Lamp Systems” defines exposure limits of electromagnetic radiation in the wavelength range from 200 nm to 3000 nm for each possible hazard (to the skin, eye, and retina). The deep ultraviolet light emitted from this product can be classified as belonging to the following hazards. It is recommended to understand the content of the standard and design your product and process accordingly before using this product.

Relevant Hazards

- Hazard to the skin
  - 4.3.1 Es Actinic UV hazard exposure limit for the skin and eye
- Hazard to the eye (cornea)
  - 4.3.1 Es Actinic UV hazard exposure limit for the skin and eye
  - 4.3.2 Euva Near-UV hazard exposure limit for the eye
- Hazard to the retina
  - 4.3.3 Lb Retina blue light hazard exposure limit
  - 4.3.4 Eb Retina blue light hazard exposure limit – small source

3) This product has a larger proportion of horizontal light intensity components compared to our cavity package products. Therefore, in applications where this product is mounted, it is recommended to install an interlock to avoid unintended UV exposure.

(G) Others

1) This product is intended to be used for a general purpose (industry or consumer equipment). Consult NKFG's sale staff in advance for information on more specialized applications in which higher quality is required (power plant application, submarine equipment, space equipment, aircraft equipment, medical equipment, transport equipment, emergency equipment etc.).
2) The customer shall not reverse engineer by disassembling or analysis of the LEDs without having prior written consent from NKFG. When defective LEDs are found, the customer shall inform NKFG directly before disassembling or analysis.