NICHIA CORPORATION

# SPECIFICATION FOR STANDARD LED FOR UV IRRADIANCE

# PART NO. NLSU04S11A

- LED reference standard with a temperature control unit for UV irradiance calibration

# SPECIFICATIONS

## (1) Absolute Maximum Ratings

| Item | Symbol | Absolute Maximum Rating | Unit |
|---|---|---|---|
| Forward Current | $I_F$ | 1000 | mA |
| Allowable Reverse Current | $I_R$ | 85 | mA |
| Operating Temperature | $T_{opr}$ | 20~30 | °C |
| Storage Temperature | $T_{stg}$ | -30~85 | °C |
| Platinum Resistance Temperature Device (RTD) Current | $I_{pt}$ | 1 | mA |
| Peltier Device Current | $I_{pel}$ | -2~2 | A |
| Peltier Device Voltage | $V_{pel}$ | -15~15 | V |

* Absolute maximum ratings at $T_A$=25°C.
* A Class B Pt100 RTD (reference standard: IEC 60751) is incorporated.

## (2) Initial Electrical/Optical Characteristics

| Item | Symbol | Condition | Typ | Unit |
|---|---|---|---|---|
| Forward Voltage | $V_F$ | $T_{pt}$=90°C, $I_F$=1000mA | 14.9 | V |
| Irradiance | $E_e$ | $T_{pt}$=90°C, $I_F$=1000mA | 165 | mW/cm$^2$ |
| Peak Wavelength | $\lambda_p$ | $T_{pt}$=90°C, $I_F$=1000mA | 370 | nm |
| Non-uniformity of Irradiance | $E_{umi}$ | $T_{pt}$=90°C, $I_F$=1000mA | 1 | % |

* Characteristics at $T_A$=25°C.
* The irradiance value is traceable to the national calibration standard.
* Irradiance at a measurement distance of 200mm.
* The non-uniformity of irradiance is calculated as two times the standard deviation of the irradiance measured on a circular surface of ⌀10mm at a measurement distance of 200mm when the measurement is performed by moving a detector with a detection area of ⌀1mm in increments of 1mm.
* Characteristics measured after the LED is operated for 200 hours at $I_F$=1000mA at $T_A$=25°C (i.e. the measurements are performed after the irradiance of the LED has stabilized).

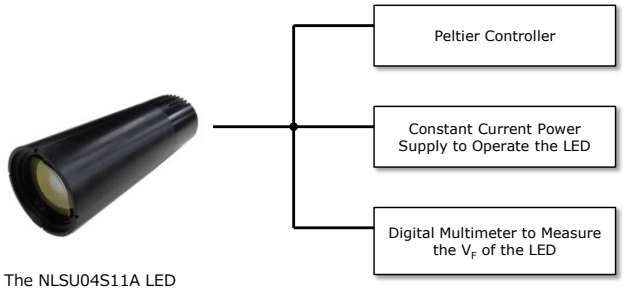
## (3) Irradiance Maintenance

* The change in irradiance will be ≤±3% when the LED has been operated for 100 hours in total or when 1 year has passed from the calibration date of the LED, whichever occurs earlier.
* Operating conditions: $T_A$=25°C, $T_{pt}$=90°C (±0.03°C), $I_F$=1000mA (±0.1%)

# DIRECTIONS FOR USE

## (1) Recommended Peripheral Equipment to Connect to the LED

- The following describes examples of recommended peripheral equipment to connect to the LED.




The NLSU04S11A LED

Recommended Specifications for Peripheral Equipment

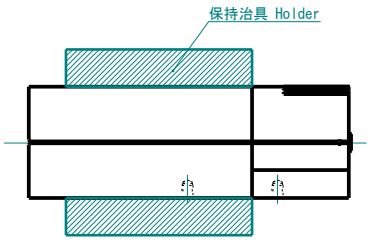
| | |
|---|---|
| Peltier Controller | PID controllable.<br>Temperature measurement accuracy: ±0.03°C |
| Constant Current Power Supply to Operate the LED | Drive current accuracy: ≤0.1% of the set current |
| Digital Multimeter to Measure the $V_F$ of the LED | Input impedance: ≥1GΩ |

## (2) How to Hold the LED

- The following figures show examples for how to hold the LED.

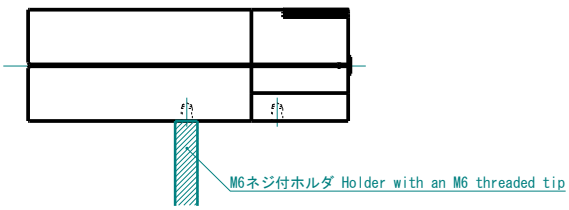
Example 1:

The LED is held by the part that is ⌀60mm (i.e. not near the rear side of the LED) using a holder.




Example 2:

The LED is held using a holder with an M6 threaded tip.

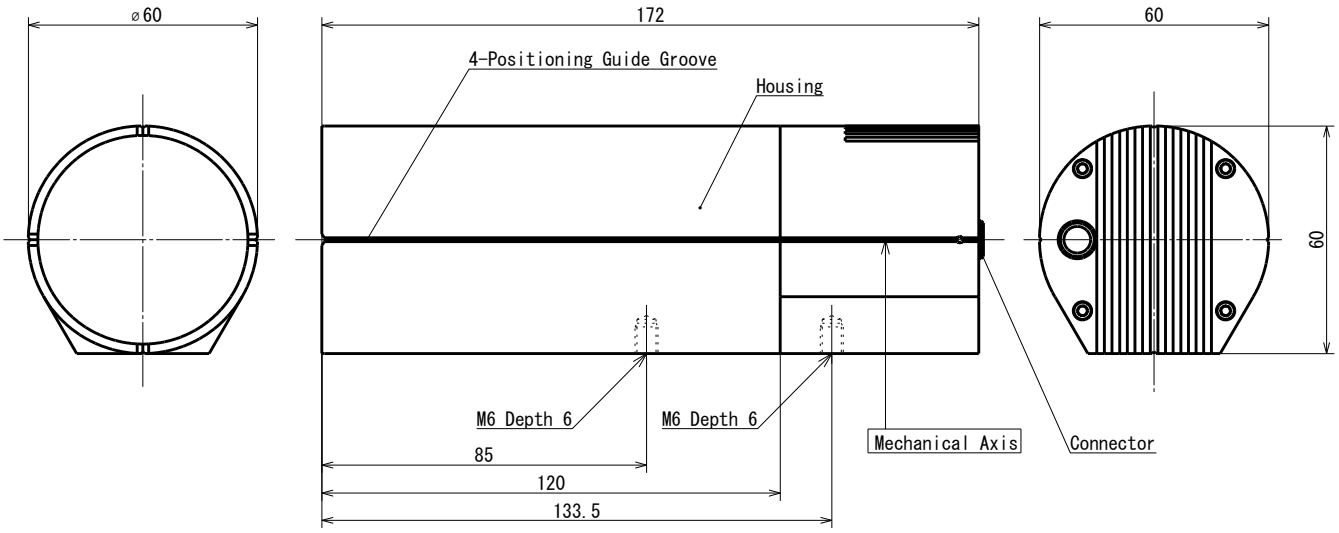



## (3) How to Prepare the LED for Calibration

- Turn on the temperature control system and apply a constant current to the LED. Ensure that the LED is operated for a sufficiently long time (i.e. usually for longer than 30 minutes) in order to stabilize the irradiance before it is measured for calibration purposes. For the characteristics for 60 minutes from the start of operation, see the graphs for the operation time characteristics provided in OPERATION TIME CHARACTERISTICS/TEMPERATURE CHARACTERISTICS.

# OUTLINE DIMENSIONS

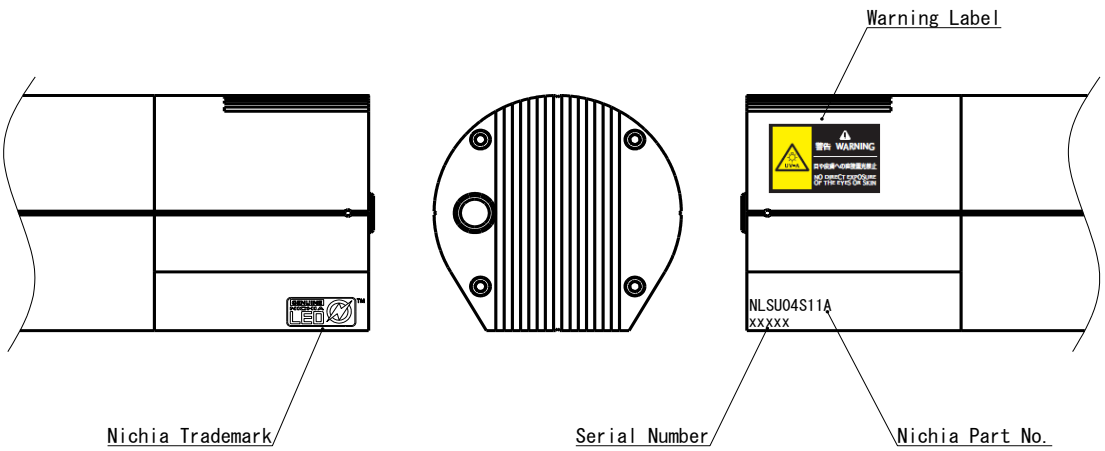
Part No. NLSU04S11A
No. SQST-DA6-0006A




単位 Unit：mm

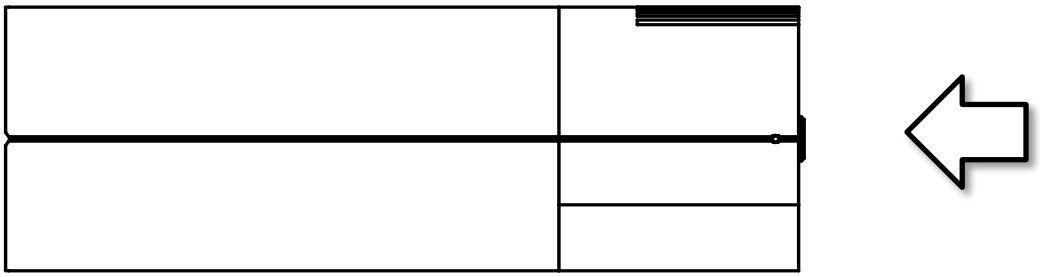
＊ 異なる記載がない限り、この図面の公差は下記のとおりISO 2768-mに準拠する:
30超から120までは±0.3、120超から400までは±0.5
Unless otherwise specified, the tolerances on the drawings comply with ISO 2768-m as below:
±0.3 for above 30 to 120, ±0.5 for above 120 to 400

| 項目<br>Item | 内容<br>Description | 数量<br>Quantity |
|---|---|---|
| コネクタ<br>Connector | EGJ.0B.309.CLA<br>manufactured by LEMO Japan Ltd. | 1 |
| 筐体<br>Housing | 材質:アルミニウム<br>Material:Aluminum | 1 |

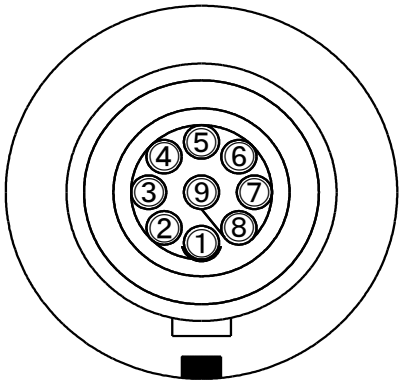


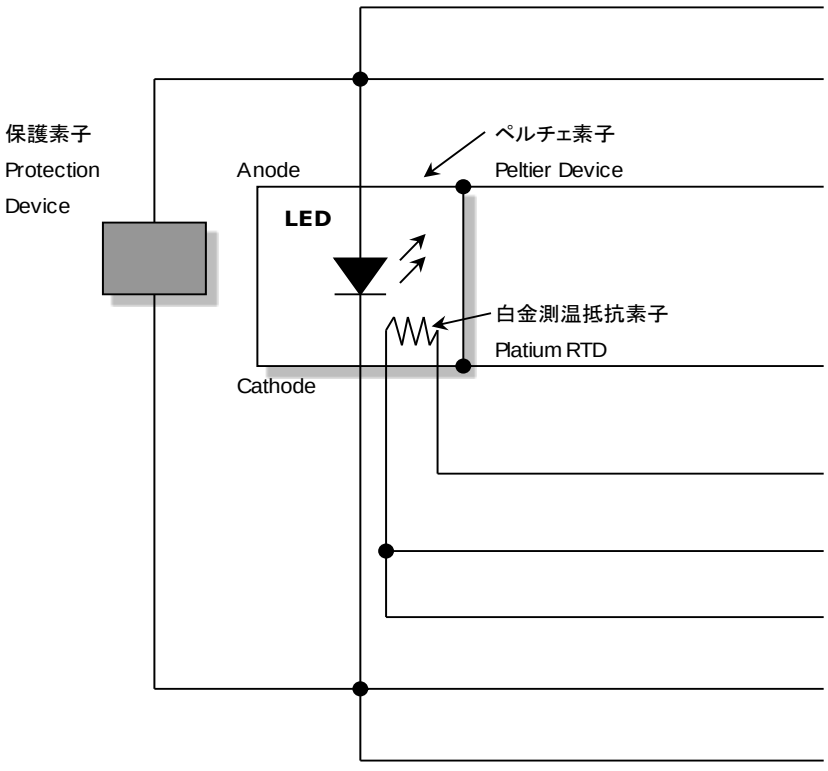
# CIRCUIT AND INTERFACE CONNECTION

Part No. NLSU04S11A
No. SQST-DA6-0007B



下の図は、LED裏面のコネクタです（矢印の方向から見た図）
The following picture shows the connector on the rear side of the LED (i.e. viewed from the direction of the arrow).




1. LED点灯用（アノード側）
   To operate the LED (anode)
6. LED順電圧測定用（アノード側）
   To monitor the $V_F$ of the LED (anode)

8. ペルチェ素子制御用（+）
   To control the Peltier device (+)

9. ペルチェ素子制御用（−）
   To control the Peltier device (-)

3. 白金測温抵抗素子（3 端子）
   To monitor the RTD (three-wire RTD)
4. 白金測温抵抗素子（3 端子）
   To monitor the RTD (three-wire RTD)
5. 白金測温抵抗素子（3 端子）
   To monitor the RTD (three-wire RTD)

7. LED順電圧測定用（カソード側）
   To monitor the $V_F$ of the LED (cathode)
2. LED点灯用（カソード側）
   To operate the LED (cathode)

# PACKAGING

Part No. NLSU04S11A
No. SQST-DA6-0008A

保護キャップを付けたLED
The LED with a Protective Cap

シリカゲル乾燥剤
Silica Gel Desiccants

防湿アルミ袋
Moisture-proof Aluminum Bag

プラスチックケース
Hard Plastic Case

段ボール箱
Cardboard Box

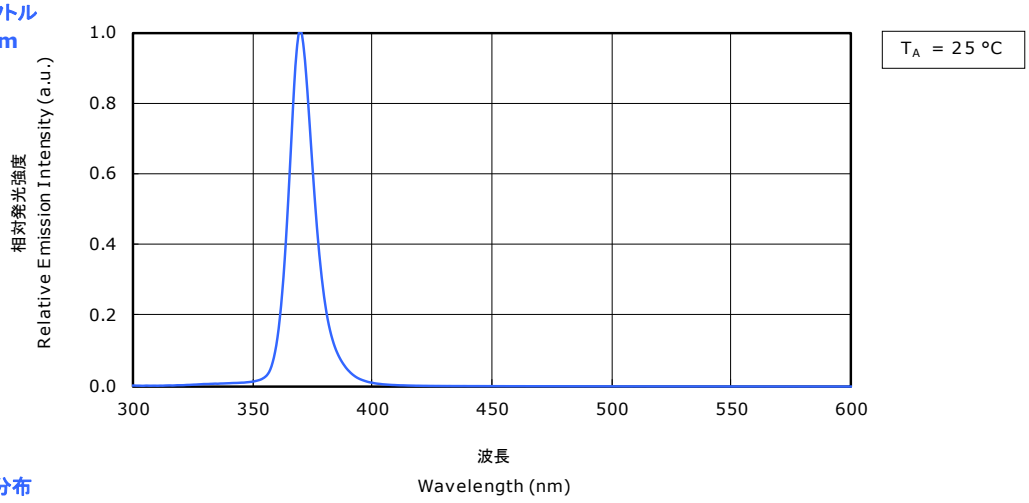
* レンズに保護用キャップを付けたLED１個を、シリカゲル乾燥剤と一緒に防湿アルミ袋に入れます。その後、防湿アルミ袋を熱シールします。
  One LED with a protective cap on the lens is placed in a moisture-proof aluminum bag with silica gel desiccants. The moisture-proof aluminum bag is then heat-sealed.
* 防湿アルミ袋をプラスチックケースに入れます。
  The moisture-proof aluminum bag is placed in a hard plastic case.
* プラスチックケースを、緩衝材と一緒に段ボール箱に入れます。
  The hard plastic case is packed in a cardboard box with cushioning material.
* 梱包テープで段ボール箱に封をします。
  The cardboard box is sealed with packing tape.
* プラスチックケースと段ボール箱には、顧客名、日亜型番、数量、シリアル番号などを記載したラベルが貼付されます。
  The hard plastic case and the cardboard box have a label that provides the Customer name, Nichia part number, quantity, serial number, etc.

# OPTICAL CHARACTERISTICS

Part No. NLSU04S11A
No. SQST-DA6-0009A

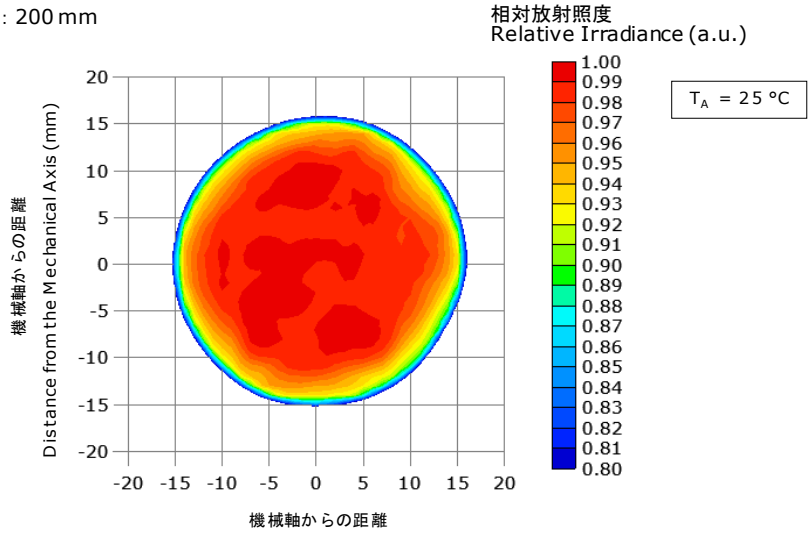
* 本特性は参考です。
  All characteristics shown are for reference only and are not guaranteed.
* グラフの特性は、白金測温抵抗素子の温度を90 ºCに制御し、$I_F$=1000 mAで測定した特性です。
  The characteristics shown in the graphs are the characteristics measured while the temperature of the incorporated RTD is controlled to be 90 ºC and at $I_F$=1000 mA.
* 特性測定に使用した外付け温度コントローラの温度制御精度は±0.03 ºC（温度コントローラ製造業者が提示する仕様値）です。
  The temperature control accuracy of the external temperature controller used for the characteristics measurements is ±0.03 ºC (i.e. the specification value provided by the manufacturer of the temperature controller).

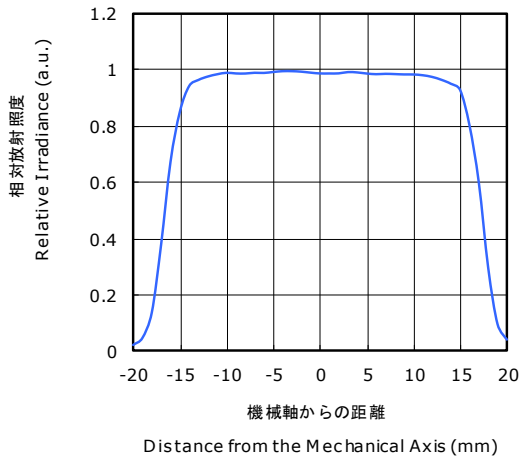
**発光スペクトル**
**Spectrum**




**放射照度分布**
**Irradiance Distribution**

測定距離
Measurement Distance : 200 mm



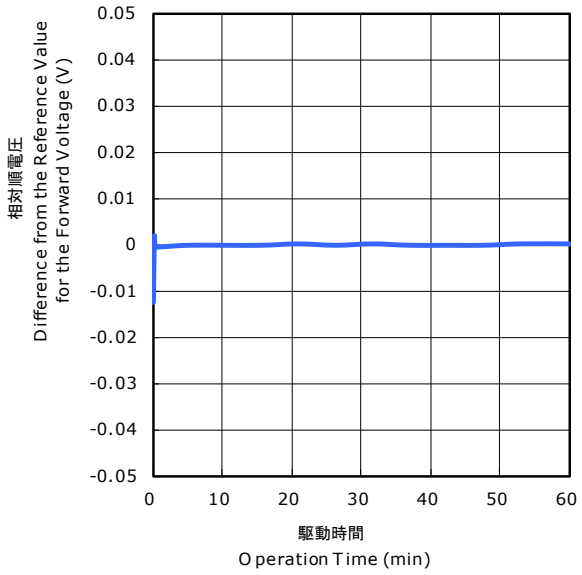



# OPERATION TIME CHARACTERISTICS/TEMPERATURE CHARACTERISTICS

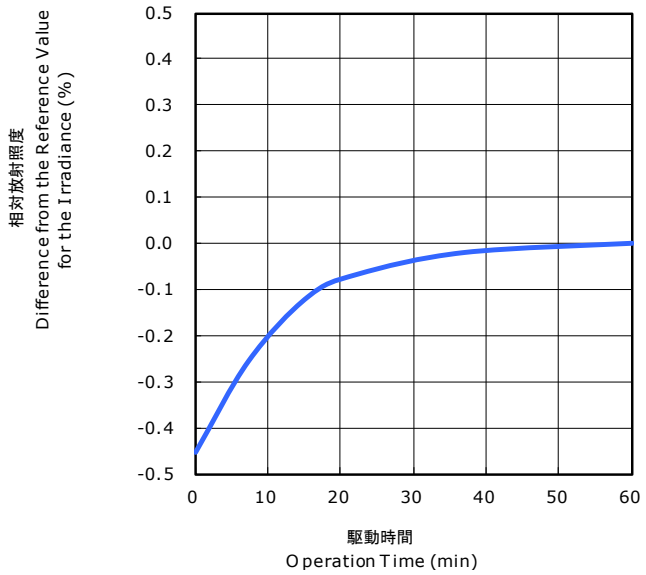
Part No. NLSU04S11A
No. SQST-DA6-0010B

* 本特性は参考です。
  All characteristics shown are for reference only and are not guaranteed.
* グラフの特性は、白金測温抵抗素子の温度を90 ºCに制御し、$I_F$=1000 mAで測定した特性です。
  The characteristics shown in the graphs are the characteristics measured while the temperature of the incorporated RTD is controlled to be 90 ºC and at $I_F$=1000 mA.
* 特性測定に使用した外付け温度コントローラの温度制御精度は±0.03 ºC（温度コントローラ製造業者が提示する仕様値）です。
  The temperature control accuracy of the external temperature controller used for the characteristics measurements is ±0.03 ºC (i.e. the specification value provided by the manufacturer of the temperature controller).
* グラフの基準値は、$T_A$= 25 ºCで駆動時間60分での測定値です。
  The reference values for the graphs are the values measured at the operation time of 60 minutes at $T_A$= 25 ºC.
* 基準値との差は、LEDが使用される条件/環境によって異なる場合があります。
  The difference from the reference values may change depending on the conditions/environment in which the LED is used.

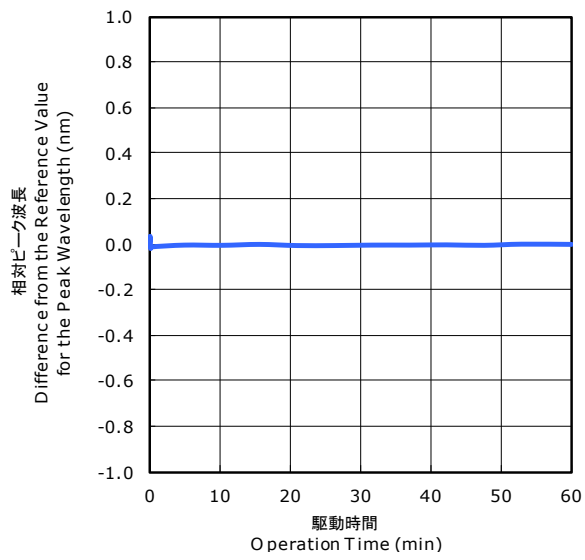
**駆動時間 vs 順電圧**
**Operation Time vs Forward Voltage**



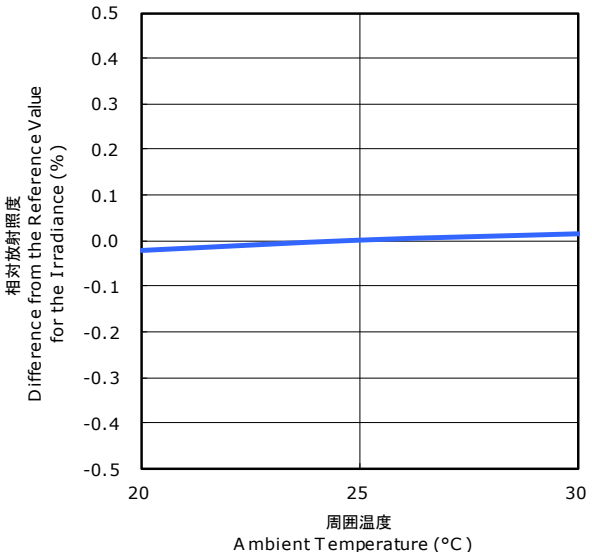

**駆動時間 vs 放射照度**
**Operation Time vs Irradiance**




**駆動時間 vs ピーク波長**
**Operation Time vs Peak Wavelength**




**周囲温度 vs 放射照度**
**Ambient Temperature vs Irradiance**



# CAUTIONS

## (1) Storage

- The LED should be stored at ≤30°C and ≤70% RH in a hermetically-sealed container with silica gel desiccants.
- To avoid condensation, the LED must not be stored in areas where temperature and humidity fluctuate greatly.

## (2) Handling Precautions

- Ensure that the LED is not dropped/exposed to any impact, and/or that nothing touches the lens of the LED; that may affect the characteristics.

## (3) Design Consideration

- Volatile organic compounds that have been released from materials present around the LED (e.g. housing, gasket/seal, adhesive, secondary lens, lens cover, etc.) may penetrate the components of the LED (e.g. lens). If the LED is being used in a hermetically sealed environment, these volatile compounds can discolor after being exposed to heat and/or photon energy and it may greatly reduce the LED light output. In this case, ventilating the environment may improve the reduction in light output. Perform a light-up test of the chosen application for optical evaluation to ensure that there are no issues, especially if the LED is planned to be used in a hermetically sealed environment.

## (4) Electrostatic Discharge (ESD)

- This LED is sensitive to transient excessive voltages (e.g. ESD, lightning surge). If this excessive voltage occurs in the circuit, it may cause the LED to be damaged causing issues (e.g. an effect on the characteristics). Ensure that when handling the LED, necessary measures are taken to protect it from an ESD discharge. The following examples are recommended measures to eliminate the charge:
  - Grounded wrist strap, ESD footwear, clothes, and floors
  - Grounded workstation equipment and tools
  - ESD table/shelf mat made of conductive materials

## (5) Eye Safety

- In 2006, the International Electrical Commission (IEC) published IEC 62471:2006 Photobiological safety of lamps and lamp systems, which added discrete LED components in its scope. On the other hand, the IEC 60825-1:2007 (i.e. Edition 2.0) laser safety standard removed LEDs from its scope. However, be advised that some countries and regions have adopted standards based on the IEC 60825-1:2001 (i.e. Edition 1.2), which still includes discrete LED components in its scope. This LED emits light in the ultraviolet (UV) region and is classified as belonging into Risk Group 3 (High-Risk) according to IEC 62471:2006; even a momentary or short period of exposure to the UV light of this LED may cause injury to the skin/eyes. Do not look directly or indirectly (e.g. through an optic) at the UV light of this LED. Ensure that if there is a possibility that the UV light reflects off objects and enters the eyes, appropriate protection gear (e.g. goggles) is used to prevent the eyes from being exposed to the UV light. Also, wear appropriate protective clothing and gear (i.e. gloves, thick clothing with long sleeves, a face mask, etc.) to protect the skin.
- Ensure that appropriate warning signs/labels are provided both on each of the systems/applications using this LED, in all necessary documents (e.g. specification, manual, catalogs, etc.), and on the packaging materials.

## (6) Others

- The applicable warranty period is one year from the date that the LED is delivered. In the case of any incident that appears to be in breach of this warranty, the local Nichia sales representative should be notified to discuss instructions on how to proceed while ensuring that the LED in question is not disassembled. If a breach of this warranty is proved, Nichia will provide the replacement for the non-conforming LED at Nichia's discretion. FOREGOING ARE THE EXCLUSIVE REMEDIES AVAILABLE TO THE CUSTOMER IN RESPECT OF THE BREACH OF THE WARRANTY CONTAINED HEREIN, AND IN NO EVENT SHALL NICHIA BE RESPONSIBLE FOR ANY INDRECT, INCIDENTAL OR CONSEQUENTIAL LOSSES AND/OR EXPENSES (INCLUDING LOSS OF PROFIT) THAT MAY BE SUFFERED BY THE CUSTOMER ARISING OUT OF A BREACH OF THE WARRANTY.
- This LED is intended to be used for calibration only. Do not use it for other purposes.
- The customer will not reverse engineer, disassemble or otherwise attempt to extract knowledge/design information from the LED.
- All copyrights and other intellectual property rights in this specification in any form are reserved by Nichia or the right holders who have granted Nichia permission to use the content. Without prior written permission from Nichia, no part of this specification may be reproduced in any form or by any means.
- Both the customer and Nichia will agree on the official specifications for the supplied LED before any programs are officially launched. Without this agreement in writing (i.e. Customer Specific Specification), changes to the content of this specification may occur without notice (e.g. changes to the foregoing specifications and appearance, discontinuation of the LED, etc.).