NICHIA CORPORATION

SPECIFICATIONS FOR WHITE LED

NSPW315BS

- RoHS Compliant

SPECIFICATIONS

(1) Absolute Maximum Ratings

Item	Symbol	Absolute Maximum Rating	Unit
Forward Current	I_F	30	mA
Pulse Forward Current	I_{FP}	100	mA
Reverse Voltage	V_R	5	V
Power Dissipation	P_D	120	mW
Operating Temperature	T_{opr}	-30~85	°C
Storage Temperature	T_{stg}	-40~100	°C
Junction Temperature	T_J	100	°C

* Absolute Maximum Ratings at T_A=25°C.

* I_{FP} conditions with pulse width ≤10ms and duty cycle ≤10%.

(2) Initial Electrical/Optical Characteristics

Item		Symbol	Condition	Typ	Unit
Forward Voltage		V_F	I_F=20mA	3.6	V
Reverse Current		I_R	V_R=5V	-	μA
Luminous Intensity		I_v	I_F=20mA	1.1	cd
Chromaticity Coordinate	x	-	I_F=20mA	0.31	-
	y		I_F=20mA	0.32	

* Characteristics at T_A=25°C.

* Chromaticity Coordinates as per CIE 1931 Chromaticity Chart.

RANKS

Item	Rank	Min	Max	Unit
Forward Voltage	-	2.95	4.00	V
Reverse Current	-	-	50	μA
Luminous Intensity	T	1.26	1.84	cd
	S	0.92	1.26	
	R	0.64	0.92	

Color Ranks

	Rank a0			
x	0.280	0.264	0.283	0.296
y	0.248	0.267	0.305	0.276

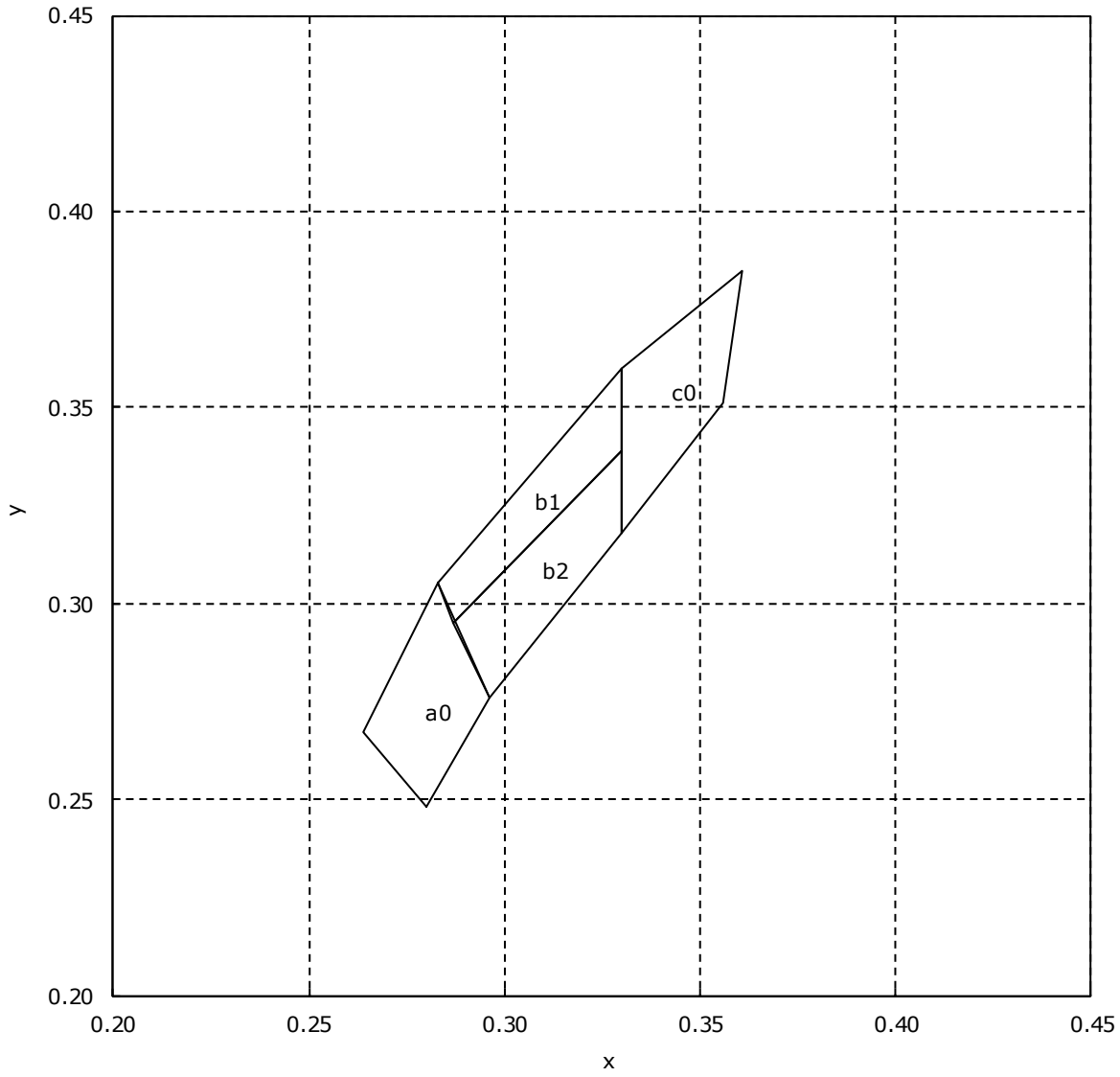
	Rank b1			
x	0.287	0.283	0.330	0.330
y	0.295	0.305	0.360	0.339

	Rank b2			
x	0.296	0.287	0.330	0.330
y	0.276	0.295	0.339	0.318

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

* Ranking at T_A=25°C.
* Forward Voltage Tolerance: ±3%
* Luminous Intensity Tolerance: ±10%
* Chromaticity Coordinate Tolerance: ±0.01
* LEDs from the above ranks will be shipped. The rank combination ratio per shipment will be decided by Nichia.

CHROMATICITY DIAGRAM



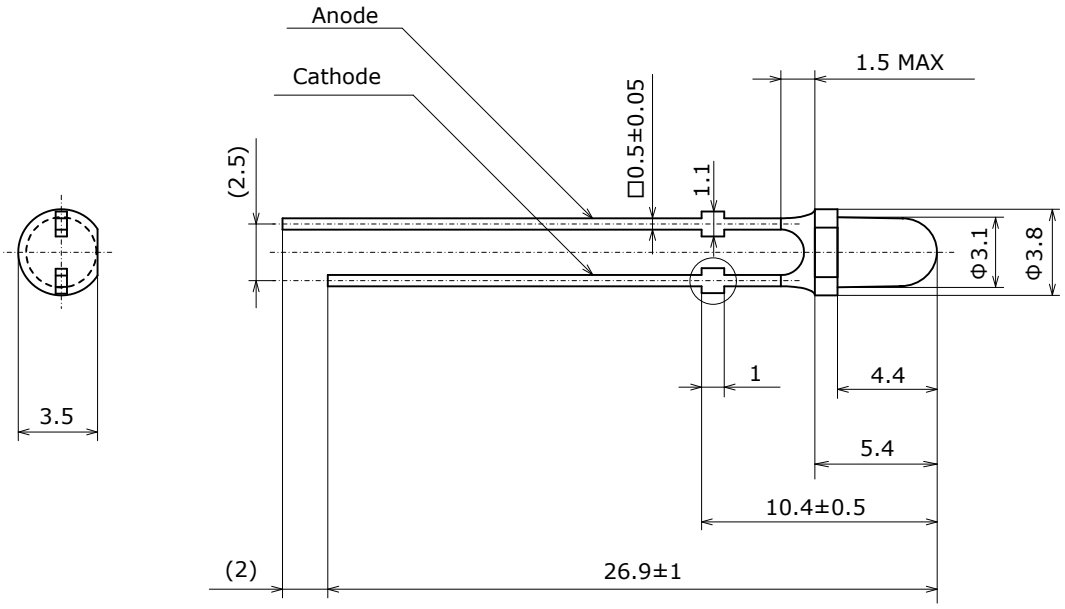
OUTLINE DIMENSIONS

* 本製品はRoHS指令に適合しております。
This product complies with RoHS Directive.

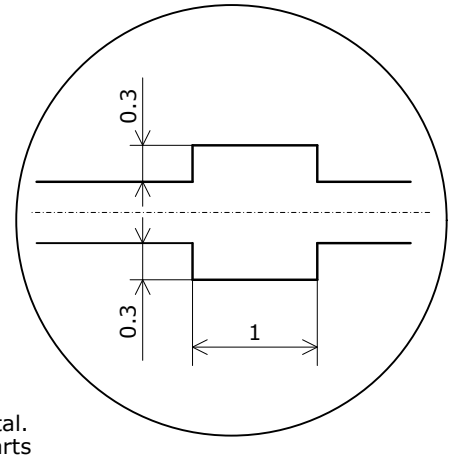
* 括弧で囲まれた寸法は参考値です。
The dimension(s) in parentheses are for reference purposes.

NSPW315xS
管理番号 No. STS-DA7-2552A

(単位 Unit: mm, 公差 Tolerance: ±0.2)



ストッパー部詳細図
Lead Standoff



項目 Item	内容 Description
樹脂材質 Resin Materials	エポキシ樹脂(一部蛍光体入り) Epoxy Resin(partly using phosphor)
レンズ色 Lens Color	乳白色(拡散剤入り) Milky(with diffuser)
リードフレーム材質 Lead Frame Materials	銅合金+銀メッキ Ag-plated Copper Alloy
質量 Weight	0.17g(TYP)

* 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。
The tie bar cut-end surface exhibits exposed copper alloy base metal.
Care must be taken to handle the LEDs, as it may contain sharp parts such as lead, and can cause injury.

SOLDERING

- Recommended Hand Soldering Condition

Temperature	350°C Max
Soldering Time	3sec Max
Position	No closer than 3mm from the base of the lens.

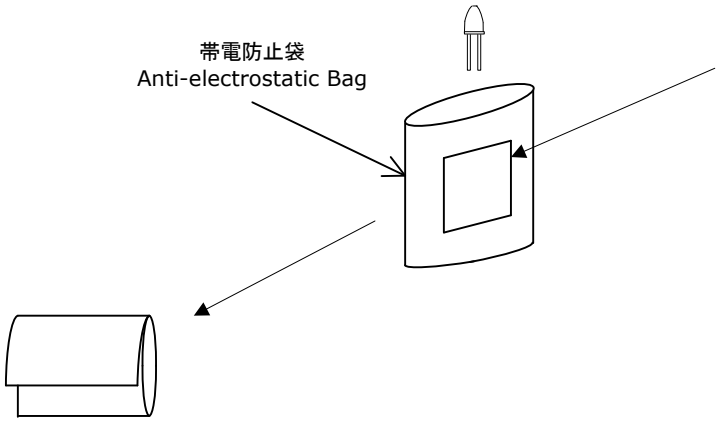
- Recommended Dip Soldering Condition

Pre-heat	120°C Max
Pre-heat Time	60sec Max
Solder Bath Temperature	260°C Max
Dipping Time	10sec Max
Dipping Position	No closer than 3mm from the base of the lens.

* For a better thermal performance, copper alloy is used for the leadframe of the product. Care must be taken for the soldering conditions and handling of the products after soldering.
* Solder the LED no closer than 3mm from the base of the lens. Soldering beyond the base of the tie bar is recommended.
* Dip soldering/hand soldering must not be performed more than once.
* Care should be taken to avoid cooling at a rapid rate and ensure the peak temperature ramps down slowly.
* When soldering, do not apply stress to the lead frame while the LED is hot.
* When using a pick and place machine, choose an appropriate nozzle for this product.
* After soldering, the LED position must not be corrected.
* After soldering, NO mechanical shock or vibration should be applied to LED lens until the LEDs cool down to room temperature.
* In order to avoid damage on the lens during cutting and clinching the leads, it is not recommended to solder the LEDs directly on customer PCB without any gap between the lens and the board. If it is unavoidable, customer is advised to check whether such soldering will not cause wire breakage or lens damage. Direct soldering to double-sided PCBs must be avoided due to an increased effect of heat on the lens.
* 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 lead frames at room temperature. Cutting the lead frames at high temperature may cause failure of the LEDs.
* Consider factors such as the dip soldering temperature, hand soldering temperature, etc. when choosing the solder.
* When flux is used, it should be a halogen free flux. Ensure that the manufacturing process is not designed in a manner where the flux will come in contact with the LEDs.

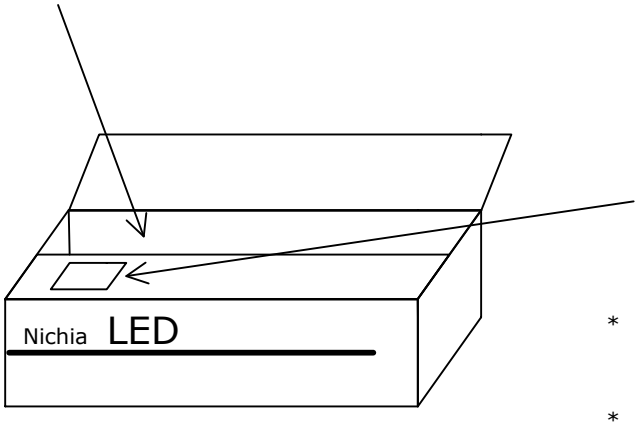
PACKAGING - BULK

Nxxxxxxx
管理番号 No.　STS-DA7-0001C

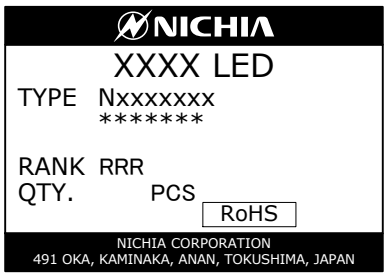


袋の表示 Label printed on the bag

帯電防止袋を並べて入れ、ダンボールで仕切ります。
Anti-electrostatic bags are packed in cardboard boxes with corrugated partitions.



ラベル Label attached to the box



* 客先型名を*******で示します。
客先型名が設定されていない場合は空白です。
******* is the customer part number.
If not provided, it will not be indicated on the label.

* ロット表記方法についてはロット番号の項を
参照して下さい。
For details, see "LOT NUMBERING CODE"
in this document.

* 本製品は帯電防止袋に入れたのち、輸送の衝撃から保護するためダンボールで梱包します。
Products are packed in an anti-electrostatic bag.
They are shipped in cardboard boxes to protect them from external forces during transportation.

* 取り扱いに際して、落下させたり、強い衝撃を与えたりしますと、製品を損傷させる原因になりますので注意して下さい。
Do not drop or expose the box to external forces as it may damage the products.

* ダンボールには防水加工がされておりませんので、梱包箱が水に濡れないよう注意して下さい。
Do not expose to water. The box is not water-resistant.

* 輸送、運搬に際して弊社よりの梱包状態あるいは同等の梱包を行って下さい。
Using the original package material or equivalent in transit is recommended.

LOT NUMBERING CODE

Lot Number is presented by using the following alphanumeric code.

YMxxxx - RRR

Y - Year

Year	Y
2016	G
2017	H
2018	I
2019	J
2020	K
2021	L

M - Month

Month	M	Month	M
1	1	7	7
2	2	8	8
3	3	9	9
4	4	10	A
5	5	11	B
6	6	12	C

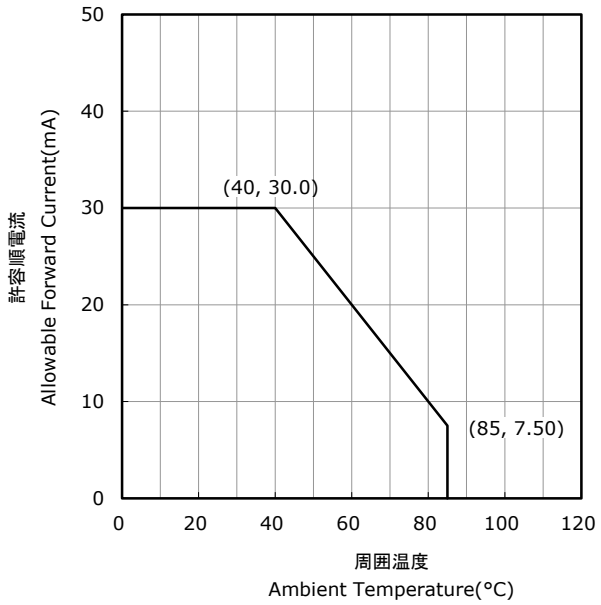
xxxx-Nichia's Product Number

RRR-Ranking by Color Coordinates, Ranking by Luminous Intensity

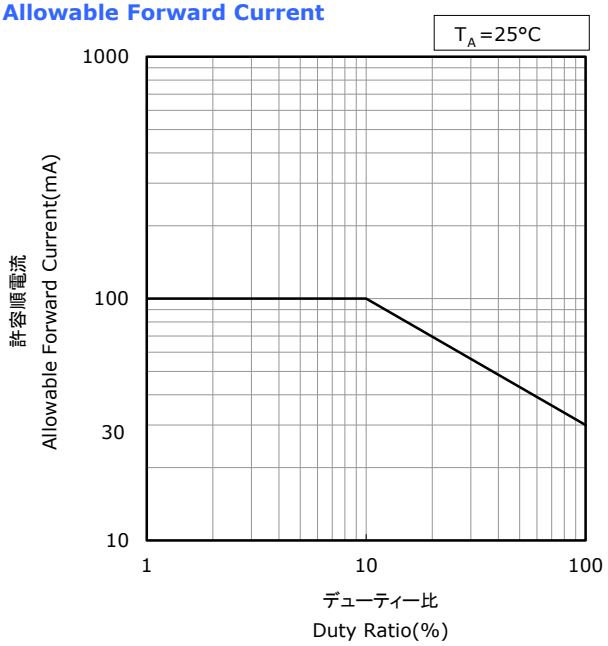
DERATING CHARACTERISTICS

NSPW315BS
管理番号 No. STS-DA7-11730

周囲温度–許容順電流特性
Ambient Temperature vs
Allowable Forward Current



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

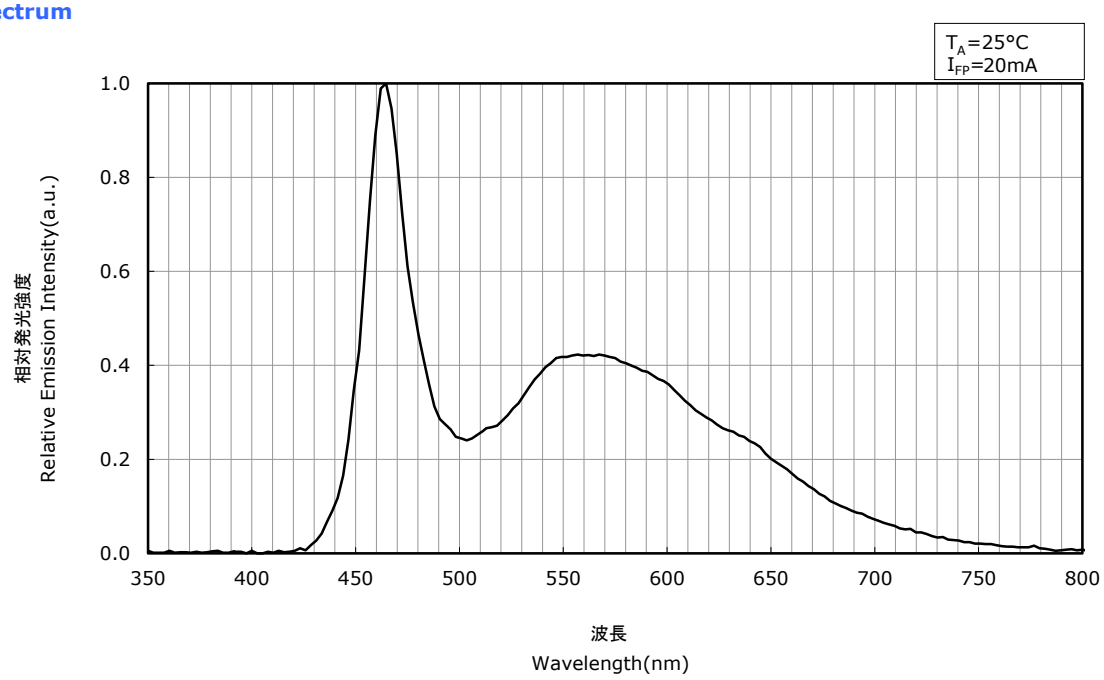


OPTICAL CHARACTERISTICS

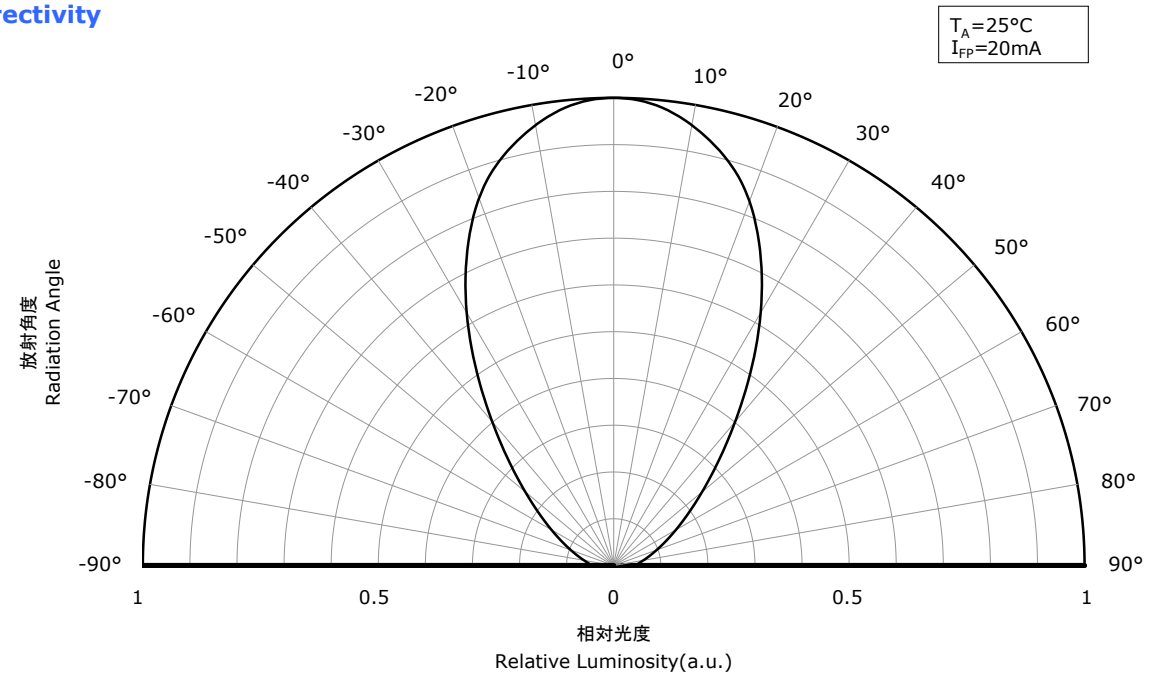
* 本特性は参考です。
All characteristics shown are for reference only and are not guaranteed.

NSPW315BS
管理番号 No. STS-DA7-11731

発光スペクトル
Spectrum



指向特性
Directivity



FORWARD CURRENT CHARACTERISTICS / TEMPERATURE CHARACTERISTICS

* 本特性は参考です。
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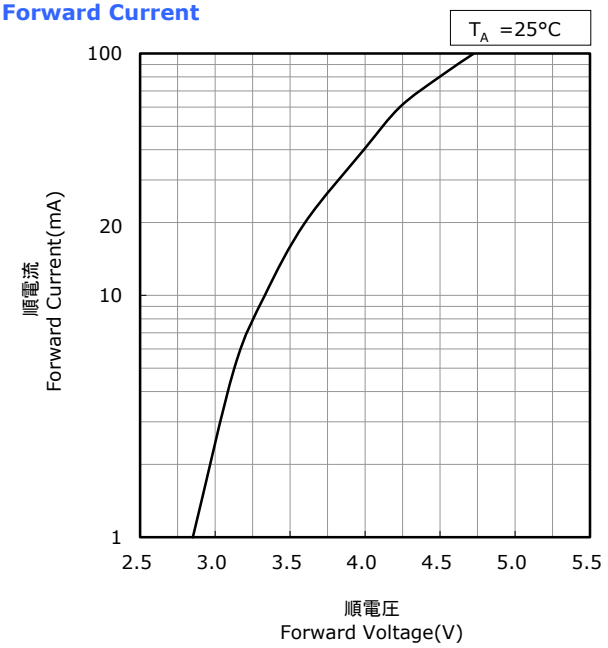
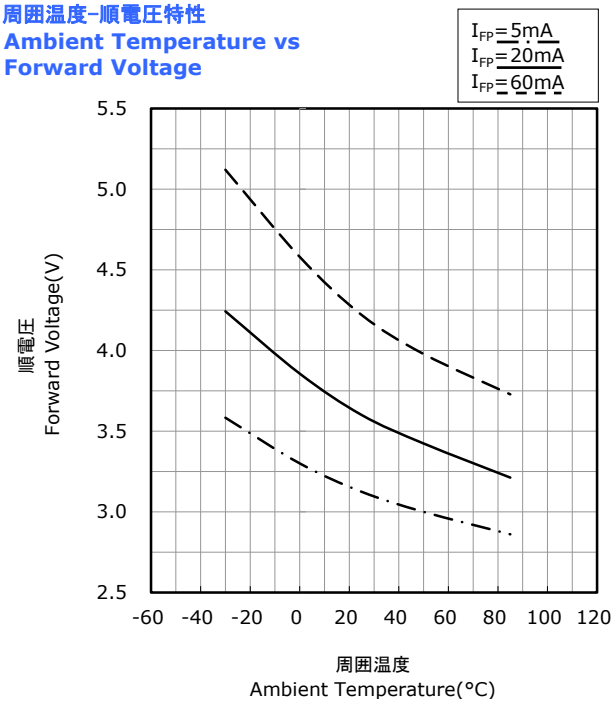
NSPW315BS
管理番号 No. STS-DA7-11732

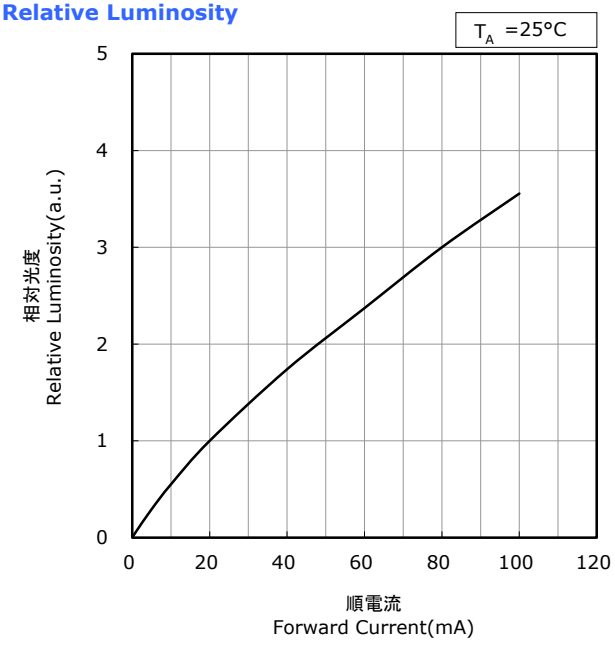
順電圧–順電流特性
Forward Voltage vs Forward Current



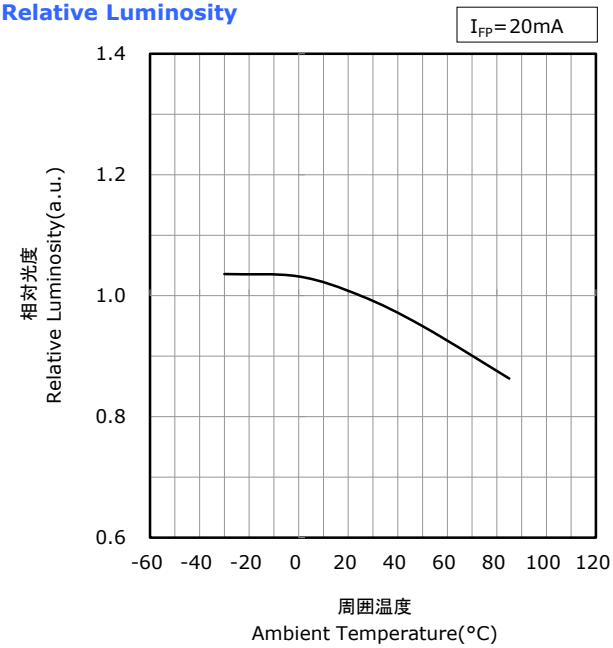
周囲温度–順電圧特性
Ambient Temperature vs Forward Voltage



順電流–相対光度特性
Forward Current vs Relative Luminosity



周囲温度–相対光度特性
Ambient Temperature vs Relative Luminosity

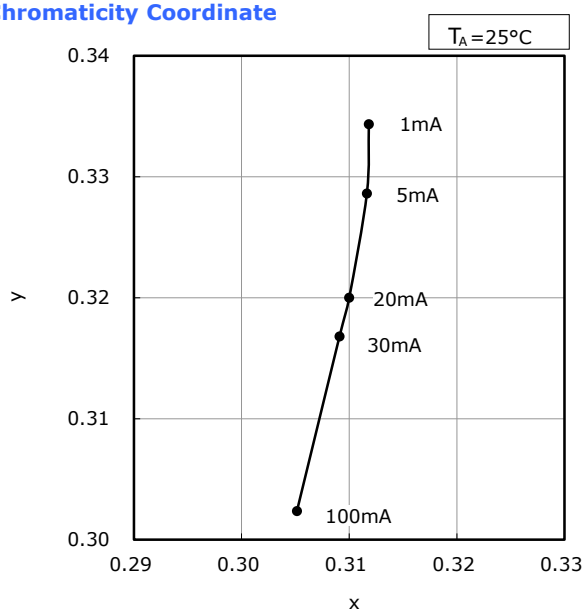


FORWARD CURRENT CHARACTERISTICS / TEMPERATURE CHARACTERISTICS

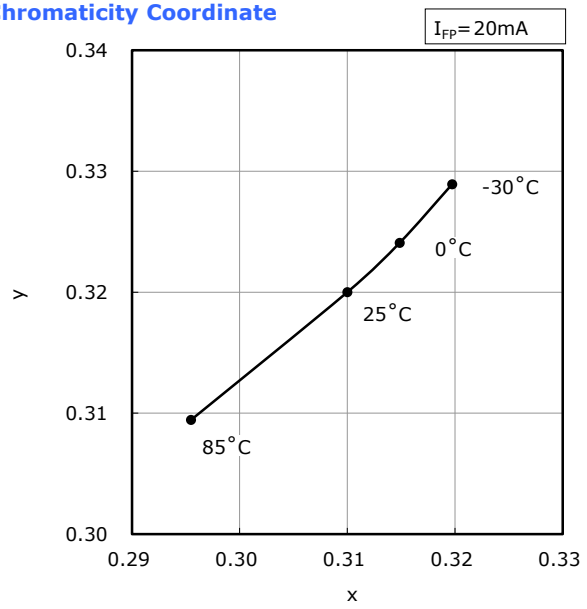
* 本特性は参考です。
All characteristics shown are for reference only and are not guaranteed.

NSPW315BS
管理番号 No. STS-DA7-11733

順電流-色度 特性
Forward Current vs Chromaticity Coordinate



周囲温度-色度 特性
Ambient Temperature vs Chromaticity Coordinate



RELIABILITY

(1) Tests and Results

Test	Reference Standard	Test Conditions	Test Duration	Failure Criteria #	Units Failed/Tested
Resistance to Soldering Heat	JEITA ED-4701 300 302	T_{sld}=260±5°C, 10sec, 1dip, 3mm from the base of the lens		#1	0/100
Solderability	JEITA ED-4701 303 303A	T_{sld}=245±5°C, 5sec, Lead-free Solder(Sn-3.0Ag-0.5Cu)		#2	0/100
Thermal Shock	JEITA ED-4701 300 307	0°C to 100°C, 15sec dwell	100cycles	#1	0/100
Temperature Cycle	JEITA ED-4701 100 105	-40°C(30min)~25°C(5min)~ 100°C(30min)~25°C(5min)	100cycles	#1	0/100
Moisture Resistance (Cyclic)	JEITA ED-4701 200 203	25°C~65°C~-10°C, 90%RH, 24hr per cycle	10cycles	#1	0/100
Terminal Bend Strength	JEITA ED-4701 400 401	5N, 0°~90°~0°bend, 2bending cycles		#1	0/100
Terminal Pull Strength	JEITA ED-4701 400 401	10N, 10±1sec		#1	0/100
High Temperature Storage	JEITA ED-4701 200 201	T_A=100°C	1000hours	#1	0/100
Temperature Humidity Storage	JEITA ED-4701 100 103	T_A=60°C, RH=90%	1000hours	#1	0/100
Low Temperature Storage	JEITA ED-4701 200 202	T_A=-40°C	1000hours	#1	0/100
Room Temperature Operating Life		T_A=25°C, I_F=30mA	1000hours	#1	0/100
Temperature Humidity Operating Life		60°C, RH=90%, I_F=20mA	500hours	#1	0/100
Low Temperature Operating Life		T_A=-30°C, I_F=20mA	1000hours	#1	0/100

NOTES:

Measurements are performed after allowing the LEDs to return to room temperature.

(2) Failure Criteria

Criteria #	Items	Conditions	Failure Criteria
#1	Forward Voltage(V_F)	I_F=20mA	>U.S.L.×1.1
	Luminous Intensity(I_V)	I_F=20mA	<L.S.L.×0.7
	Reverse Current(I_R)	V_R=5V	>U.S.L.×2.0
#2	Solderability	-	Less than 95% solder coverage

U.S.L. : Upper Specification Limit L.S.L. : Lower Specification Limit

CAUTIONS

(1) Lead Forming

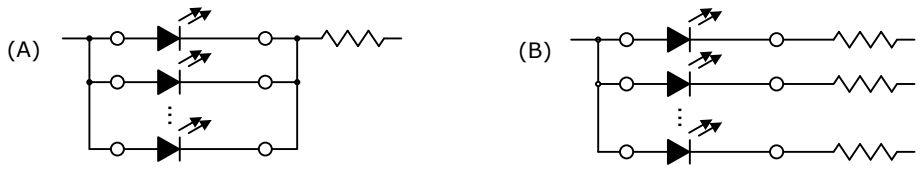
- When forming leads, the leads should be bent at a point at lease 3mm from the base of the epoxy bulb. Do not use the base of the leadframe as a fulcrum during lead forming.
- Lead forming should be done before soldering.
- Do not apply any bending stress to the base of the lead. The stress to the base may damage the LED's characteristics or it may break the LEDs.
- When mounting the product onto a printed circuit board, the via-holes on the board should be exactly aligned with the lead pitch of the product. If the LEDs are mounted with stress at the leads, it causes deterioration of the epoxy resin and this will degrade the LEDs.

(2) Storage

- Shelf life of the products in unopened bag is 3 months(max.) at <30°C and 70% RH from the delivery date. If the shelf life exceeds 3 months or more, the LEDs need to be stored in a sealed container with silica gel desiccants to ensure their shelf life will not exceed 1 year.
- Nichia LED leadframe are silver plated copper alloy. This 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 operation. It is recommended that the LEDs be used as soon as possible.
- To avoid condensation, the products must not be stored in the areas where temperature and humidity fluctuate greatly.
- Do not store the LEDs in a dusty environment.
- Do not expose the LEDs to direct sunlight and/or an environment where the temperature is higher than normal room temperature.

(3) Directions for Use

- When designing a circuit, the current through each LED must not exceed the Absolute Maximum Rating. Operating at a constant current per LED is recommended. In case of operating at a constant voltage, Circuit B is recommended. If the LEDs are operated with constant voltage using Circuit A, the current through the LEDs may vary due to the variation in Forward Voltage characteristics of the LEDs.



- This product should be operated using forward current. Ensure that the product is not subjected to either forward or reverse voltage while it is not in use. In particular, subjecting it to continuous reverse voltage may cause migration, which may cause damage to the LED die. When used in displays that are not used for a long time, the main power supply should be switched off for safety.
- It is recommended to operate the LEDs at a current greater than 10% of the sorting current to stabilize the LED characteristics.
- Care must be taken to ensure that the reverse voltage will not exceed the Absolute Maximum Rating when using the LEDs with matrix drive.
- Ensure that excessive voltages such as lightning surges are not applied to the LEDs.
- For outdoor use, necessary measures should be taken to prevent water, moisture and salt air damage.

(4) Handling Precautions

- Do not handle the LEDs with bare hands as it will contaminate the LED surface and may affect the optical characteristics: it might cause the LED to be deformed and/or the wire to break, which will cause the LED not to illuminate. The lead could also cause an injury.
- Dropping the product may cause damage.
- Do not stack assembled PCBs together. Failure to comply can cause the resin portion of the product to be cut, chipped, delaminated and/or deformed. It may cause wire to break, leading to catastrophic failures.

(5) Design Consideration

- PCB warpage after mounting the products onto a PCB can cause the package to break. The LED should be placed in a way to minimize the stress on the LEDs due to PCB bow and twist.
- The position and orientation of the LEDs affect how much mechanical stress is exerted on the LEDs placed near the score lines. The LED should be placed in a way to minimize the stress on the LEDs due to board flexing.
- Board separation must be performed using special jigs, not using hands.

(6) Electrostatic Discharge (ESD)

- The products are sensitive to static electricity or surge voltage. ESD can damage a die and its reliability. When handling the products, the following measures against electrostatic discharge are strongly recommended:
  Eliminating the charge
  Grounded wrist strap, ESD footwear, clothes, and floors
  Grounded workstation equipment and tools
  ESD table/shelf mat made of conductive materials
- Ensure that tools (e.g. soldering irons), jigs and machines that are being used are properly grounded and that proper grounding techniques are used in work areas. For devices/equipment that mount the LEDs, protection against surge voltages should also be used.
- If tools or equipment contain insulating materials such as glass or plastic, the following measures against electrostatic discharge are strongly recommended:
  Dissipating static charge with conductive materials
  Preventing charge generation with moisture
  Neutralizing the charge with ionizers
- The customer is advised to check if the LEDs are damaged by ESD when performing the characteristics inspection of the LEDs in the application. Damage can be detected with a forward voltage measurement or a light-up test at low current (≤1mA).
- ESD damaged LEDs may have an increased leakage current, current flow at a low voltage or no longer illuminate at a low current.
  Failure Criteria: V_F<2.0V at I_F=0.5mA

(7) Thermal Management

- Proper thermal management is an important when designing products with LEDs. LED die temperature is affected by PCB thermal resistance and LED spacing on the board. Please design products in a way that the LED die temperature does not exceed the maximum Junction Temperature (T_J).
- Drive current should be determined for the surrounding ambient temperature (T_A) to dissipate the heat from the product.

(8) Cleaning

- The LEDs should not be cleaned with water, benzine, and/or thinner.
- If required, isopropyl alcohol (IPA) should be used. Other solvents may cause premature failure to the LEDs due to the damage to the resin portion. The effects of such solvents should be verified prior to use. In addition, the use of CFCs such as Freon is heavily regulated.
- When dust and/or dirt adheres to the LEDs, soak a cloth with Isopropyl alcohol (IPA), then squeeze it before wiping the LEDs.
- Ultrasonic cleaning is not recommended since it may have adverse effects on the LEDs depending on the ultrasonic power and how LED is assembled. If ultrasonic cleaning must be used, the customer is advised to make sure the LEDs will not be damaged prior to cleaning.

(9) Eye Safety

- In 2006, the International Electrical Commission (IEC) published IEC 62471:2006 Photobiological safety of lamps and lamp systems, which added LEDs in its scope. On the other hand, the IEC 60825-1:2007 laser safety standard removed LEDs from its scope. However, please be advised that some countries and regions have adopted standards based on the IEC laser safety standard IEC 60825-1:20112001, which still includes LEDs in its scope. Most of Nichia's LEDs can be classified as belonging into either the Exempt Group or Risk Group 1. High-power LEDs, that emit light containing blue wavelengths, may be classified as Risk Group 2. Please proceed with caution when viewing directly any LEDs driven at high current, or viewing LEDs with optical instruments which may greatly increase the damages to your eyes.
- Viewing a flashing light may cause eye discomfort. When incorporating the LED into your product, please be careful to avoid adverse effects on the human body caused by light stimulation.

(10) Miscellaneous

- Nichia warrants that the discrete LEDs will meet the requirements/criteria as detailed in the Reliability section within this specification. If the LEDs are used under conditions/environments deviating from or inconsistent with those described in this specification, the resulting damage and/or injuries will not be covered by this warranty.
- Nichia warrants that the discrete LEDs manufactured and/or supplied by Nichia will meet the requirements/criteria as detailed in the Reliability section within this specification; it is the customer's responsibility to perform sufficient verification prior to use to ensure that the lifetime and other quality characteristics required for the intended use are met.
- 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 or removed from the PCB if it has been attached to the PCB. If a breach of this warranty is proved, Nichia will provide the replacement for the non-conforming LED or an equivalent item 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.
- NICHIA DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
- This LED is intended to be used for general lighting, household appliances, electronic devices (e.g. mobile communication devices); it is not designed or manufactured for use in applications that require safety critical functions (e.g. aircraft, automobiles, combustion equipment, life support systems, nuclear reactor control system, safety devices, spacecraft, submarine repeaters, traffic control equipment, trains, vessels, etc.). If the LEDs are planned to be used for these applications, unless otherwise detailed in the specification, Nichia will neither guarantee that the LED is fit for that purpose nor be responsible for any resulting property damage, injuries and/or loss of life/health. This LED does not comply with ISO/TS 16949 and is not intended for automotive applications.
- 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 LEDs 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 LEDs, etc.).