

NICHIA CORPORATION

SPECIFICATIONS FOR WARM WHITE LED

NSBLL110-H3

- Built-in ESD Protection Device
- RoHS Compliant



SPECIFICATIONS

(1) Absolute Maximum Ratings

Item	Symbol	Absolute Maximum Rating	Unit
Forward Current	I_F	600	mA
Pulse Forward Current	I_{FP}	900	mA
Allowable Reverse Current	I_R	85	mA
Power Dissipation	P_D	21.6	W
Operating Temperature	T_{opr}	-40 ~ 100	°C
Storage Temperature	T_{stg}	-40 ~ 100	°C
Junction Temperature	T_J	130	°C

* Absolute Maximum Ratings at $T_C=25^{\circ}\text{C}$.

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

* The operating Temperature (T_{opr}) range is the range of case temperatures.

(2) Initial Electrical/Optical Characteristics

Item		Symbol	Condition	Typ	Max	Unit
Forward Voltage		V_F	$I_F=320\text{mA}$	33.3	-	V
R8000	Luminous Flux	Φ_v	$I_F=320\text{mA}$	990	-	lm
	Color Rendering	R_a	$I_F=320\text{mA}$	85	-	-
Chromaticity Coordinate	x	-	$I_F=320\text{mA}$	0.4338	-	-
	y	-	$I_F=320\text{mA}$	0.4030	-	-
Thermal Resistance		$R_{\theta JC}$	-	1.8	2.1	°C/W

* Characteristics at $T_C=25^{\circ}\text{C}$.

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

* The Chromaticity Coordinates are derived from the CIE 1931 Chromaticity Diagram.

* $R_{\theta JC}$ is Thermal Resistance from junction to T_C measuring point.

RANKS

Item	Rank	Min	Max	Unit
Forward Voltage	-	30	36	V
Luminous Flux	J1000	1000	1150	lm
	J850	850	1000	
	J700	700	850	
Color Rendering	R8000	R _a	80	-
		R ₉	0	-

Color Ranks

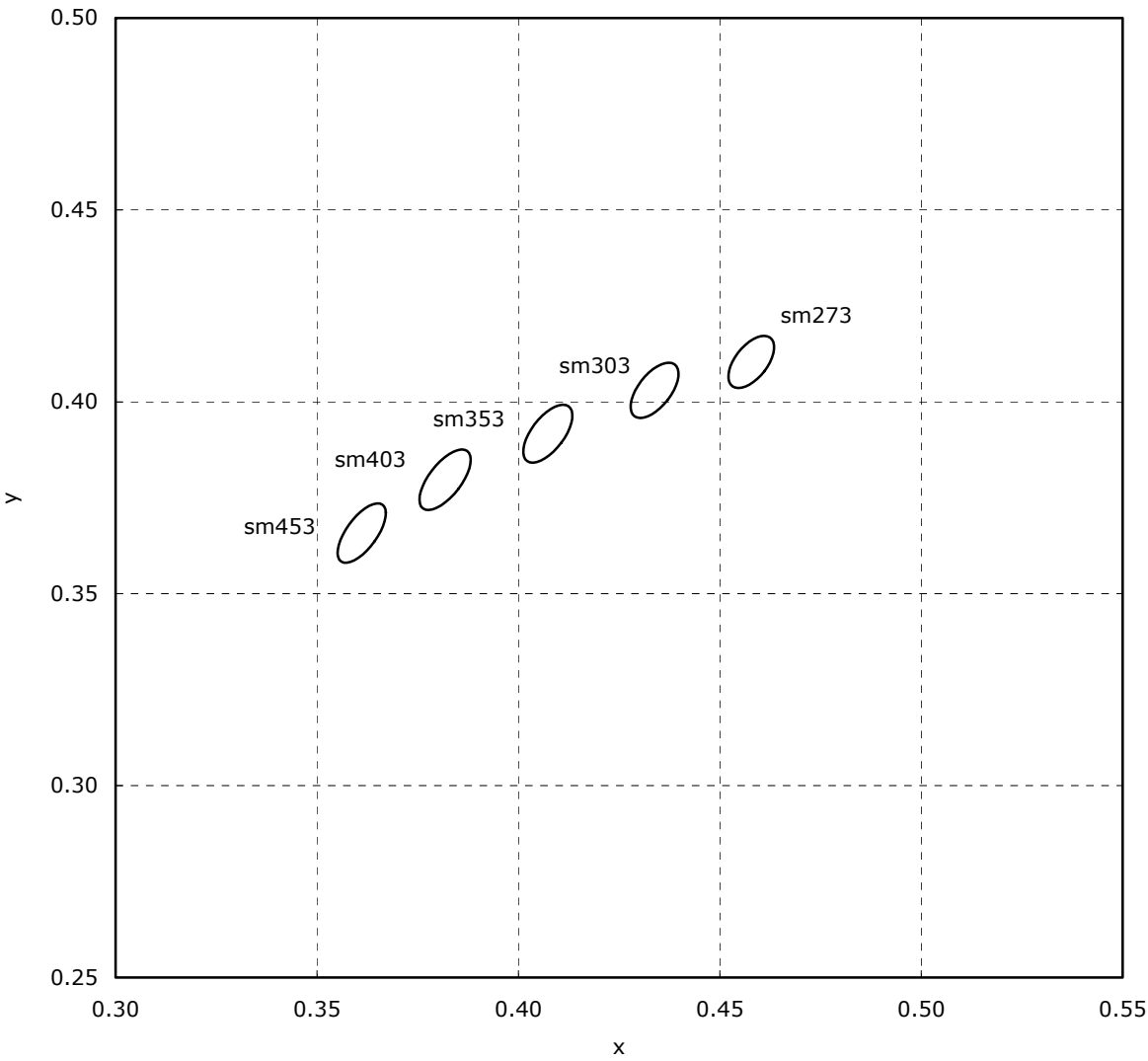
		Rank sm273	Rank sm303	Rank sm353	Rank sm403	Rank sm453
Center Point	x	0.4578	0.4338	0.4073	0.3818	0.3611
	y	0.4101	0.4030	0.3917	0.3797	0.3658

- * Ranking at T_C=25°C.
- * Tolerance of measurements of the Forward Voltage is ±0.41V.
- * Tolerance of measurements of the Luminous Flux is ±7%.
- * Tolerance of measurements of the Color Rendering R_a is ±2.
- * Tolerance of measurements of the Color Rendering R₉ is ±6.5.
- * The R₉ value for the above rank shall be greater than 0.
- * Tolerance of measurements of the Chromaticity Coordinate is ±0.01.
- * The color rank has a chromaticity range within a 3-step MacAdam ellipse.
- * 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, Color Rendering - Luminous Flux ranks

Ranking by Color Coordinates, Color Rendering		Ranking by Luminous Flux		
		J700	J850	J1000
sm273,sm303		R8000		
sm353, sm403,sm453		R8000		

CHROMATICITY DIAGRAM



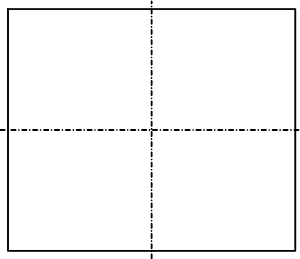
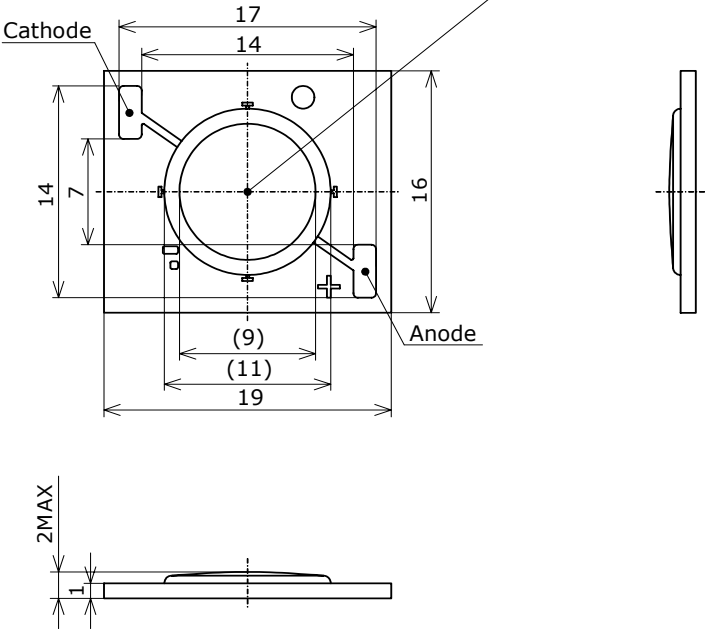
OUTLINE DIMENSIONS

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

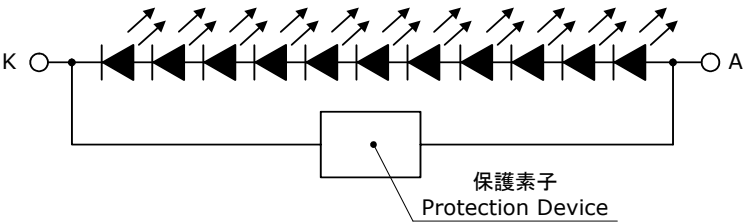
NSBLL110-H3
管理番号 No. STS-DA7-0078

(単位 Unit: mm, 公差 Tolerance: ±0.3)

発光部中心の位置精度 ±0.3mm
The center of emitting area to be centered ±0.3mm.



項目 Item	内容 Description
パッケージ材質 Package Materials	セラミックス Ceramics
封止樹脂材質 Encapsulating Resin Materials	シリコン樹脂（蛍光体入り） Silicone Resin (with phosphor)
電極材質 Electrodes Materials	金メッキ Au-plated
質量 Weight	1.2g (TYP)



SOLDERING

- Recommended Manual Soldering Condition

Temperature	380°C Max
Soldering Time	5sec Max

- * Manual soldering must only be done once.
- * Since the dam-and-fill encapsulation materials used in the product are silicone and soft material, do not press on the encapsulant. Failure to comply might lead to nicks, chip-outs, delamination and deformation of the dam-and-fill encapsulation, wire breakage and an adverse effect on product reliability.
- * Repairing should not be done after the LEDs have been soldered.
It should be confirmed beforehand whether the characteristics of the LEDs will or will not be damaged by repairing.
- * When soldering, avoid applying any stress to the LED package while heated.

TRAY DIMENSIONS

* 数量は1トレイにつき 54個入りです。

Quantity per tray=54pcs

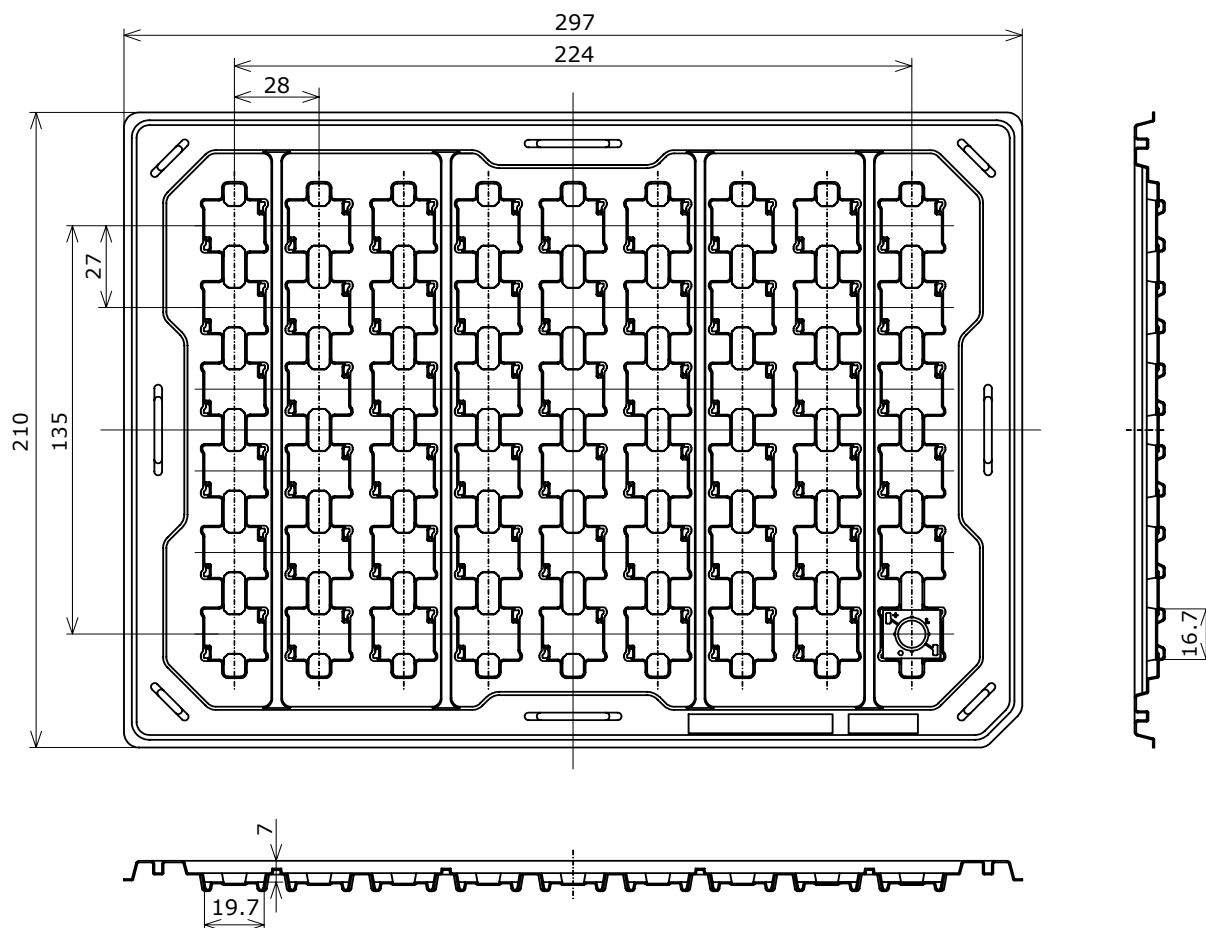
* 寸法は参考です。

All dimensions shown are for reference only and are not guaranteed.

NxxxL110x

管理番号 No. STS-DA7-0055A

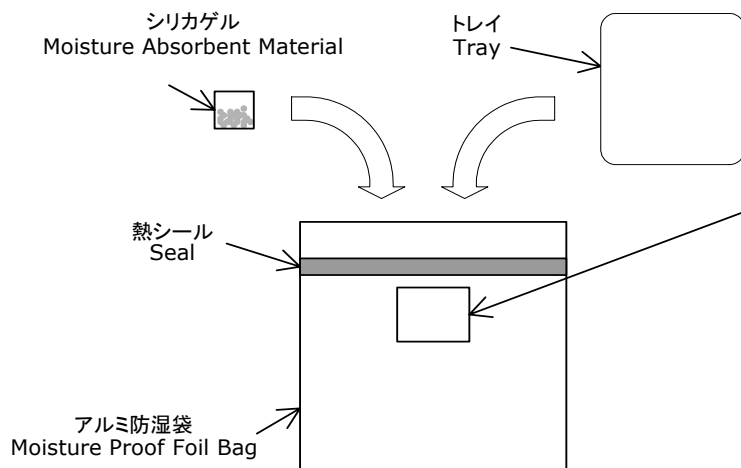
(単位 Unit: mm)



PACKAGING - TRAY PACK

シリカゲルとともにトレイをアルミ防湿袋に入れ、熱シールにより封をします。
The trays are placed in the moisture proof bag with a moisture absorbent material. The bag is heat sealed.

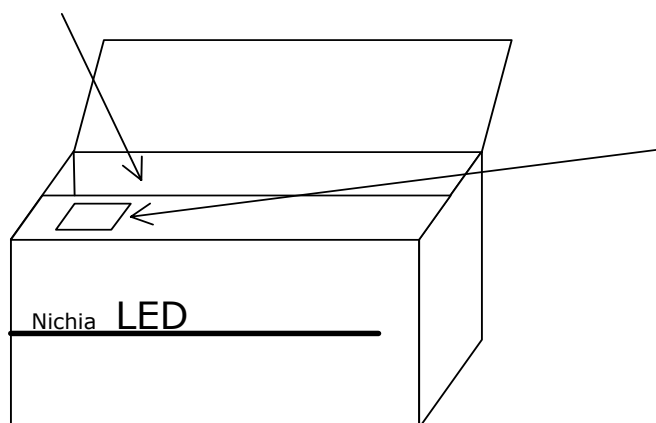
Nxxxxxxx
管理番号 No. STS-DA7-0007



ラベル Label



アルミ防湿袋を並べて入れ、ダンボールで仕切ります。
The moisture proof foil bags are packed in a cardboard box with corrugated partition.



ラベル Label



- * 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 is not 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 SCHEME" in this document.

- * 本製品はトレイに入れたのち、輸送の衝撃から保護するためダンボールで梱包します。
The products are placed in trays, and then packed in moisture-proof bags.
The moisture-proof bags are packed in cardboard boxes to prevent damage during shipment.
- * 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 the cardboard box or expose it to shock. If the box falls, the products could be damaged.
- * ダンボールには防水加工がされておきませんので、梱包箱が水に濡れないよう注意して下さい。
The cardboard box is not water-resistant. Do not expose to water.
- * 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。
Customer is advised to pack the products in the original packaging or equivalent in transit.

LOT NUMBERING SCHEME

Lot Number is presented by using the following alphanumeric code.

YMxxxx - RRR

Y - Year

Year	Y
2009	9
2010	A
2011	B
2012	C
2013	D
2014	E

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

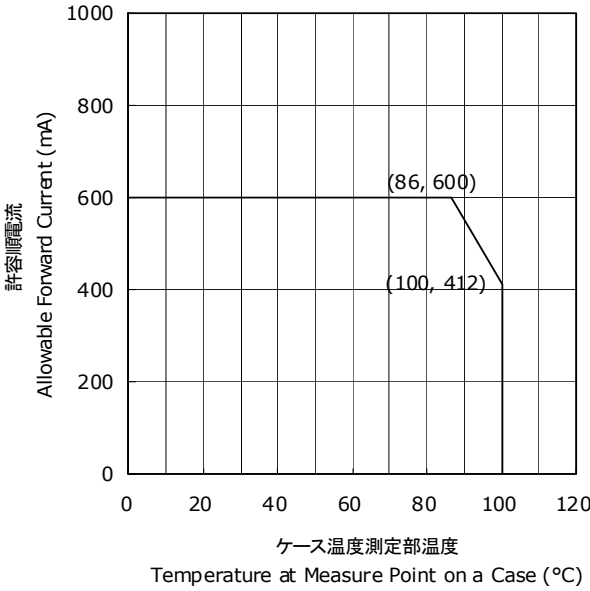
xxxx-Nichia's Product Number

RRR-Ranking by Color Coordinates, Ranking by Luminous Flux, Ranking by Color Rendering

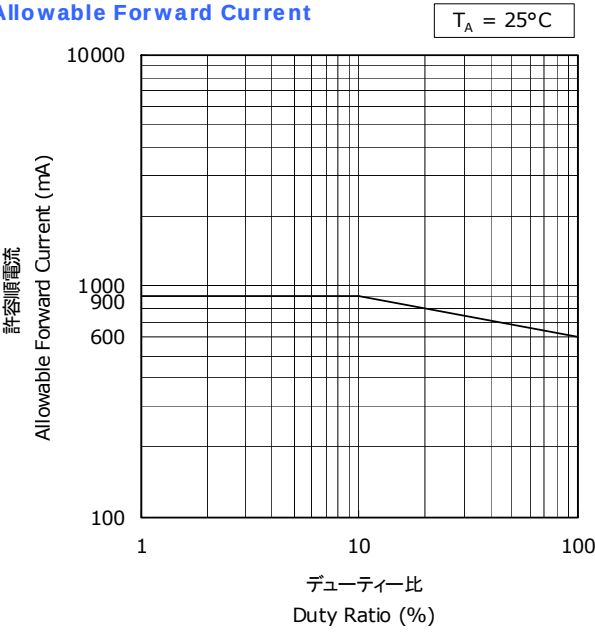
DERATING CHARACTERISTICS

NSBLL110-H3
管理番号 No. STS-DA7-0074

ケース温度測定部温度 - 許容順電流特性
Temperature at Measure Point on a Case vs
Allowable Forward Current



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

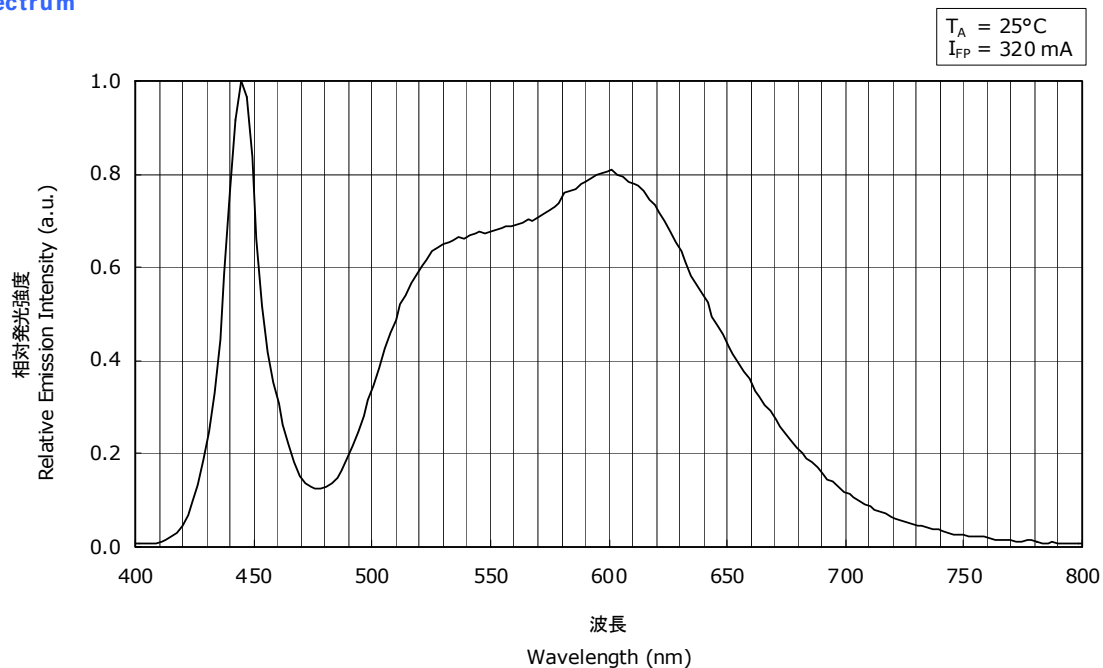


OPTICAL CHARACTERISTICS

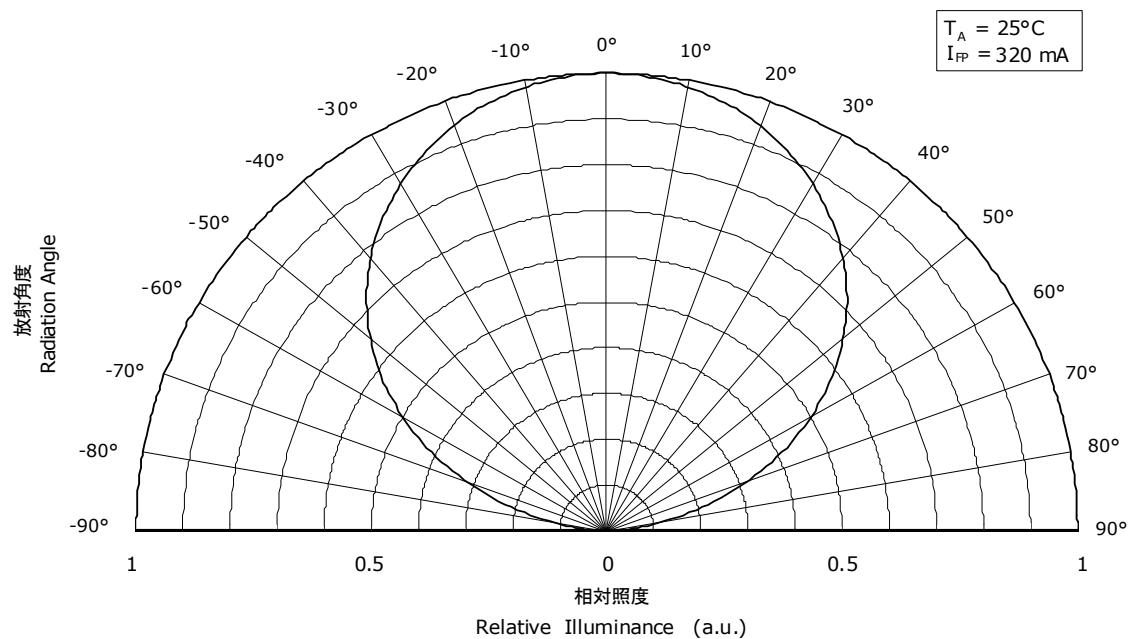
* 本特性は参考です。
All characteristics shown are for reference only and are not guaranteed.

NSBLL110-H3
管理番号 No. STS-DA7-0075

発光スペクトル Spectrum



指向特性 Directivity



FORWARD CURRENT CHARACTERISTICS / TEMPERATURE CHARACTERISTICS

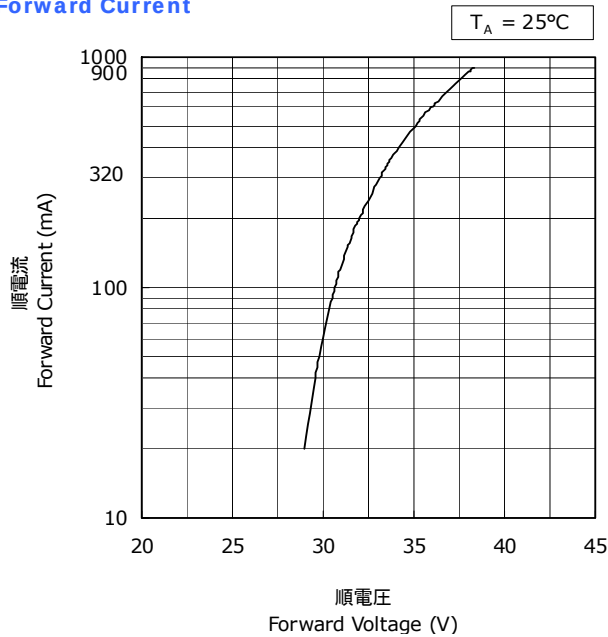
* 本特性は参考です。

All characteristics shown are for reference only and are not guaranteed.

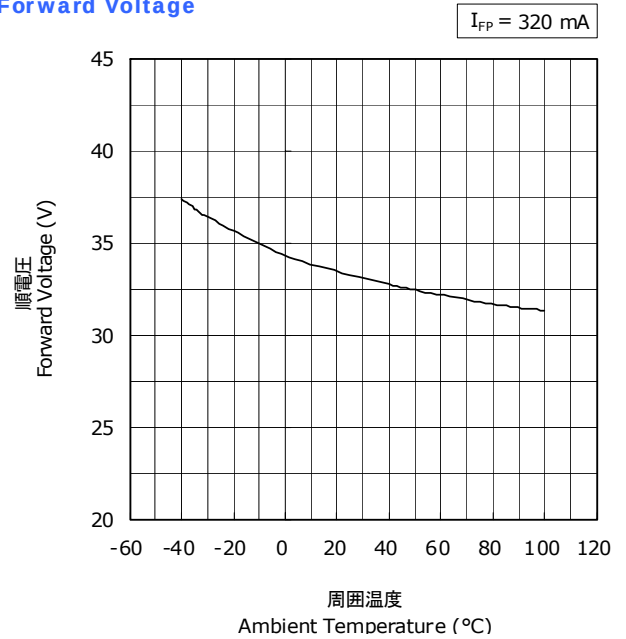
NSBLL110-H3

管理番号 No. STS-DA7-0076

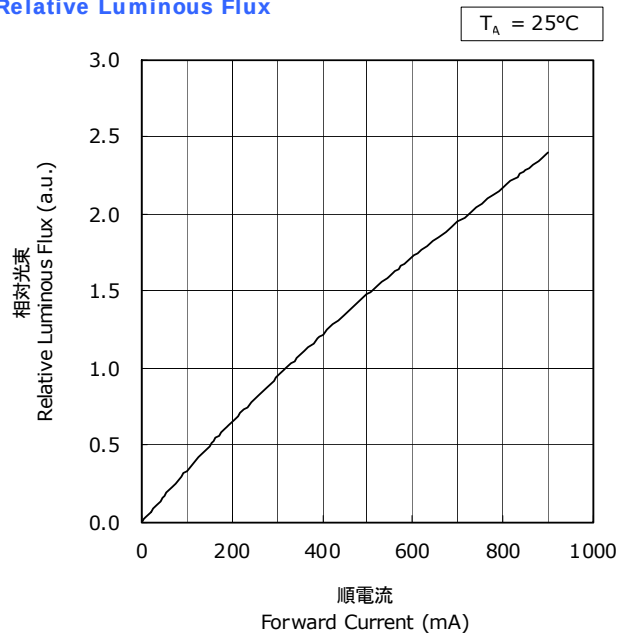
順電圧 - 順電流特性
Forward Voltage vs
Forward Current



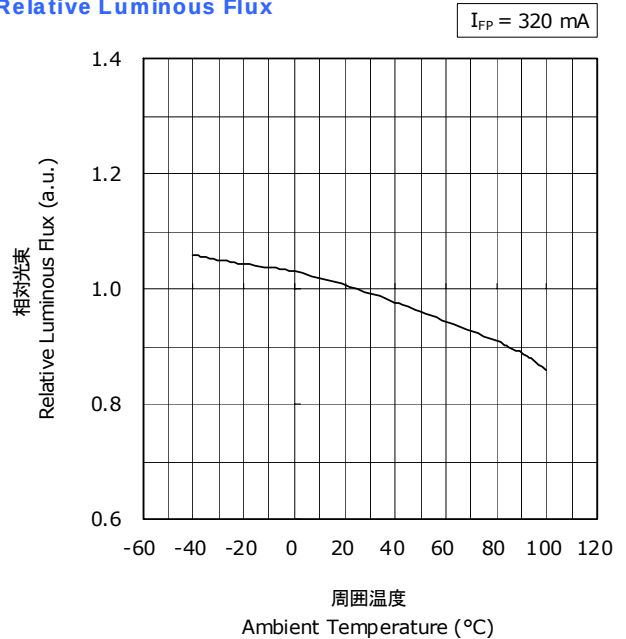
周囲温度 - 順電圧特性
Ambient Temperature vs
Forward Voltage



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



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

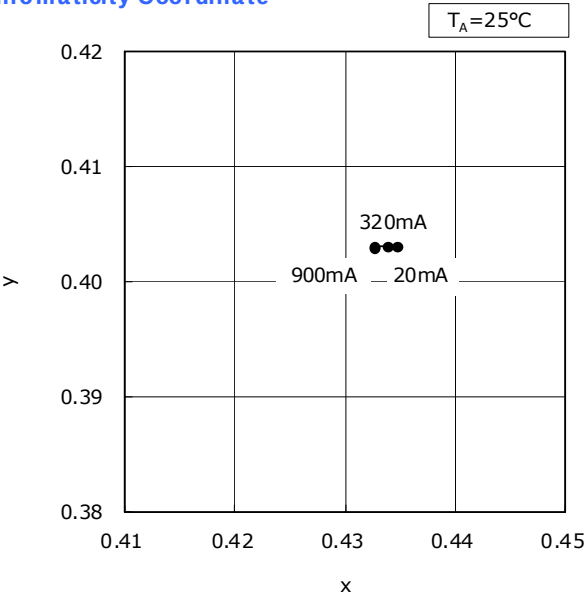


FORWARD CURRENT CHARACTERISTICS / TEMPERATURE CHARACTERISTICS

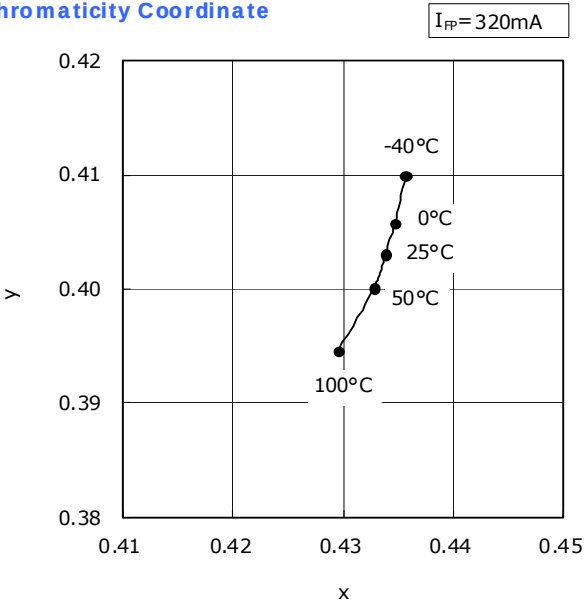
* 本特性は参考です。
All characteristics shown are for reference only and are not guaranteed.

NSBLL110-H3
管理番号 No. STS-DA7-0077A

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
Temperature Cycle	JEITA ED-4701 100 105	-40°C (30 min) ~ 25°C (5 min) ~ 100°C (30 min) ~ 25°C (5 min)	100 cycles	# 1	0/10
High Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	1000 hours	# 1	0/10
Temperature Humidity Storage	JEITA ED-4701 100 103	T _A =60°C, RH=90%	1000 hours	# 1	0/10
Low Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	1000 hours	# 1	0/10
High Temperature Operating Life		T _C =85°C, I _F =600mA	1000 hours	# 1	0/10
Electrostatic Discharges	JEITA ED-4701 300 304	HBM, 2 kV, 1.5 kΩ, 100 pF, 3 pulses, alternately positive or negative		# 1	0/10

NOTES:

- 1) 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 =320mA	> Initial value × 1.1
	Luminous Flux (Φ _V)	I _F =320mA	< Initial value × 0.7

CAUTIONS

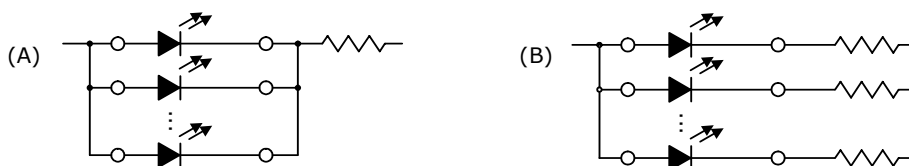
(1) Storage

Conditions		Temperature	Humidity	Time
Storage	Before Opening Aluminum Bag	$\leq 30^{\circ}\text{C}$	$\leq 90\%\text{RH}$	Within 1 Year from Delivery Date
	After Opening Aluminum Bag	$\leq 30^{\circ}\text{C}$	$\leq 70\%\text{RH}$	≤ 168 hours

- After opening the moisture-proof aluminum bag, the products should be completed soldering process within the range of the conditions above. If unused LEDs remain, they should be stored with desiccants (silica gel) in hermetically sealed container. Nichia recommends using the original moisture-proof bag for storage.
- Although the leads or electrode pads (anode and cathode) of the product are plated with gold, prolonged exposure to a corrosive environment might cause the gold plated the leads or electrode pads to tarnish. If unused LEDs remain, they must be stored in a hermetically sealed container. Nichia recommends using the original moisture-proof bag for storage.
- Do not use sulfur-containing materials in commercial products. Some materials, such as seals and adhesives, may contain sulfur. The contaminated plating of LEDs might cause an open circuit. Silicone rubber is recommended as a material for seals. Bear in mind, the use of silicones may lead to silicone contamination of electrical contacts inside the products, caused by low molecular weight volatile siloxane.
- To avoid condensation, the products must not be stored in the areas where temperature and humidity fluctuate greatly.

(2) Directions for Use

- 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 characteristics of the LEDs.



- 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.
- Pulse width modulation (PWM) is recommended for dimming LEDs as color point changes with drive current.
- For stabilizing the LED characteristics, it is recommended to operate at 10% of the rated current or higher.
- For outdoor use, necessary measures should be taken to prevent water, moisture and salt air damage.

(3) Handling Precautions

- When handling the product, do not touch it directly with bare hands as it may contaminate the surface and affect on optical characteristics. In the worst cases, excessive force to the product might result in catastrophic failure due to package damage and/or wire breakage.
- When handling the product with tweezers, make sure that excessive force is not applied to the resin portion of the product. Failure to comply can cause the resin portion of the product to be cut, chipped, delaminated and/or deformed, and wire to be broken, and thus resulting in catastrophic failure.
- If the product is dropped, it might be damaged.
- Do not stack the products. Force applied to the resin portion may cause it to damage and/or delaminate, and the wires to deform and/or brake, resulting in catastrophic failure.

(4) Design Consideration

- Excessive forces on this product can cause the ceramic package to crack. It is recommended to use a holder when fixing this product to a chassis.
- It is recommended to use a thermal film or thermal grease between the product and a chassis for increased heat dissipation.

(5) Electrostatic Discharge (ESD)

- The products are sensitive to static electricity or surge voltage. An ESD event may damage its die or reduce its reliability performance. When handling the products, measures against electro static discharge, including the followings, are strongly recommended.
 - Eliminating the charge;
 - Wrist strap, ESD footwear and garments, ESD floors
 - Grounding the equipment and tools at workstation
 - ESD table/shelf mat (conductive materials)
- Proper grounding techniques are required for all devices, equipment and machinery used in the assembly of the products. Also note that surge protection should be considered in the design of customer products.
- If tools or equipment contain insulating materials, such as glass or plastic, proper measures against electro static discharge, including the followings, are strongly recommended.
 - Dissipating the charge with conductive materials
 - Preventing the charge generation with moisture
 - Neutralizing the charge with ionizers

(6) Thermal Management

- Thermal management is an important factor when designing your product by using the LEDs. The rise in LED die temperature can be affected by the thermal resistance of the LED module or/and LED spacing. Customer is advised to design the product to ensure that the LED die temperature does not exceed the required maximum Junction Temperature (T_J).
- The dice temperature of the products should be calculated, using the case temperature (T_C) of the product incorporated into the end-product, by the following equation.

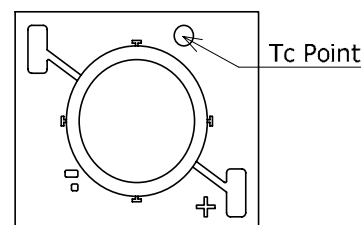
$$T_J = T_C + R_{\theta JC} \cdot W$$

* T_J = LED junction temperature: °C

T_C = Case temperature: °C

$R_{\theta JC}$ = Thermal resistance from junction to T_C measuring point: °C/W

W = Input power ($I_F \times V_F$): W



(7) Cleaning

- 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.
- Ultrasonic cleaning is not recommended for the LEDs since it may adversely effect on the LEDs by the ultrasonic power and LED assembled condition. If it is unavoidable, customer is advised to check prior to use that the cleaning will not damage the LEDs.

(8) Eye Safety

- 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 it 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. 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 greatly increase the hazard to your eyes.
- Viewing a flashing light may cause eye discomfort. When incorporating the LED into your product, precaution should be taken to avoid adverse effect on human body caused by the light stimulus.

(9) Others

- 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 system, 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.
- Customer and Nichia shall agree the official specification of supplied products prior to the start of a customer's volume production.
- The appearance and specifications of the product may be modified for improvement without notice.