NICHIA CORPORATION

SPECIFICATIONS FOR WHITE LED

NF3W585ART

- Pb-free Reflow Soldering Application
- Built-in ESD Protection Device
- RoHS Compliant

ØNICHIA

SPECIFICATIONS

(1) Absolute Maximum Ratings

Item	Symbol	Absolute Maximum Rating	Unit
Forward Current	I_F	160	mA
Pulse Forward Current	I_{FP}	250	mA
Allowable Reverse Current	I_R	85	mA
Power Dissipation	P_D	1.4	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_J=25°C.

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

* For I_F and I_{FP}, see the "DERATING CHARACTERISTICS" of this specification.

(2) Initial Electrical/Optical Characteristics

Item		Symbol	Condition	Typ	Max	Unit
Forward Voltage		V_F	I_F=50mA	8.44	-	V
R70	Luminous Flux (Chromaticity Coordinate1)	Φ_v	I_F=50mA	83.9	-	lm
	Color Rendering Index (Chromaticity Coordinate1)	R_a	I_F=50mA	73	-	-
R8000	Luminous Flux (Chromaticity Coordinate1)	Φ_v	I_F=50mA	76.3	-	lm
	Color Rendering Index (Chromaticity Coordinate1)	R_a	I_F=50mA	83	-	-
Chromaticity Coordinate1	x	-	I_F=50mA	0.4338	-	-
	y		I_F=50mA	0.4030	-	
R70	Luminous Flux (Chromaticity Coordinate2)	Φ_v	I_F=50mA	87.5	-	lm
	Color Rendering Index (Chromaticity Coordinate2)	R_a	I_F=50mA	73	-	-
R8000	Luminous Flux (Chromaticity Coordinate2)	Φ_v	I_F=50mA	82.4	-	lm
	Color Rendering Index (Chromaticity Coordinate2)	R_a	I_F=50mA	83	-	-
Chromaticity Coordinate2	x	-	I_F=50mA	0.3447	-	-
	y		I_F=50mA	0.3553	-	
Thermal Resistance		$R_{\theta JS}$	-	8	11	°C/W

* Characteristics at T_J=25°C and measured in pulse mode.

* Optical Characteristics as per CIE 127:2007 standard.

* Chromaticity Coordinates as per CIE 1931 Chromaticity Chart.

* $R_{\theta JS}$ is the thermal resistance from the junction to the T_S measurement point.

* $R_{\theta JS}$ is measured using the Dynamic Mode detailed in JESD51-1.

RANKS

Item	Rank		Condition	Min	Max	Unit
Forward Voltage	-		I_F=50mA	8.03	8.79	V
Luminous Flux	P17		I_F=50mA	85.6	101.8	lm
	P16			72.0	85.6	
	P15			60.5	72.0	
Color Rendering Index	R70	R_a	I_F=50mA	70	-	-
	R8000	R_a		80	-	
		R_9		0	-	

Color Ranks(I_F=50mA)

The color ranks have chromaticity ranges within 5-step MacAdam ellipse.

		Rank sm225	Rank sm255	Rank sm275	Rank sm305	Rank sm355	Rank sm405
Color Temperature (Unit: K)	T_{CP}	2200	2500	2700	3000	3500	4000
Center Point	x	0.5018	0.4806	0.4578	0.4338	0.4073	0.3818
	y	0.4153	0.4141	0.4101	0.4030	0.3917	0.3797
Minor Axis	a	0.006670	0.006715	0.006760	0.006845	0.006830	0.006785
Major Axis	b	0.012010	0.012525	0.013120	0.013985	0.014660	0.015470
Ellipse Rotation Angle	Φ	-39.89	-37.58	-36.05	-36.00	-35.47	-35.95

		Rank sm455	Rank sm505	Rank sm575	Rank sm655
Color Temperature (Unit: K)	T_{CP}	4500	5000	5700	6500
Center Point	x	0.3611	0.3447	0.3287	0.3123
	y	0.3658	0.3553	0.3417	0.3282
Minor Axis	a	0.006420	0.005925	0.005145	0.004515
Major Axis	b	0.015015	0.014030	0.013015	0.010935
Ellipse Rotation Angle	Φ	-34.33	-31.78	-31.56	-32.35

The color ranks have chromaticity ranges within 7-step MacAdam ellipse.

		Rank sm2270a	Rank sm2270b	Rank sm2270c	Rank sm2270d	Rank sm2270e	Rank sm2270f
Color Temperature (Unit: K)	T_{CP}	2200					
Center Point	x	0.5018					
	y	0.4153					
Minor Axis	a	0.009338					
Major Axis	b	0.016814					
Ellipse Rotation Angle	Φ	-39.89					

		Rank sm2570a	Rank sm2570b	Rank sm2570c	Rank sm2570d	Rank sm2570e	Rank sm2570f
Color Temperature (Unit: K)	T_{CP}	2500					
Center Point	x	0.4806					
	y	0.4141					
Minor Axis	a	0.009401					
Major Axis	b	0.017535					
Ellipse Rotation Angle	Φ	-37.58					

		Rank sm2770a	Rank sm2770b	Rank sm2770c	Rank sm2770d	Rank sm2770e	Rank sm2770f
Color Temperature (Unit: K)	T_{CP}	2700					
Center Point	x	0.4578					
	y	0.4101					
Minor Axis	a	0.009464					
Major Axis	b	0.018368					
Ellipse Rotation Angle	Φ	-36.05					

		Rank sm3070a	Rank sm3070b	Rank sm3070c	Rank sm3070d	Rank sm3070e	Rank sm3070f
Color Temperature (Unit: K)	T_{CP}	3000					
Center Point	x	0.4338					
	y	0.4030					
Minor Axis	a	0.009583					
Major Axis	b	0.019579					
Ellipse Rotation Angle	Φ	-36.00					

		Rank sm3570a	Rank sm3570b	Rank sm3570c	Rank sm3570d	Rank sm3570e	Rank sm3570f
Color Temperature (Unit: K)	T_{CP}	3500					
Center Point	x	0.4073					
	y	0.3917					
Minor Axis	a	0.009562					
Major Axis	b	0.020524					
Ellipse Rotation Angle	Φ	-35.47					

		Rank sm4070a	Rank sm4070b	Rank sm4070c	Rank sm4070d	Rank sm4070e	Rank sm4070f
Color Temperature (Unit: K)	T_{CP}	4000					
Center Point	x	0.3818					
	y	0.3797					
Minor Axis	a	0.009499					
Major Axis	b	0.021658					
Ellipse Rotation Angle	Φ	-35.95					

		Rank sm4570a	Rank sm4570b	Rank sm4570c	Rank sm4570d	Rank sm4570e	Rank sm4570f
Color Temperature (Unit: K)	T_{CP}	4500					
Center Point	x	0.3611					
	y	0.3658					
Minor Axis	a	0.008988					
Major Axis	b	0.021021					
Ellipse Rotation Angle	Φ	-34.33					

		Rank sm5070a	Rank sm5070b	Rank sm5070c	Rank sm5070d	Rank sm5070e	Rank sm5070f
Color Temperature (Unit: K)	T_{CP}			5000			
Center Point	x			0.3447			
	y			0.3553			
Minor Axis	a			0.008295			
Major Axis	b			0.019642			
Ellipse Rotation Angle	Φ			-31.78			

		Rank sm5770a	Rank sm5770b	Rank sm5770c	Rank sm5770d	Rank sm5770e	Rank sm5770f
Color Temperature (Unit: K)	T_{CP}			5700			
Center Point	x			0.3287			
	y			0.3417			
Minor Axis	a			0.007203			
Major Axis	b			0.018221			
Ellipse Rotation Angle	Φ			-31.56			

		Rank sm6570a	Rank sm6570b	Rank sm6570c	Rank sm6570d	Rank sm6570e	Rank sm6570f
Color Temperature (Unit: K)	T_{CP}			6500			
Center Point	x			0.3123			
	y			0.3282			
Minor Axis	a			0.006321			
Major Axis	b			0.015309			
Ellipse Rotation Angle	Φ			-32.35			

* Ranking at T_J=25°C and measured in pulse mode.

* Forward Voltage Tolerance: ±0.09V

* Luminous Flux Tolerance: ±5%

* Color Rendering Index R_a Tolerance: ±2

* Color Rendering Index R_9 Tolerance: ±6.5

* The R_9 value for the above rank shall be greater than 0.

* Chromaticity Coordinate Tolerance: ±0.003

* LEDs from the above ranks will be shipped. The rank combination ratio per shipment will be decided by Nichia.

Definition of the MacAdam ellipse ranks:

A perfect circle is divided into 60 degree-sections and then transformed into the MacAdam ellipse that is presented on the chromaticity diagram in this document.

4
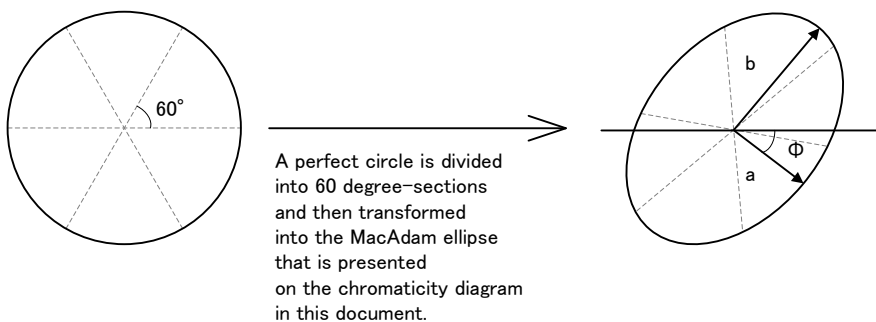
Luminous Flux Ranks by Color Rank, Color Rendering Index Rank

Ranking by Color Coordinates, Color Rendering Index	Ranking by Luminous Flux	P15	P16	P17
sm225,sm2270a,sm2270b,sm2270c,sm2270d,sm2270e,sm2270f, sm255,sm2570a,sm2570b,sm2570c,sm2570d,sm2570e,sm2570f	R8000	▓	▓	
sm275,sm2770a,sm2770b,sm2770c,sm2770d,sm2770e,sm2770f, sm305,sm3070a,sm3070b,sm3070c,sm3070d,sm3070e,sm3070f	R70		▓	▓
	R8000	▓	▓	
sm355,sm3570a,sm3570b,sm3570c,sm3570d,sm3570e,sm3570f, sm405,sm4070a,sm4070b,sm4070c,sm4070d,sm4070e,sm4070f, sm455,sm4570a,sm4570b,sm4570c,sm4570d,sm4570e,sm4570f, sm505,sm5070a,sm5070b,sm5070c,sm5070d,sm5070e,sm5070f, sm575,sm5770a,sm5770b,sm5770c,sm5770d,sm5770e,sm5770f, sm655,sm6570a,sm6570b,sm6570c,sm6570d,sm6570e,sm6570f	R70,R8000		▓	▓

CHROMATICITY DIAGRAM
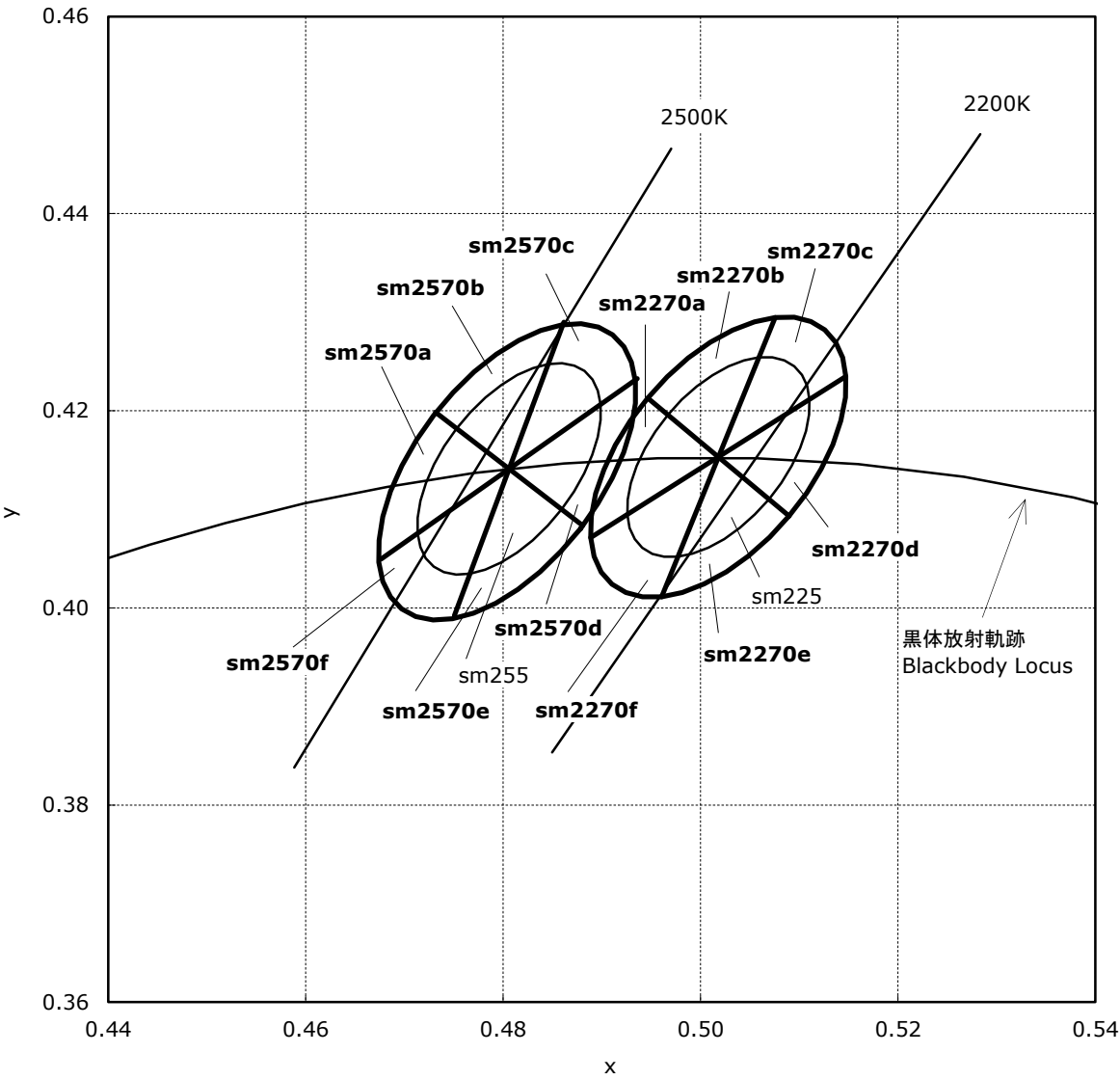
CHROMATICITY DIAGRAM
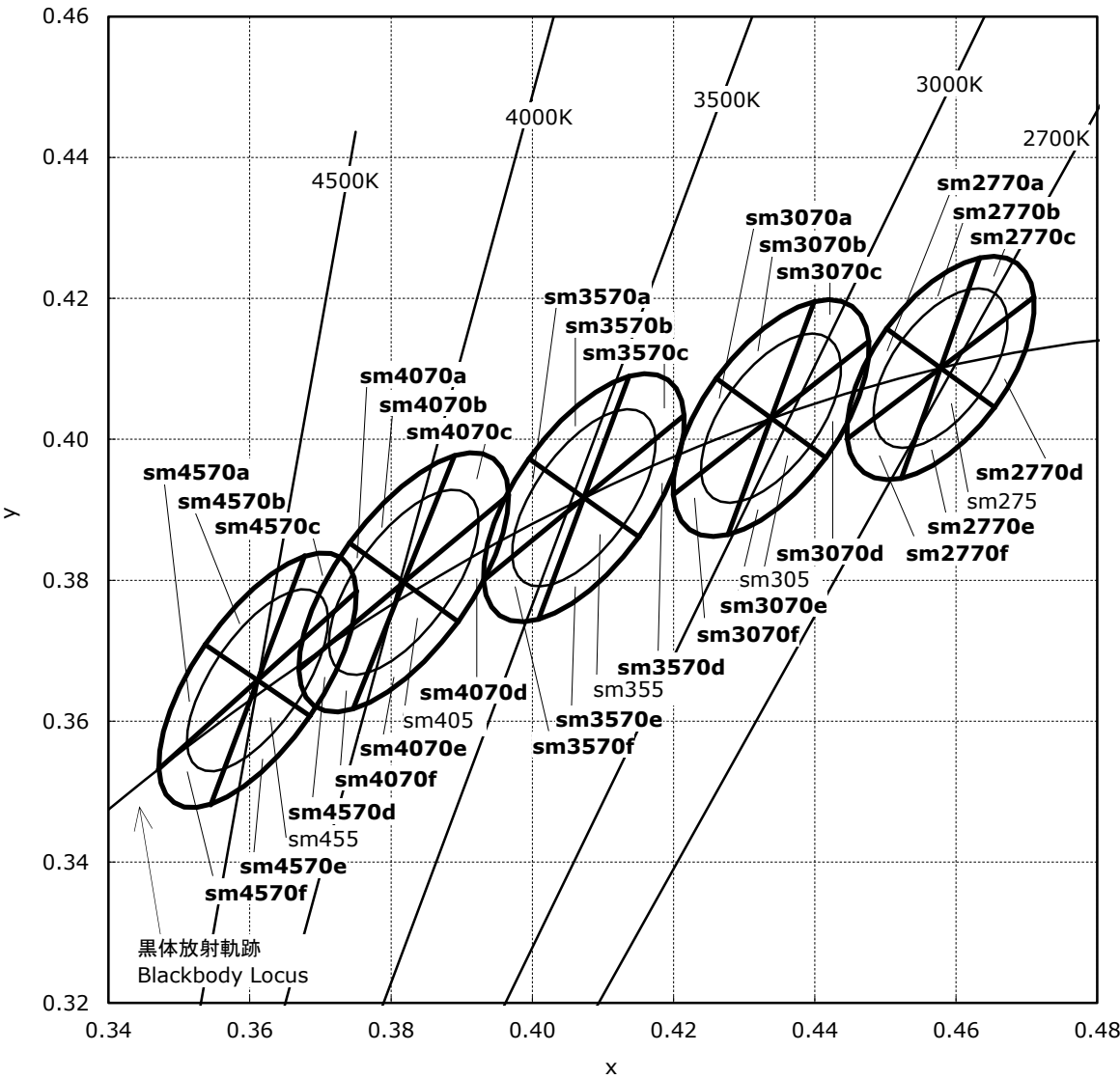
CHROMATICITY DIAGRAM
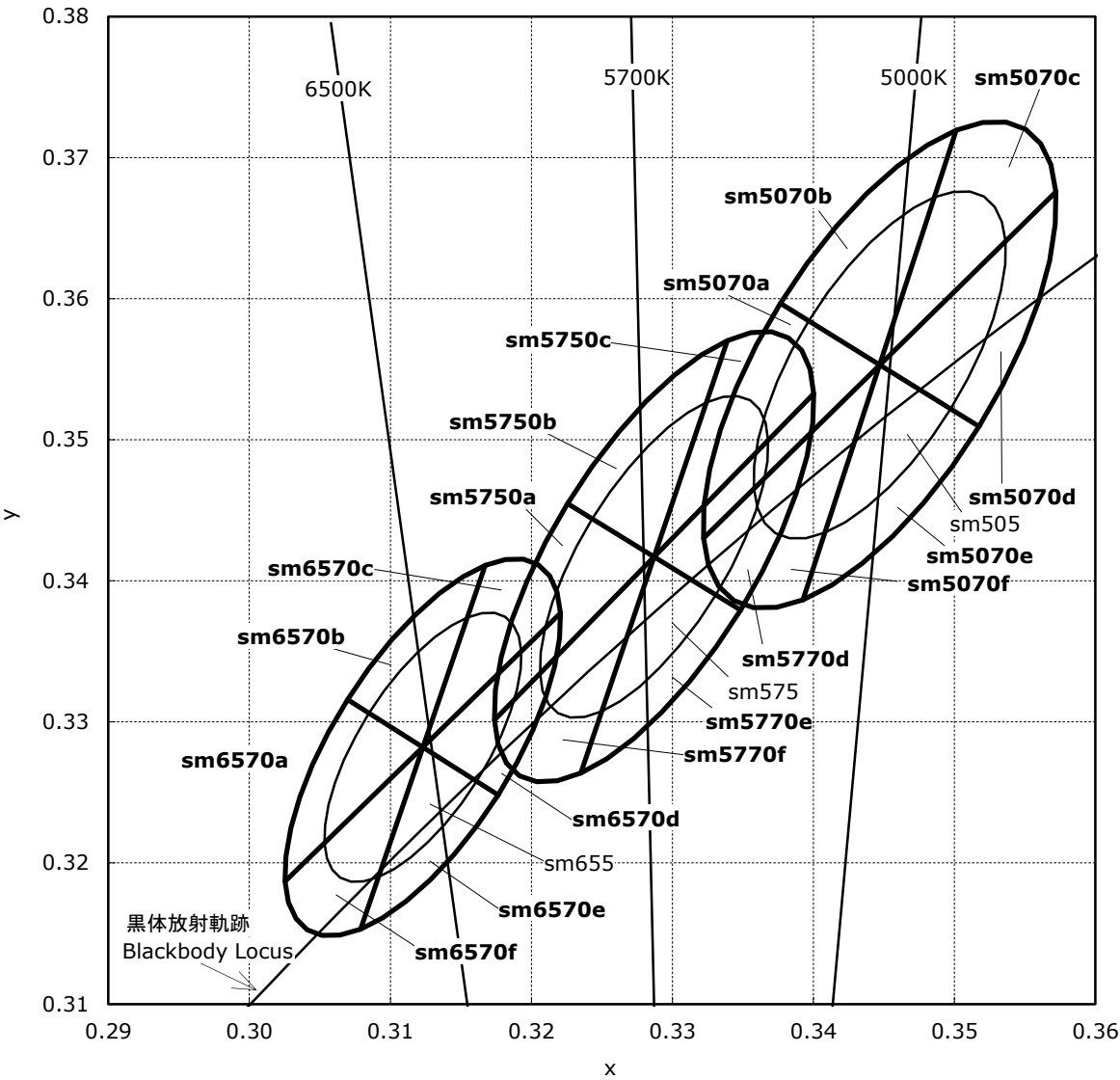
OUTLINE DIMENSIONS

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

NF3W585AR
管理番号 No. STS-DA7-14061

(単位 Unit: mm, 公差 Tolerance: ±0.2)

Cathode Mark

光学的中心位置
Location of the optical center

4

3.5

3.5

Cathode Mark

3.6

3.2

0.25

2.05

2.5
2.9

Cathode

1.13

1.78

Anode
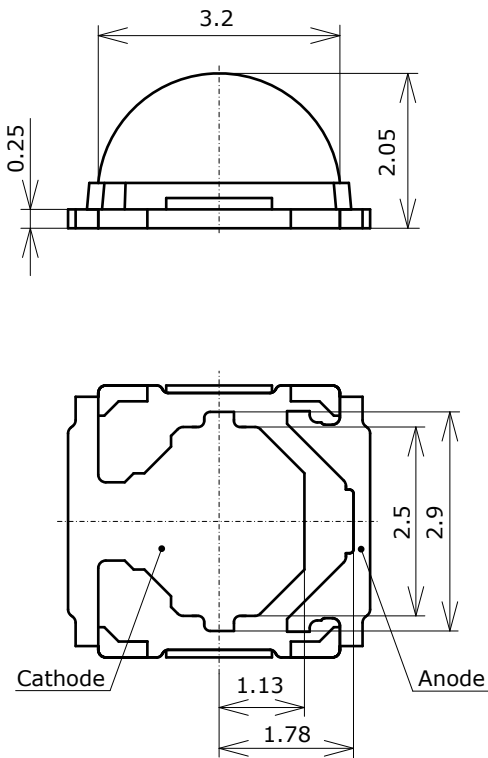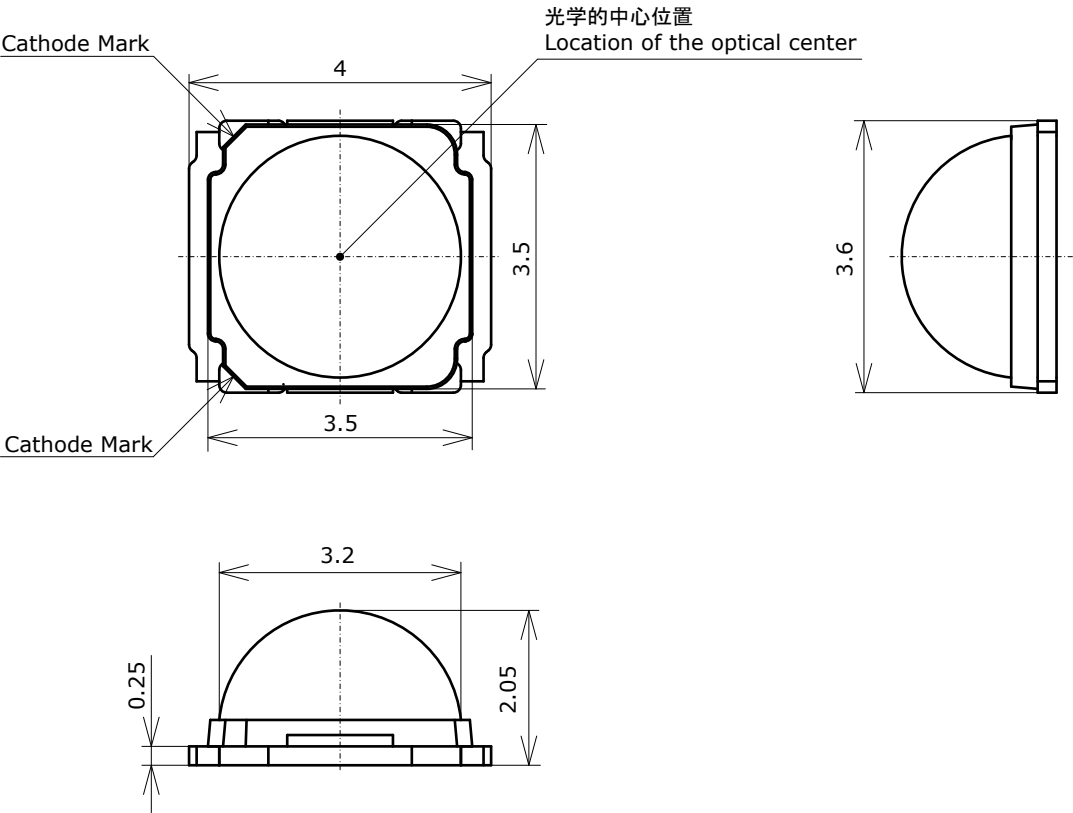
項目 Item	内容 Description
パッケージ材質 Package Materials	耐熱性ポリマー Heat-Resistant Polymer
プリコート材質 Pre-coating Materials	シリコーン樹脂 （拡散剤+蛍光体入り） Silicone Resin (with diffuser and phosphor)
レンズ材質 Lens Materials	シリコーン樹脂 Silicone Resin
電極材質 Electrodes Materials	銅合金+銀メッキ Ag-plated Copper Alloy
質量 Weight	0.036g(TYP)

K   A

保護素子
Protection Device

9
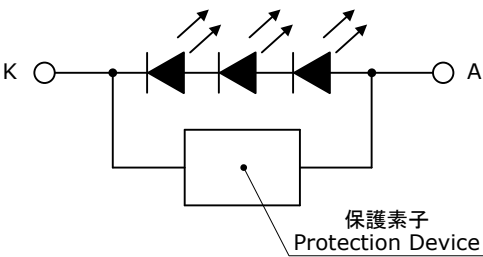
SOLDERING

● Recommended Reflow Soldering Condition(Lead-free Solder)

1 to 5°C per sec

Pre-heat
180 to 200°C

260°CMax
10sec Max

60sec Max
Above 220°C

120sec Max
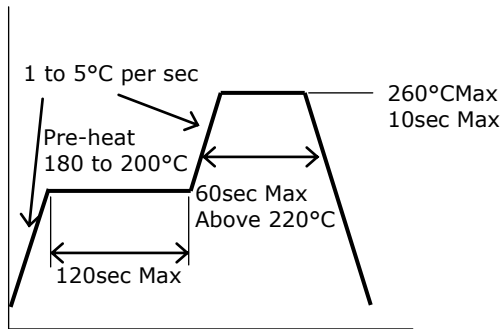
● Recommended Soldering Pad Pattern　● Recommended Solder Resist Opening　● Recommended Metal Solder Stencil Aperture

Cathode
1.5
1.13
0.32
Anode
1.28
2.9
(4.6)
(1.5)
(6)

1.13　1.23
0.322　0.457
Cathode 2
Cathode 1
Anode
1.28
2.9
3.6
3.2
4.8
1.358

1.76
0.43　C0.2
2.4
3.5
3.48
4.7
1.07
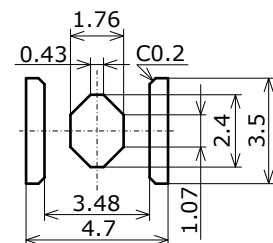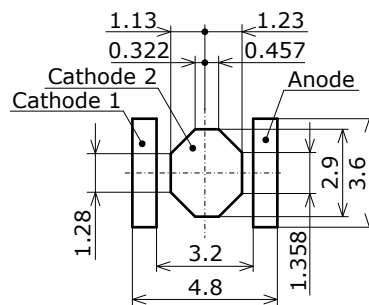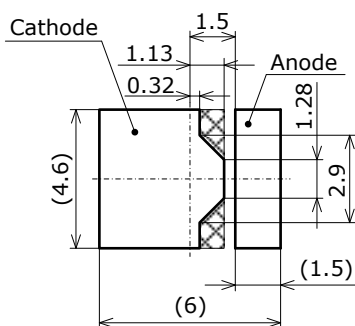
⊠ 交差斜線部にランドパターンを配置しないでください。
Do not have the solder pads
in the area shaded with crossed diagonal lines.

(単位 Unit: mm)

　　Ensure that Cathode 1 and Cathode 2 are on the same copper layer and electrically connected each other.

* This LED is designed to be reflow soldered to a PCB. If dip soldered or hand soldered, Nichia will not guarantee its reliability.

* Reflow soldering must not be performed more than twice.

* When cooling the LEDs from the peak temperature a gradual cooling slope is recommended; do not cool the LEDs rapidly.

* During reflow soldering, the heat and atmosphere in the reflow oven may cause the optical characteristics to degrade. In particular, reflow soldering performed with an air atmosphere may have a greater negative effect on the optical characteristics than if a nitrogen atmosphere is used; Nichia recommends using a nitrogen reflow atmosphere.

* This LED uses a silicone resin for the lens and internal pre-coating resin; the silicone resin is soft. If pressure is applied to the lens, it may cause the lens to be damaged, chipped, and/or delaminated. If the resin is damaged, chipped, delaminated and/or deformed, it may cause the wire to break causing a catastrophic failure (i.e. the LED not to illuminate) and/or reliability issues (e.g. the LED to corrode and/or to become dimmer, the color/directivity to change, etc.). Ensure that pressure is not applied to the lens.

If an automatic pick and place machine is used for the LEDs, use a pick up nozzle that does not affect the lens.

Recommended conditions:

   Using a nozzle specifically designed for the LEDs is recommended (See the nozzle drawing below).

   * Ensure that the nozzle does not come in contact with the lens when it picks up an LED.

      If this occurs, it may cause internal disconnection causing the LED not to illuminate.

(単位 Unit: mm)
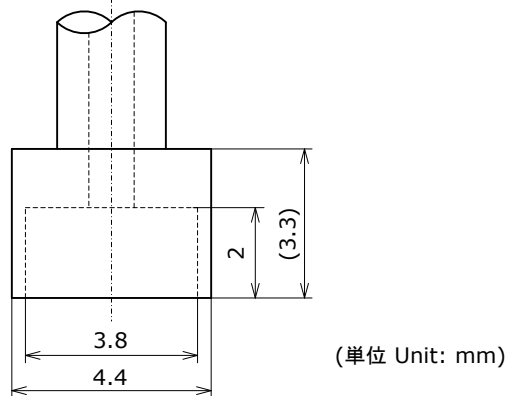
* Once the LEDs have been soldered to a PCB, it should not be repaired/reworked. If it must be done, using a hot plate is strongly recommended. Sufficient verification should be performed prior to use to ensure that the repair/rework does not cause the LED characteristics to deteriorate.

* The Cathode 2 should be soldered to customer PCB. If it is difficult or impossible, use high heat-dissipating adhesive.

* When soldering, do not apply stress to the LED while the LED is hot.

* The soldering pad pattern above is a general recommendation for LEDs to be mounted without issues; if a high degree of precision is required for the chosen application (i.e. high-density mounting), ensure that the soldering pad pattern is optimized.

* 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.

* Ensure that there are no issues with the type and amount of solder that is being used.
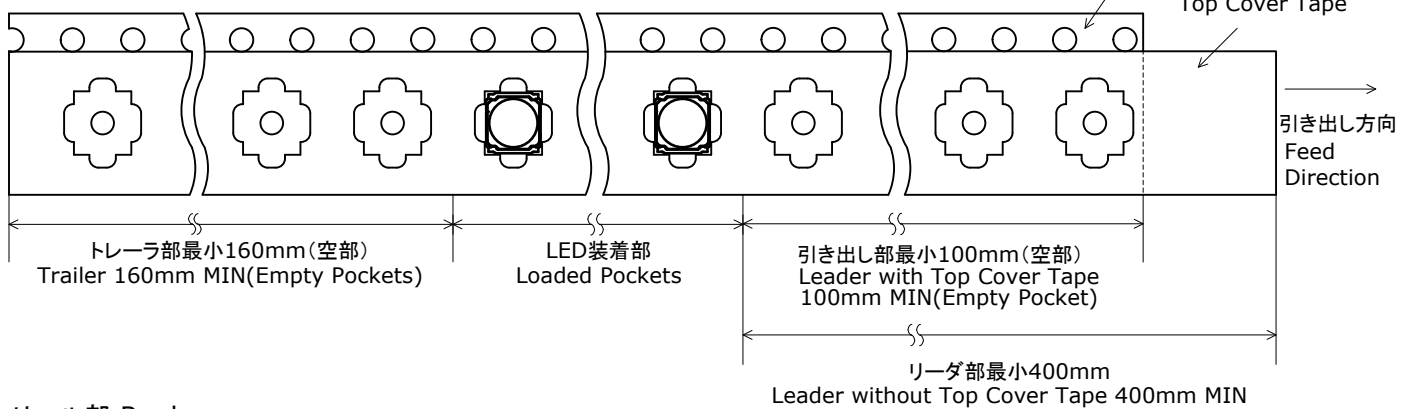
TAPE AND REEL DIMENSIONS

テーピング部 Tape

Nxxx585x
管理番号 No.　STS-DA7-14062

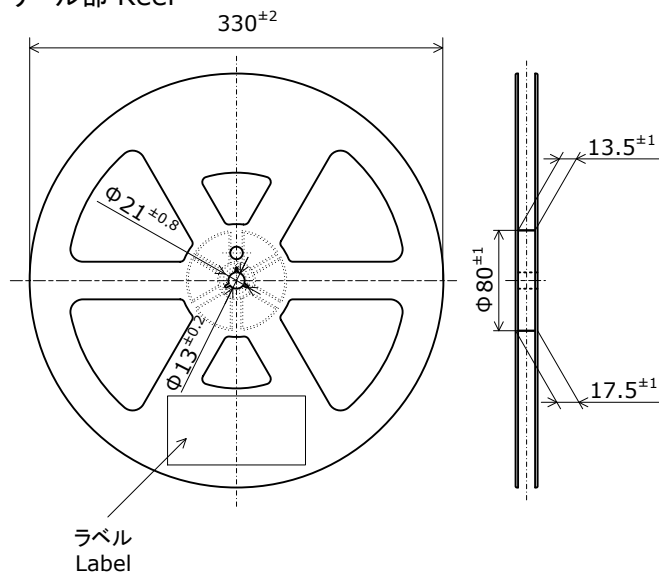(単位 Unit: mm)

Cathode Mark

$\Phi 1.5^{+0.1}_{-0}$

$8^{\pm 0.1}$　$2^{\pm 0.05}$ $4^{\pm 0.1}$

$1.75^{\pm 0.1}$

$5.5^{\pm 0.05}$

$12^{+0.3}_{-0.1}$

$\Phi 1.5^{+0.2}_{-0}$

$0.3^{\pm 0.05}$

$4.2^{\pm 0.1}$

2.5

5.9

$2.3^{\pm 0.1}$

$3.8^{\pm 0.1}$

1.75

5.1

エンボスキャリアテープ
Embossed Carrier Tape

トップカバーテープ
Top Cover Tape
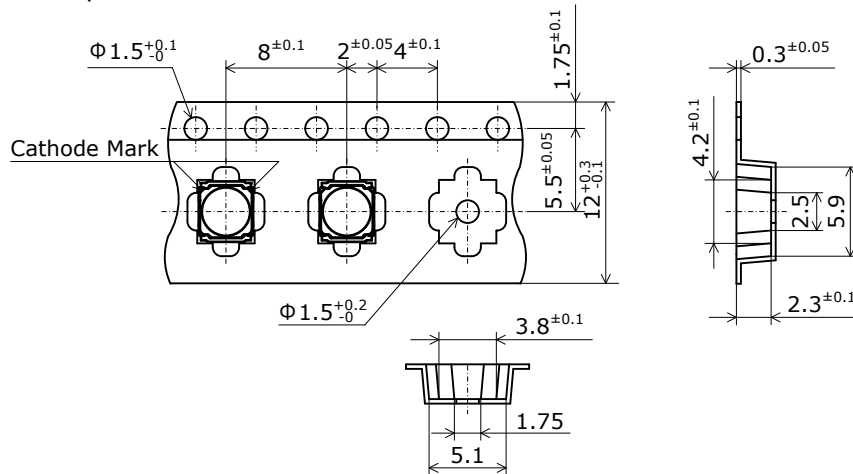
トレーラ部/リーダ部 Trailer and Leader

引き出し方向
Feed
Direction

トレーラ部最小160mm（空部）
Trailer 160mm MIN(Empty Pockets)

LED装着部
Loaded Pockets

引き出し部最小100mm（空部）
Leader with Top Cover Tape
100mm MIN(Empty Pocket)

リーダ部最小400mm
Leader without Top Cover Tape 400mm MIN

リール部 Reel

$330^{\pm 2}$

$\Phi 21^{\pm 0.8}$

$\Phi 13^{\pm 0.2}$

$13.5^{\pm 1}$

$\Phi 80^{\pm 1}$

$17.5^{\pm 1}$

ラベル
Label

* 数量は1リールにつき 3500個入りです。
  Reel Size: 3500pcs
* 実装作業の中断などでエンボスキャリアテープをリールに巻き取る場合、
  エンボスキャリアテープを強く(10N以上)締めないで下さい。
  LEDがカバーテープに貼り付く可能性があります。
  When the tape is rewound due to work interruptions,
  no more than 10N should be applied to
  the embossed carrier tape.
  The LEDs may stick to the top cover tape.
* JIS C 0806電子部品テーピングに準拠しています。
  The tape packing method complies with JIS C 0806
  (Packaging of Electronic Components on Continuous Tapes).

PACKAGING - TAPE & REEL

シリカゲルとともにリールをアルミ防湿袋に入れ、熱シールにより封をします。
Reels are shipped with desiccants in heat-sealed moisture-proof bags.

Nxxxxxxx
管理番号 No.   STS-DA7-0006C

シリカゲル
Desiccants

リール
Reel

ラベル Label

NICHIA
XXXX LED
TYPE Nxxxxxxx
      ****

LOT   YMxxxx-RRR
QTY.   PCS
                RoHS
NICHIA CORPORATION 491 OKA, KAMINAKA, ANAN, TOKUSHIMA, JAPAN

熱シール
Seal

アルミ防湿袋
Moisture-proof Bag
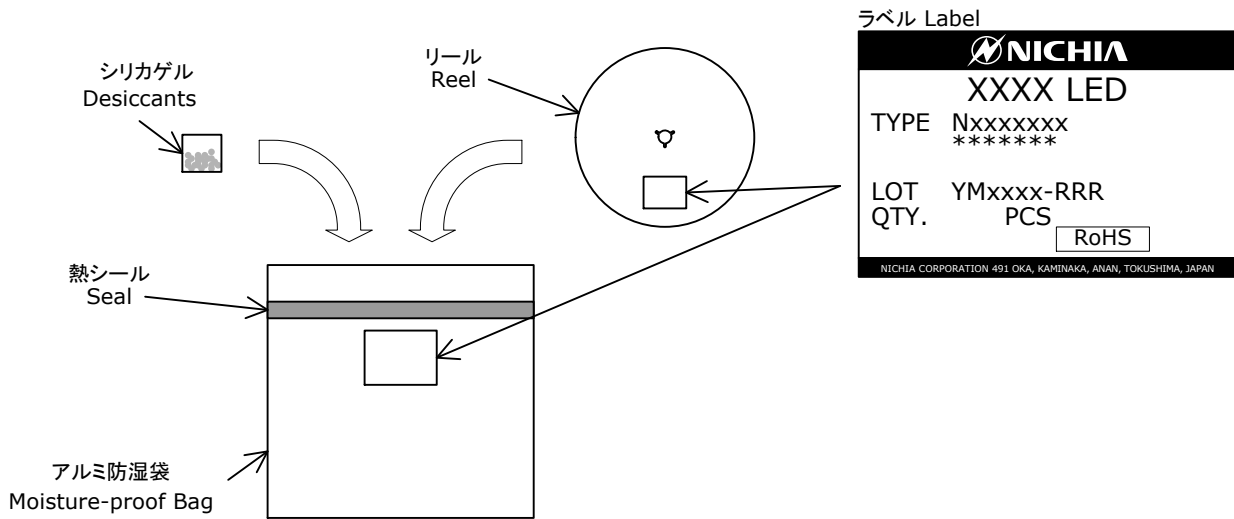
アルミ防湿袋を並べて入れ、ダンボールで仕切ります。
Moisture-proof bags are packed in cardboard boxes
with corrugated partitions.

ラベル Label

NICHIA
XXXX LED
TYPE Nxxxxxxx
      ****

RANK RRR
QTY.   PCS
              RoHS
NICHIA CORPORATION
491 OKA, KAMINAKA, ANAN, TOKUSHIMA, JAPAN

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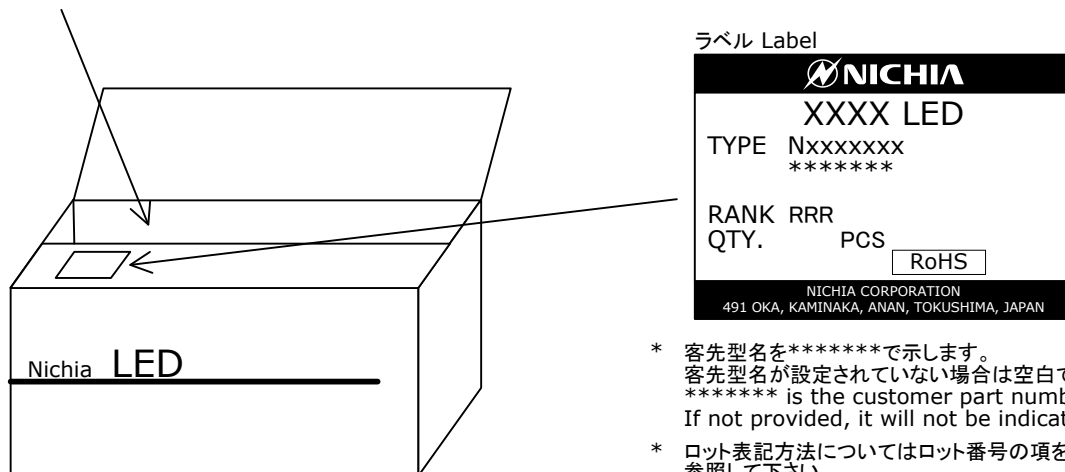
* 客先型名を*******で示します。
  客先型名が設定されていない場合は空白です。
  ******* is the customer part number.
  If not provided, it will not be indicated on the label.

* 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.

* ランク分けがない場合はランク表記はありません。
  The label does not have the RANK field for
  un-ranked products.

* 本製品はテーピングしたのち、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 shipped on tape and reel are packed in a moisture-proof 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
2017	H
2018	I
2019	J
2020	K
2021	L
2022	M

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 Index

DERATING CHARACTERISTICS

NF3W585AR
管理番号 No. STS-DA7-14063

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

$R_{\theta JA} = 31°C/W$
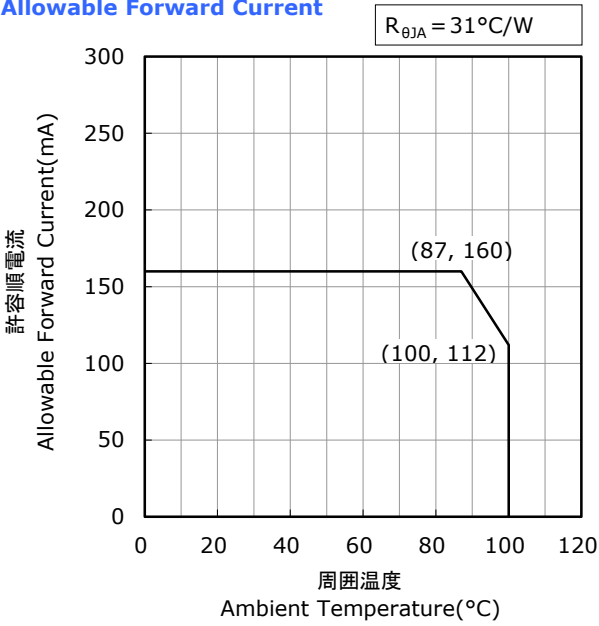
はんだ接合部温度(カソード側)–許容順電流特性
Solder Temperature(Cathode Side) vs
Allowable Forward Current
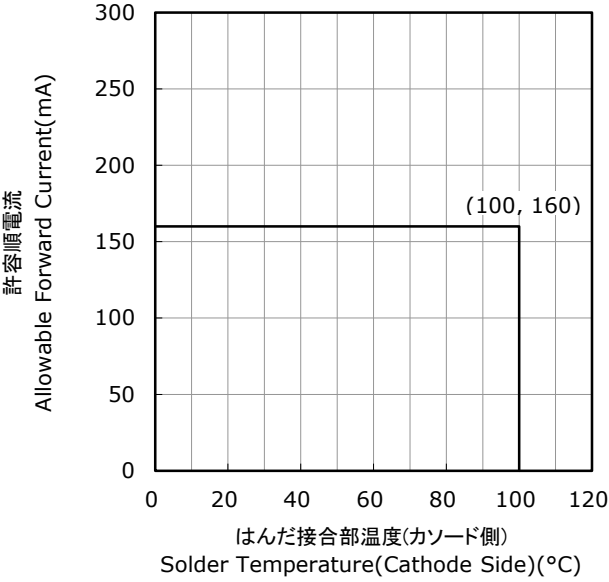
デューティー比–許容順電流特性
Duty Ratio vs
Allowable Forward Current
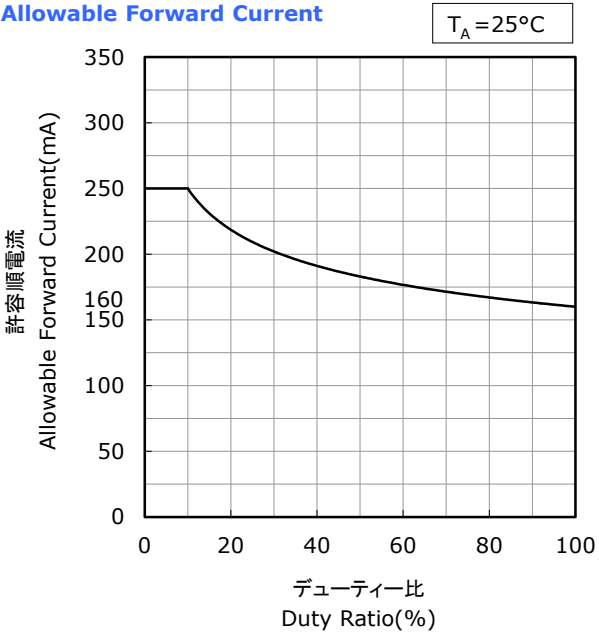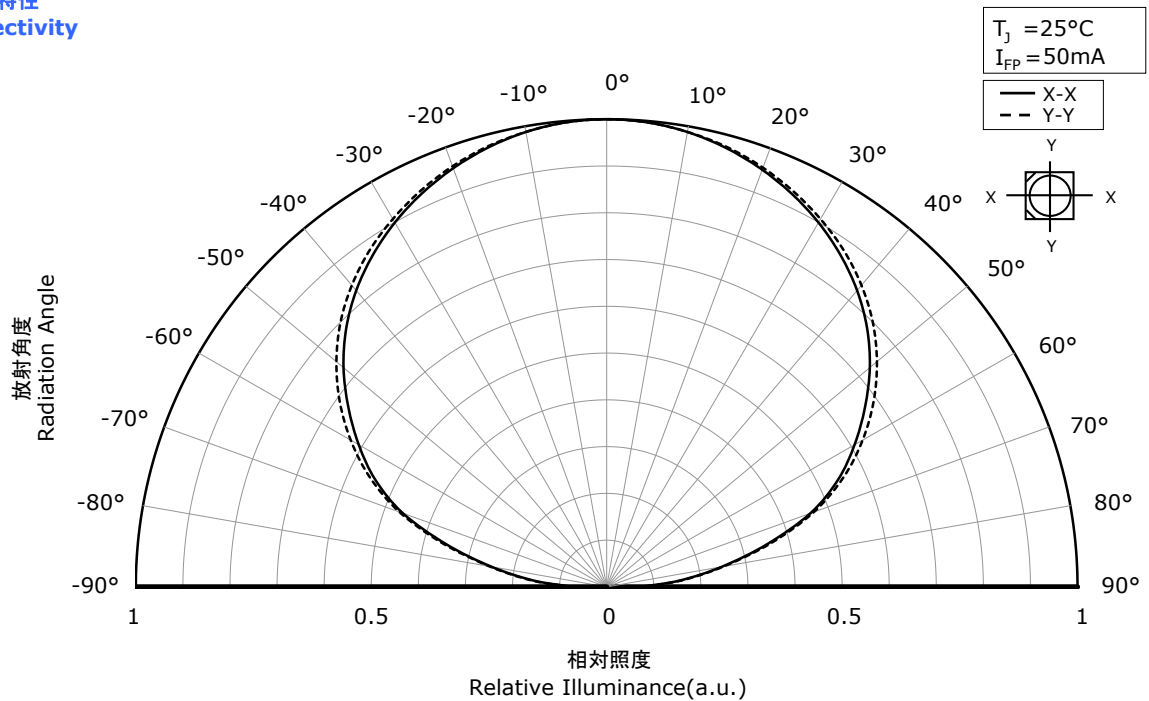
$T_A = 25°C$

15

OPTICAL CHARACTERISTICS

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

* パルス駆動により測定しています。
The following graphs show the characteristics measured in pulse mode.

NF3W585AR
管理番号 No. STS-DA7-14049

発光スペクトル
Spectrum
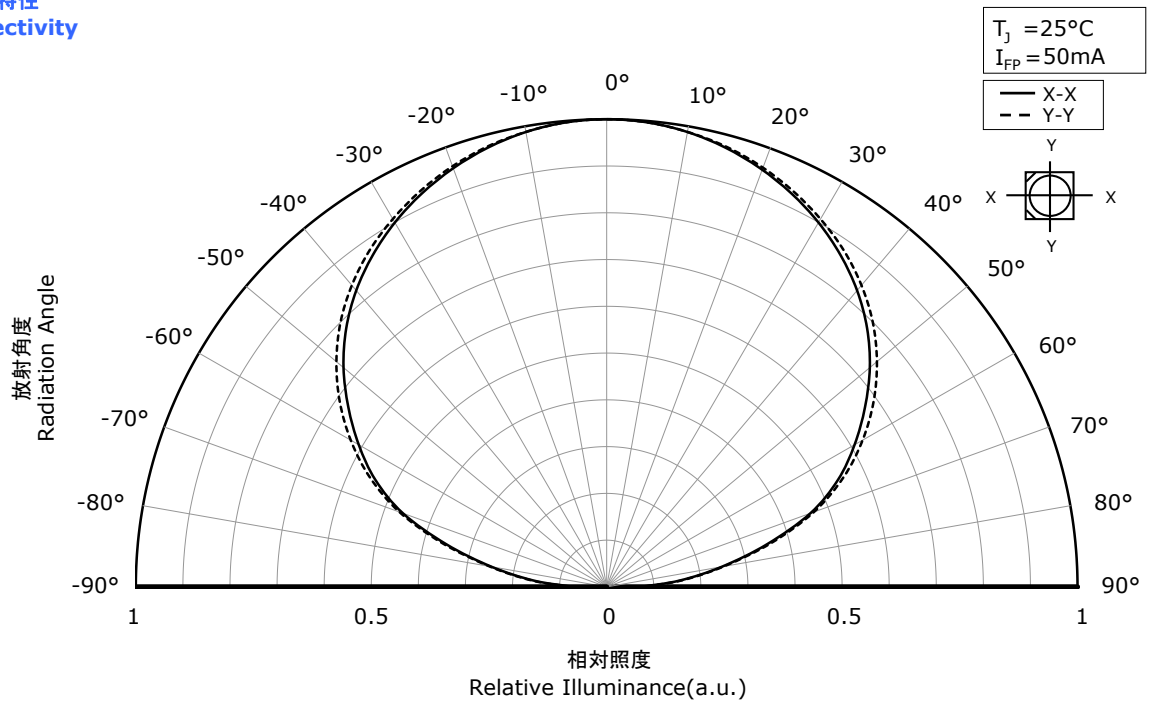
T_{cp}=3000K
T_J =25°C
I_{FP}=50mA

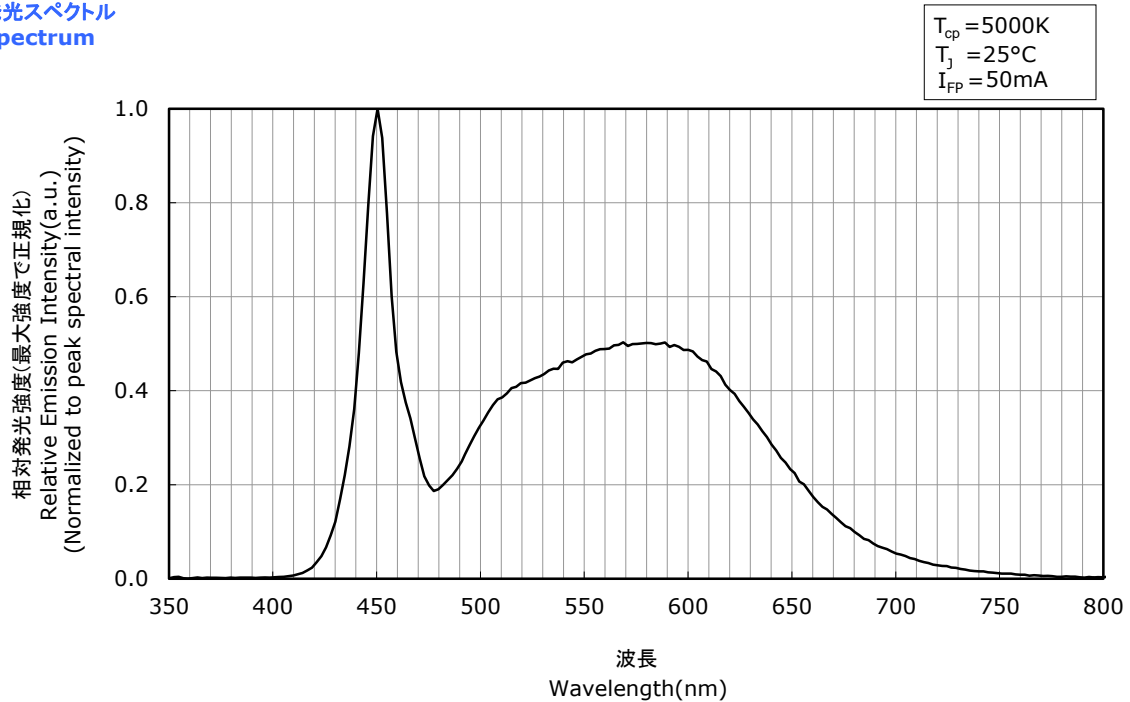**指向特性**
Directivity

T_J =25°C
I_{FP}=50mA
X-X
Y-Y

* 本特性は演色性ランクR70に対応しています。
The graphs above show the characteristics for R70 LEDs of this product.
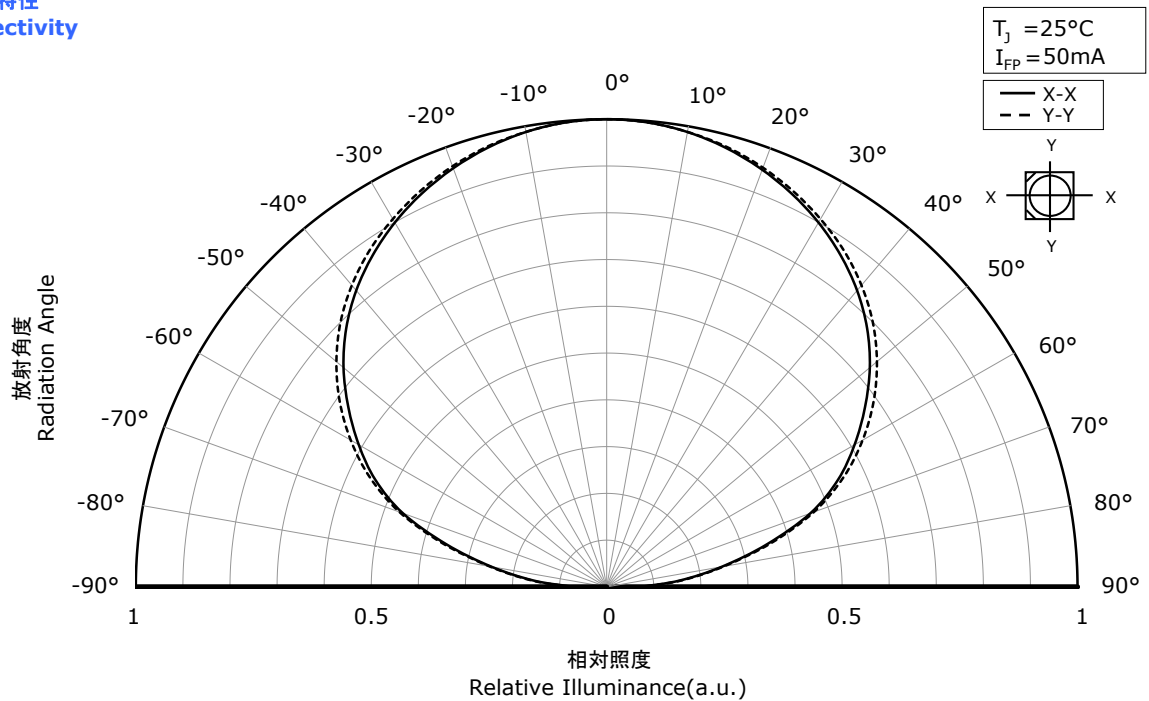
OPTICAL CHARACTERISTICS

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

* パルス駆動により測定しています。
  The following graphs show the characteristics measured in pulse mode.

NF3W585AR
管理番号 No. STS-DA7-14050

発光スペクトル
Spectrum
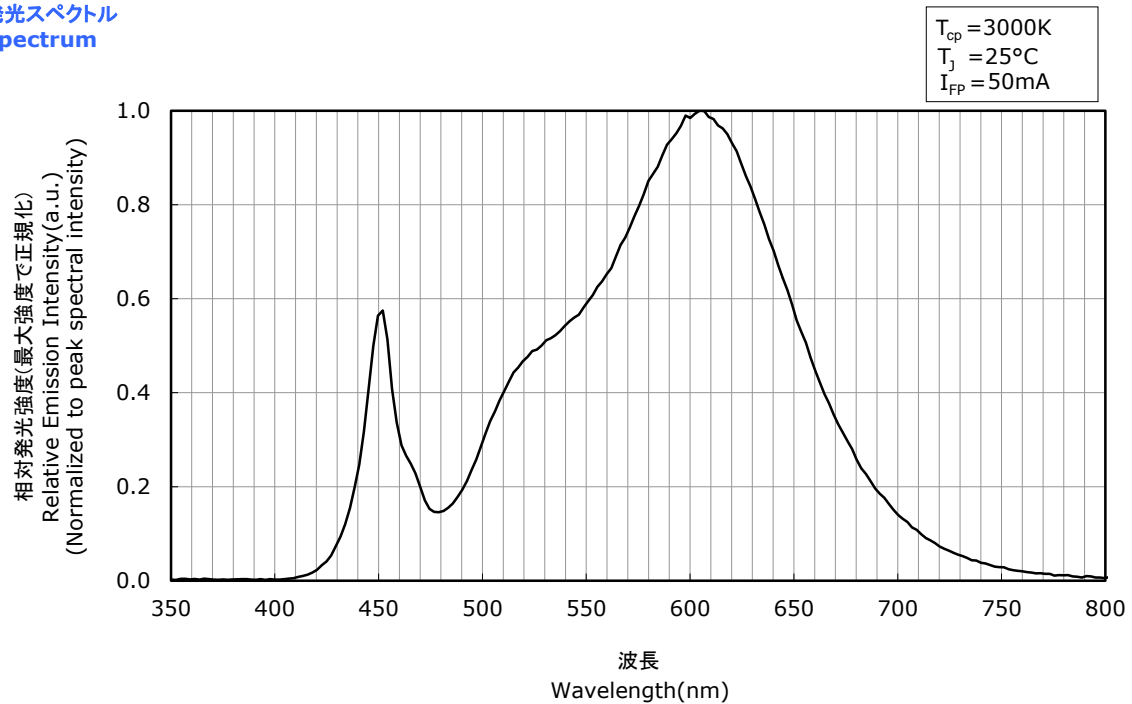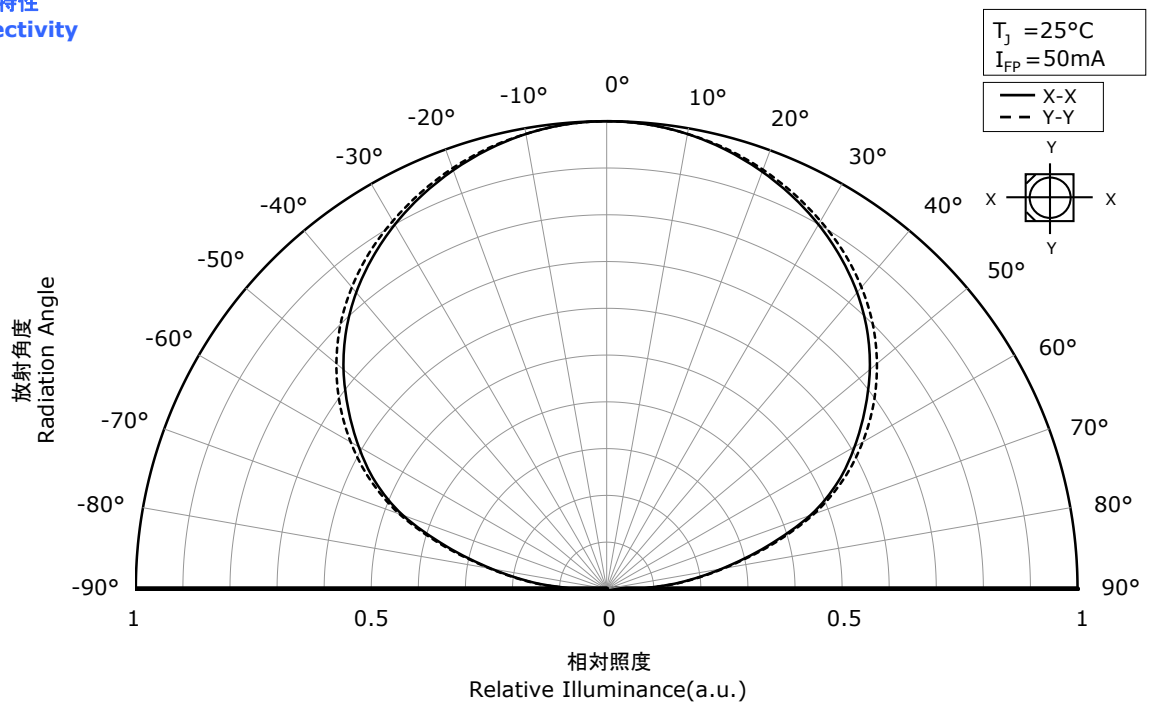
T_{cp} =3000K
T_J =25°C
I_{FP} =50mA

相対発光強度（最大強度で正規化）
Relative Emission Intensity(a.u.)
(Normalized to peak spectral intensity)

波長
Wavelength(nm)

指向特性
Directivity

T_J =25°C
I_{FP} =50mA

—— X-X
--- Y-Y

放射角度
Radiation Angle

相対照度
Relative Illuminance(a.u.)

* 本特性は演色性ランクR8000に対応しています。
  The graphs above show the characteristics for R8000 LEDs of this product.
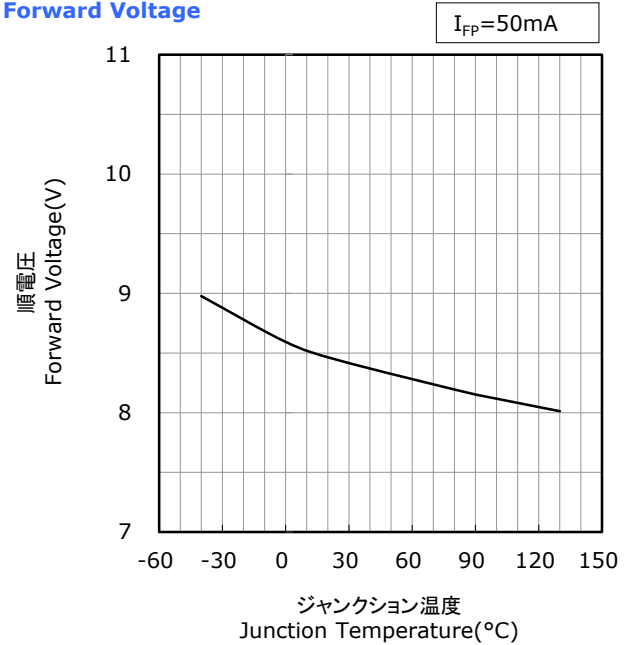
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OPTICAL CHARACTERISTICS

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

* パルス駆動により測定しています。
  The following graphs show the characteristics measured in pulse mode.

NF3W585AR
管理番号 No. STS-DA7-14051

発光スペクトル
Spectrum
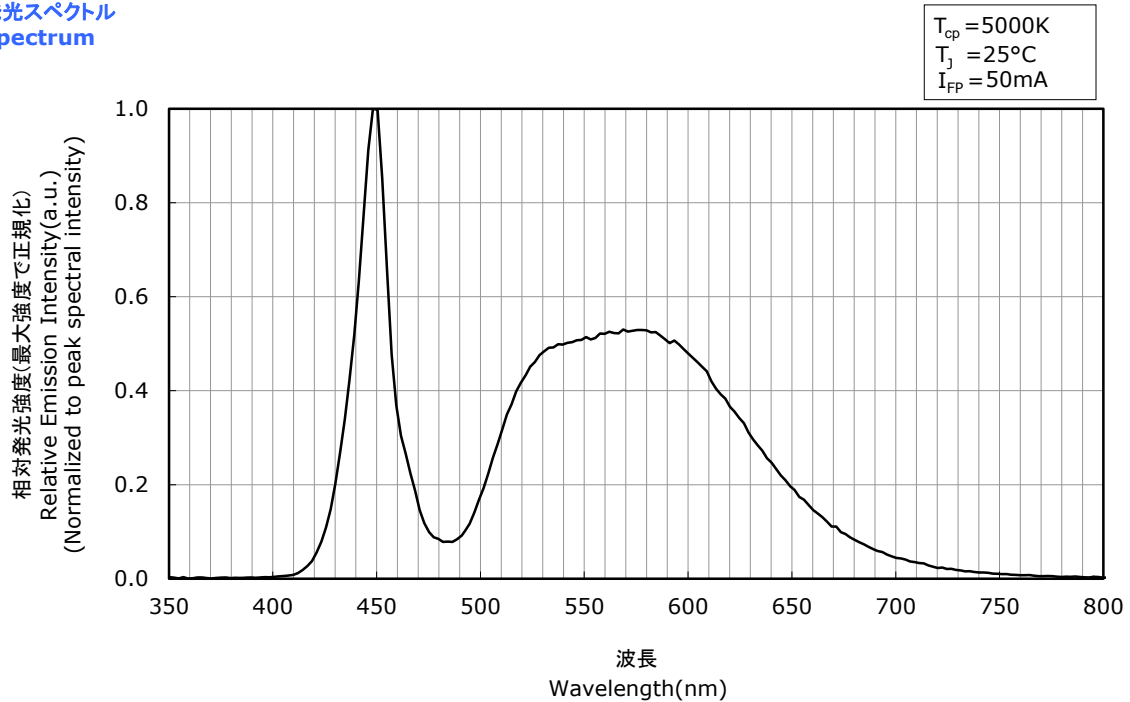
T_{cp} =5000K
T_J =25°C
I_{FP} =50mA

相対発光強度(最大強度で正規化)
Relative Emission Intensity(a.u.)
(Normalized to peak spectral intensity)

波長
Wavelength(nm)

指向特性
Directivity

T_J =25°C
I_{FP} =50mA

X-X
Y-Y

放射角度
Radiation Angle

相対照度
Relative Illuminance(a.u.)

* 本特性は演色性ランクR70に対応しています。
  The graphs above show the characteristics for R70 LEDs of this product.

OPTICAL CHARACTERISTICS

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

* パルス駆動により測定しています。
The following graphs show the characteristics measured in pulse mode.

NF3W585AR
管理番号 No. STS-DA7-14052

発光スペクトル
Spectrum

$T_{cp} = 5000K$
$T_J = 25°C$
$I_{FP} = 50mA$

相対発光強度(最大強度で正規化)
Relative Emission Intensity(a.u.)
(Normalized to peak spectral intensity)

波長
Wavelength(nm)

指向特性
Directivity

$T_J = 25°C$
$I_{FP} = 50mA$

— X-X
-- Y-Y

放射角度
Radiation Angle

相対照度
Relative Illuminance(a.u.)

* 本特性は演色性ランクR8000に対応しています。
The graphs above show the characteristics for R8000 LEDs of this product.

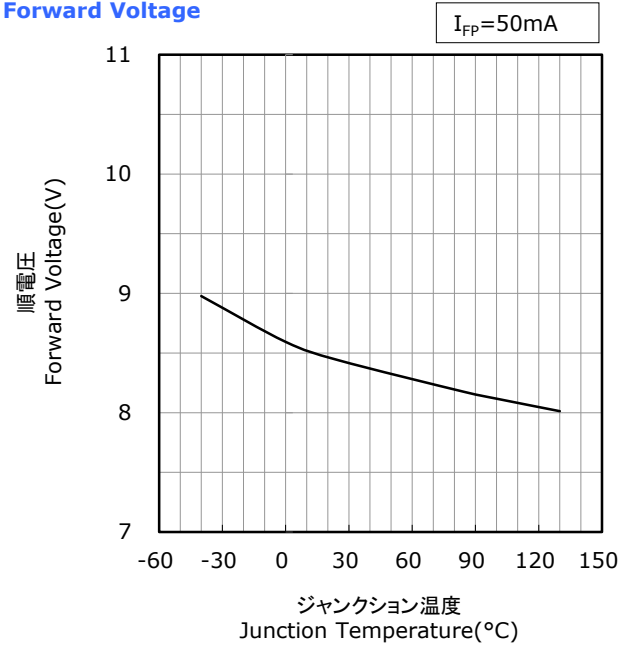# FORWARD CURRENT CHARACTERISTICS / TEMPERATURE CHARACTERISTICS

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

* パルス駆動により測定しています。
　The following graphs show the characteristics measured in pulse mode.
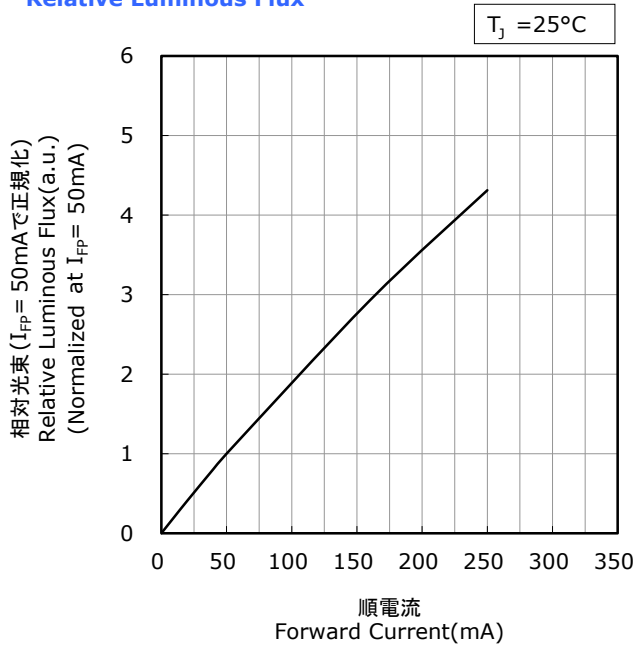
NF3W585AR
管理番号 No. STS-DA7-14053

順電圧-順電流特性
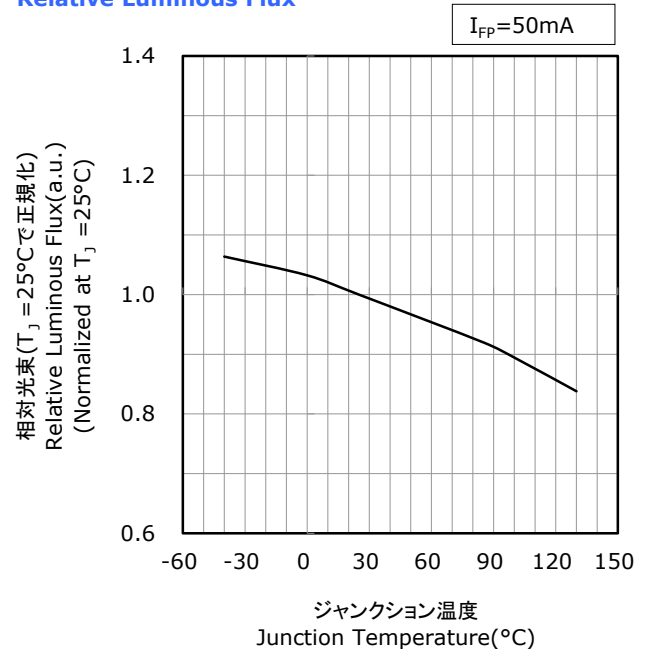**Forward Voltage vs**
Forward Current
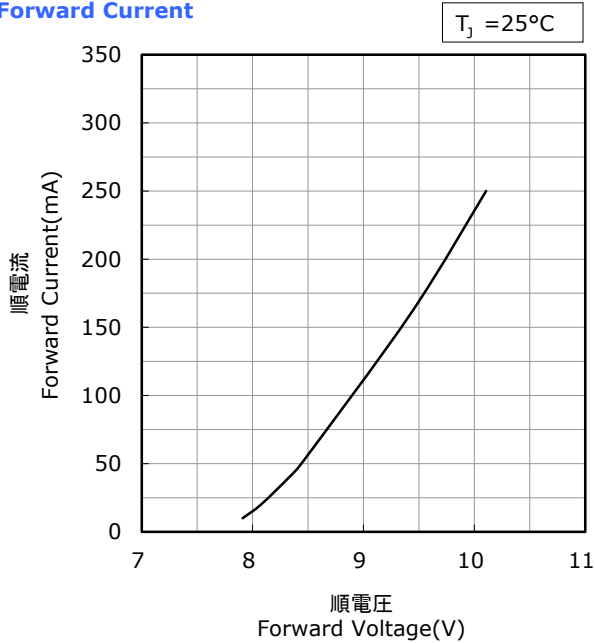
$T_J = 25°C$

順電流
Forward Voltage(V)

ジャンクション温度-順電圧特性
Junction Temperature vs
Forward Voltage

$I_{FP} = 50mA$

ジャンクション温度
Junction Temperature(°C)

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

$T_J = 25°C$

順電流
Forward Current(mA)

ジャンクション温度-相対光束特性
Junction Temperature vs
Relative Luminous Flux
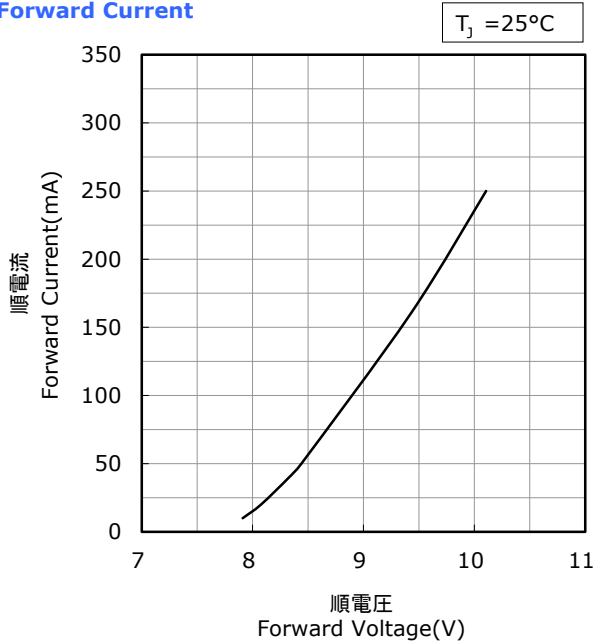
$I_{FP} = 50mA$
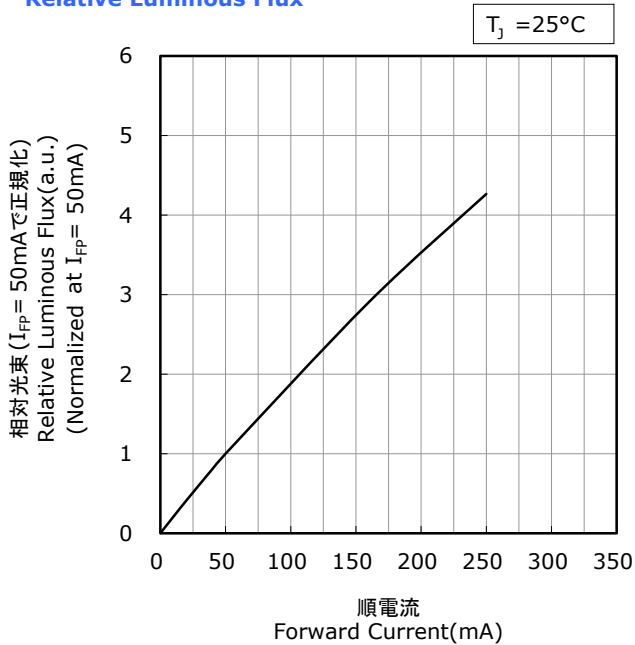
ジャンクション温度
Junction Temperature(°C)
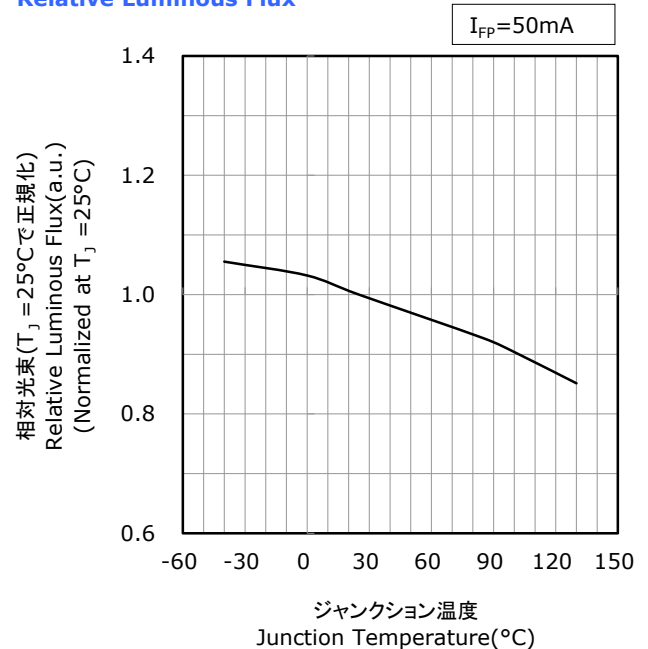
* 本特性は色温度2700K~4500K、演色性ランクR70に対応しています。
　The graphs above show the characteristics for 2700K~4500K, R70 LEDs of this product.

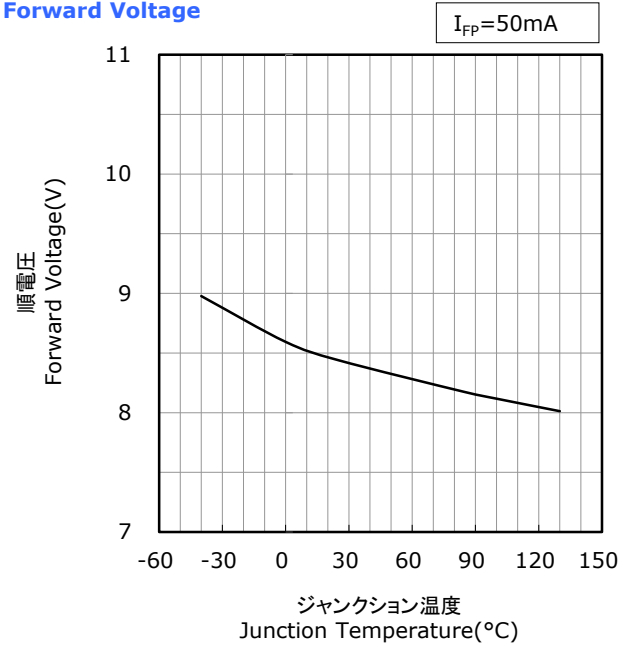# FORWARD CURRENT CHARACTERISTICS / TEMPERATURE CHARACTERISTICS

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

* パルス駆動により測定しています。
The following graphs show the characteristics measured in pulse mode.

NF3W585AR
管理番号 No. STS-DA7-14054

順電圧-順電流特性
Forward Voltage vs Forward Current
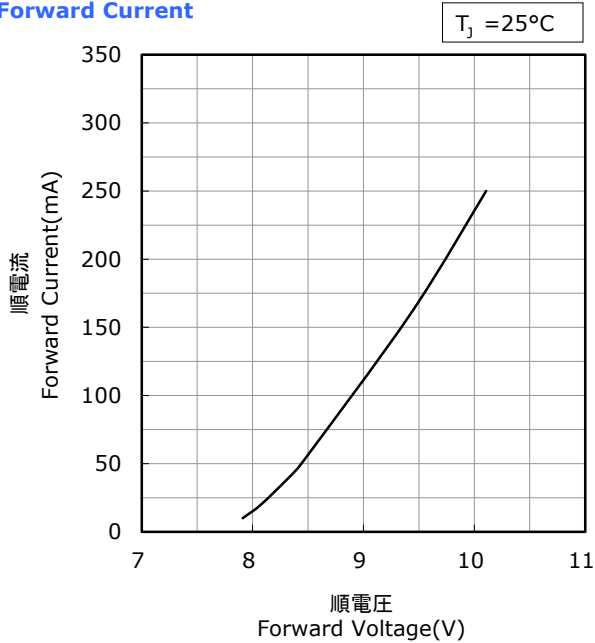
$T_J = 25°C$

順電流
Forward Current(mA)
順電圧
Forward Voltage(V)

ジャンクション温度-順電圧特性
Junction Temperature vs Forward Voltage

$I_{FP} = 50mA$

順電圧
Forward Voltage(V)
ジャンクション温度
Junction Temperature(°C)

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

$T_J = 25°C$

相対光束($I_{FP}= 50mA$で正規化)
Relative Luminous Flux(a.u.)
(Normalized at $I_{FP}= 50mA$)
順電流
Forward Current(mA)

ジャンクション温度-相対光束特性
Junction Temperature vs Relative Luminous Flux

$I_{FP} = 50mA$

相対光束($T_J = 25°C$で正規化)
Relative Luminous Flux(a.u.)
(Normalized at $T_J = 25°C$)
ジャンクション温度
Junction Temperature(°C)

* 本特性は色温度2200K~4500K、演色性ランクR8000に対応しています。
The graphs above show the characteristics for 2200K~4500K, R8000 LEDs of this product.

FORWARD CURRENT CHARACTERISTICS / TEMPERATURE CHARACTERISTICS

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

* パルス駆動により測定しています。
The following graphs show the characteristics measured in pulse mode.
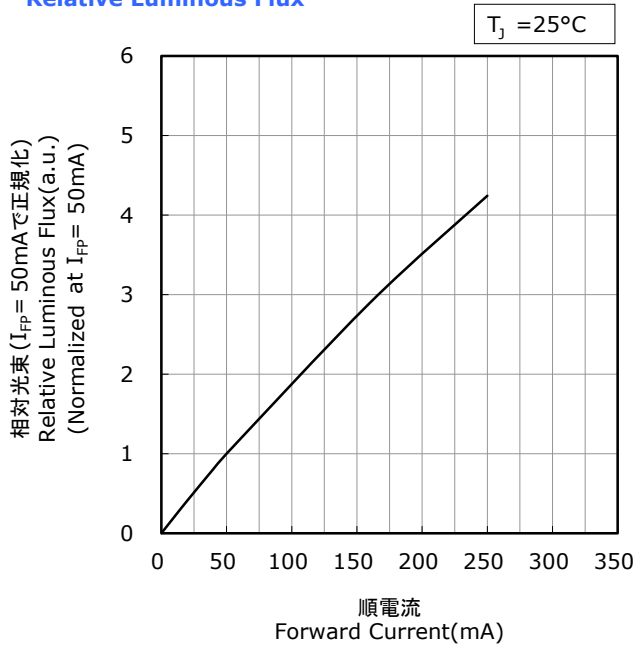
NF3W585AR
管理番号 No. STS-DA7-14055

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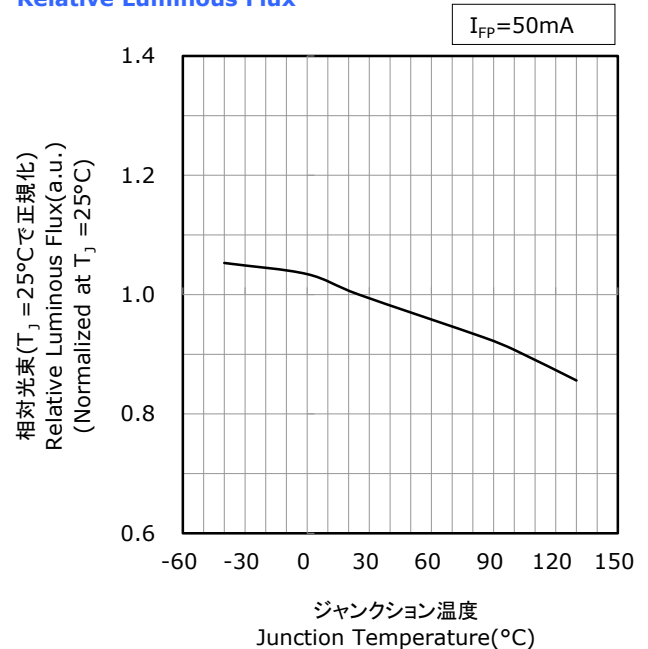**Forward Voltage vs Forward Current**

T_J =25°C

ジャンクション温度–順電圧特性
Junction Temperature vs Forward Voltage

I_{FP}=50mA

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

T_J =25°C

ジャンクション温度–相対光束特性
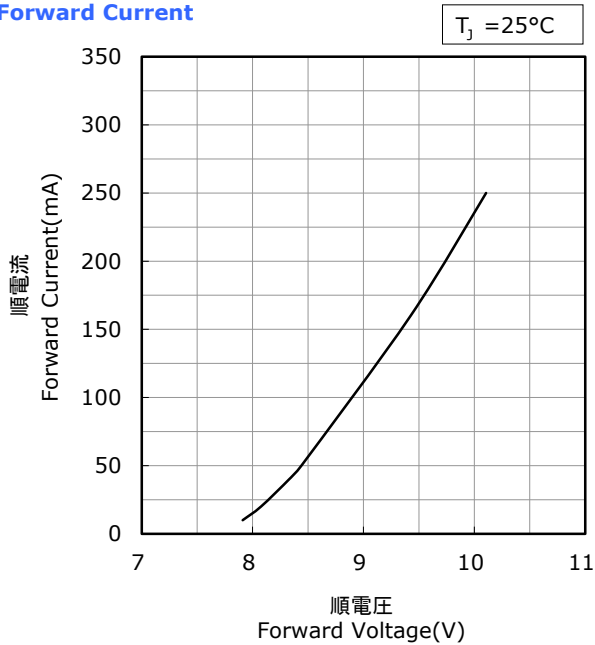**Junction Temperature vs Relative Luminous Flux**

I_{FP}=50mA

* 本特性は色温度5000K~6500K、演色性ランクR70に対応しています。
The graphs above show the characteristics for 5000K~6500K, R70 LEDs of this product.

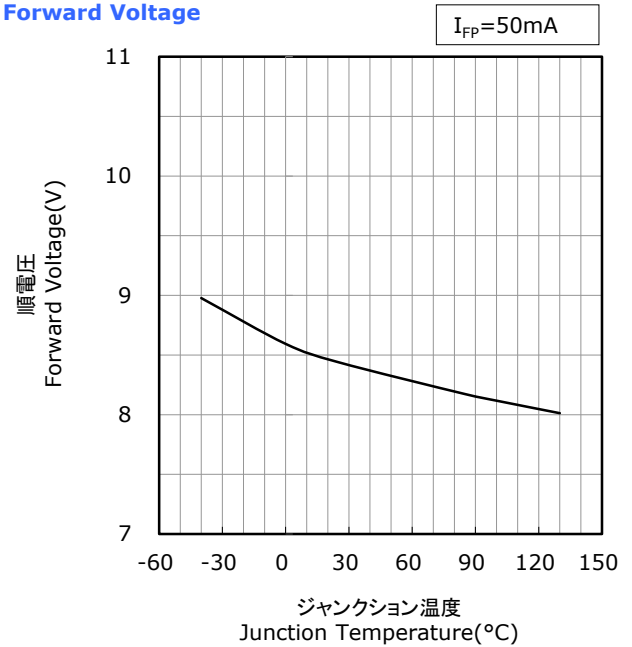# FORWARD CURRENT CHARACTERISTICS / TEMPERATURE CHARACTERISTICS

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

* パルス駆動により測定しています。
  The following graphs show the characteristics measured in pulse mode.
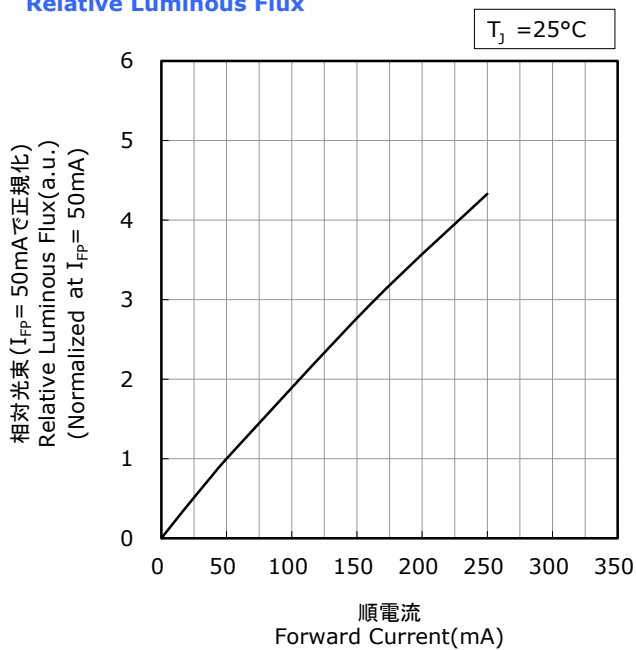
NF3W585AR
管理番号 No. STS-DA7-14056

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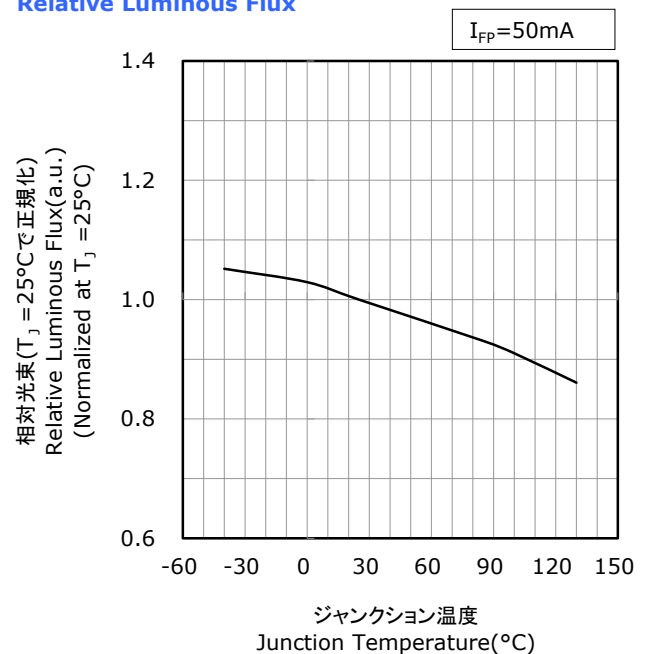**Forward Voltage vs Forward Current**

$T_J=25°C$

ジャンクション温度-順電圧特性
Junction Temperature vs Forward Voltage

$I_{FP}=50mA$

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

$T_J=25°C$

ジャンクション温度-相対光束特性
Junction Temperature vs Relative Luminous Flux

$I_{FP}=50mA$

* 本特性は色温度5000K~6500K、演色性ランクR8000に対応しています。
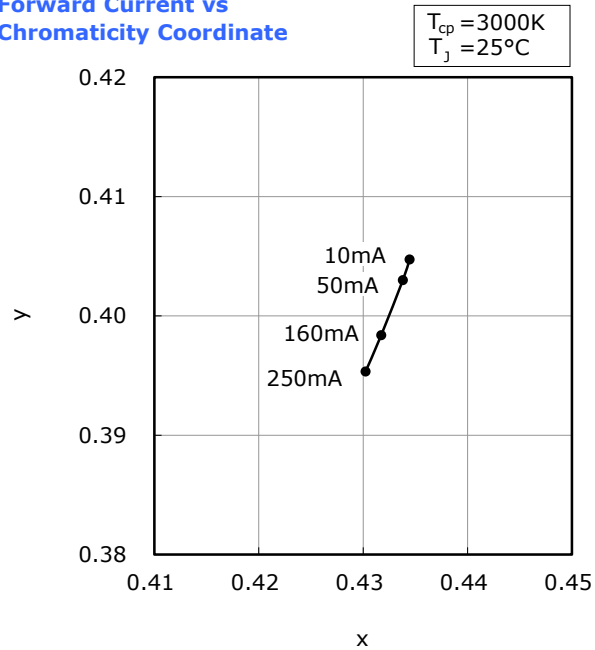 The graphs above show the characteristics for 5000K~6500K, R8000 LEDs of this product.

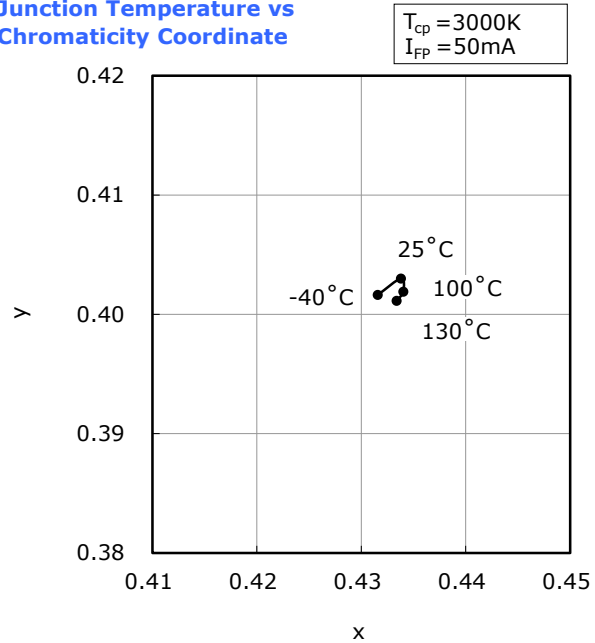# FORWARD CURRENT CHARACTERISTICS / TEMPERATURE CHARACTERISTICS

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

* パルス駆動により測定しています。
The following graphs show the characteristics measured in pulse mode.

NF3W585AR
管理番号 No. STS-DA7-14057

順電流−色度 特性
Forward Current vs
Chromaticity Coordinate

T_{cp} =3000K
T_J =25°C

10mA
50mA
160mA
250mA

y

x

ジャンクション温度−色度 特性
Junction Temperature vs
Chromaticity Coordinate

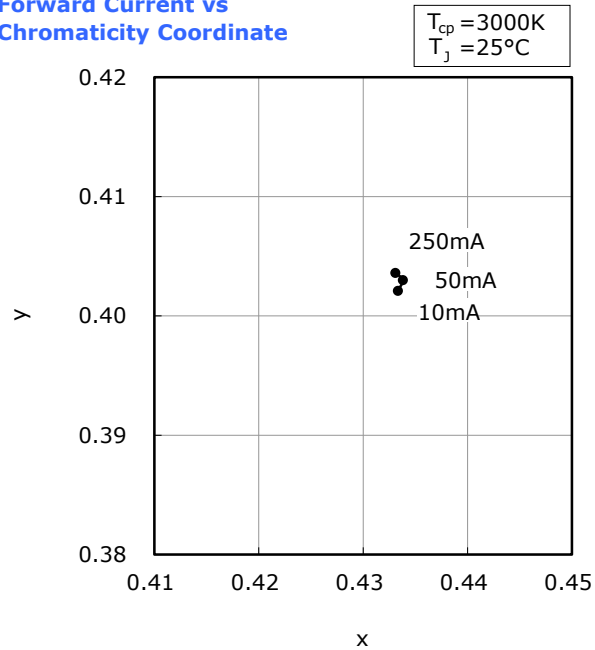T_{cp} =3000K
I_{FP} =50mA

25°C
-40°C   100°C
130°C

y

x

* 本特性は演色性ランクR70に対応しています。
The graphs above show the characteristics for R70 LEDs of this product.

FORWARD CURRENT CHARACTERISTICS / TEMPERATURE CHARACTERISTICS

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

* パルス駆動により測定しています。
   The following graphs show the characteristics measured in pulse mode.

順電流−色度 特性
Forward Current vs
Chromaticity Coordinate

$T_{cp} = 3000K$
$T_J = 25°C$

250mA
50mA
10mA

y

x

ジャンクション温度−色度 特性
Junction Temperature vs
Chromaticity Coordinate

$T_{cp} = 3000K$
$I_{FP} = 50mA$

-40°C
0°C
25°C
100°C
130°C

y

x

* 本特性は演色性ランクR8000に対応しています。
   The graphs above show the characteristics for R8000 LEDs of this product.

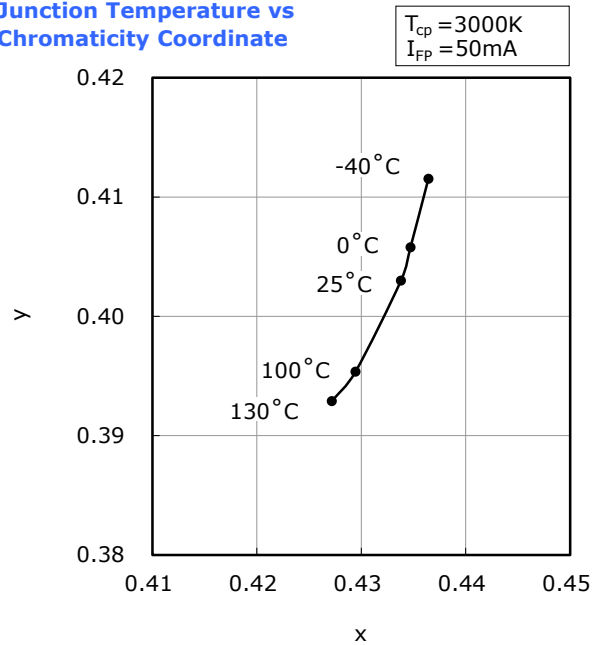# FORWARD CURRENT CHARACTERISTICS / TEMPERATURE CHARACTERISTICS

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

* パルス駆動により測定しています。
  The following graphs show the characteristics measured in pulse mode.

NF3W585AR
管理番号 No. STS-DA7-14059

順電流–色度 特性
Forward Current vs
Chromaticity Coordinate

T_{cp} =5000K
T_J =25°C

10mA
20mA
50mA
160mA
250mA

ジャンクション温度–色度 特性
Junction Temperature vs
Chromaticity Coordinate
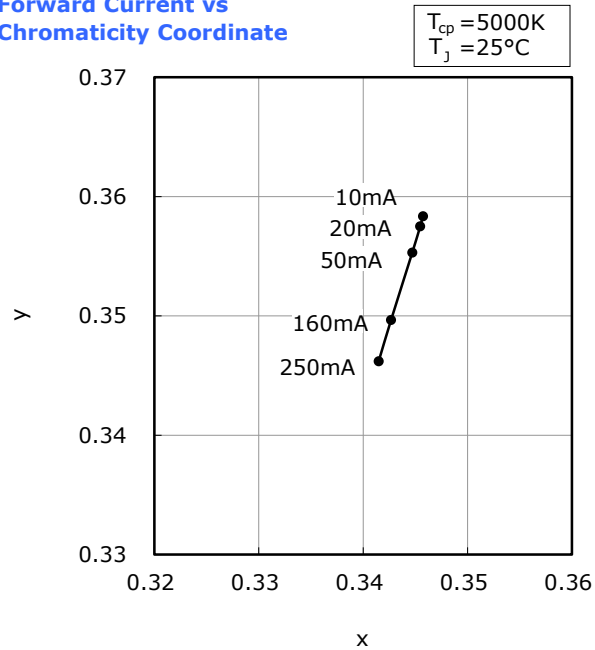
T_{cp} =5000K
I_{FP} =50mA

25°C
130°C
0°C
-40°C

* 本特性は演色性ランクR70に対応しています。
  The graphs above show the characteristics for R70 LEDs of this product.

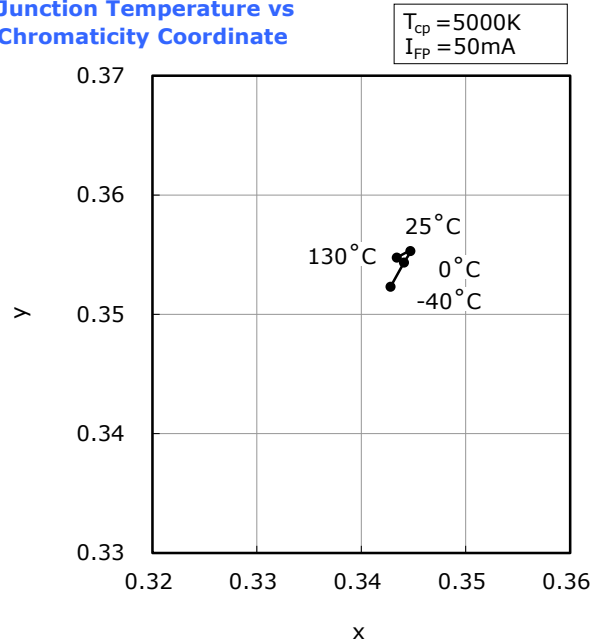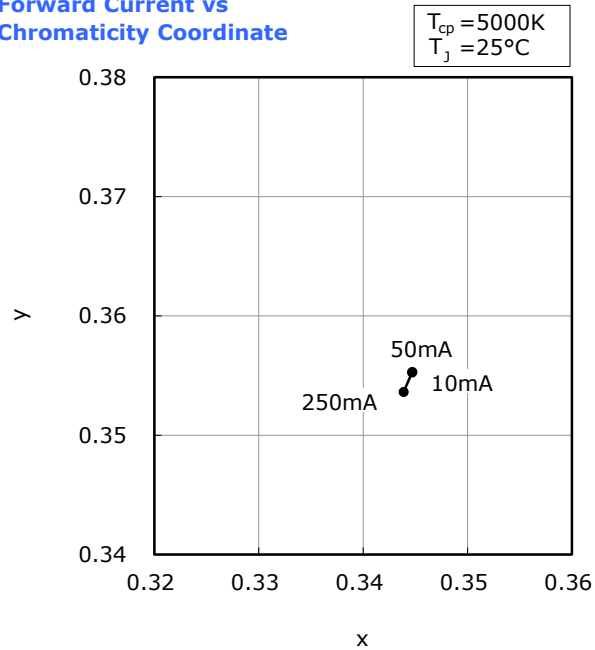# FORWARD CURRENT CHARACTERISTICS / TEMPERATURE CHARACTERISTICS

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

* パルス駆動により測定しています。
  The following graphs show the characteristics measured in pulse mode.

NF3W585AR
管理番号 No. STS-DA7-14060

順電流−色度 特性
**Forward Current vs
Chromaticity Coordinate**

T_{cp} =5000K
T_J =25°C

50mA
10mA
250mA

y

x

ジャンクション温度−色度 特性
**Junction Temperature vs
Chromaticity Coordinate**

T_{cp} =5000K
I_{FP} =50mA

-40°C
0°C
25°C
100°C
130°C

y

x
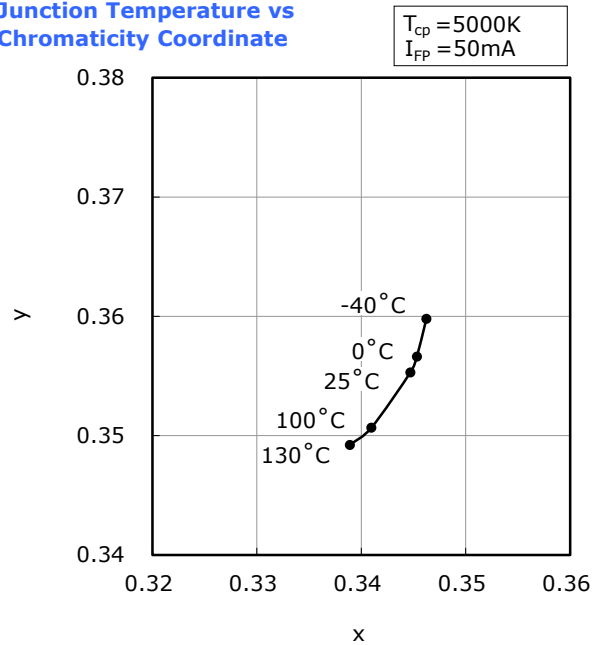
* 本特性は演色性ランクR8000に対応しています。
  The graphs above show the characteristics for R8000 LEDs of this product.

RELIABILITY

(1) Tests and Results

Test	Reference Standard	Test Conditions	Test Duration	Failure Criteria #	Units Failed/Tested
Resistance to Soldering Heat (Reflow Soldering)	JEITA ED-4701 300 301	T_{sld}=260°C, 10sec, 2reflows, Precondition: 30°C, 70%RH, 168hr		#1	0/22
Solderability (Reflow Soldering)	JEITA ED-4701 303 303A	T_{sld}=245±5°C, 5sec, Lead-free Solder(Sn-3.0Ag-0.5Cu)		#2	0/22
Temperature Cycle	JEITA ED-4701 100 105	-40°C(30min)~25°C(5min)~ 100°C(30min)~25°C(5min)	100cycles	#1	0/50
Moisture Resistance (Cyclic)	JEITA ED-4701 200 203	25°C~65°C~-10°C, 90%RH, 24hr per cycle	10cycles	#1	0/22
High Temperature Storage	JEITA ED-4701 200 201	T_A=100°C	1000hours	#1	0/22
Temperature Humidity Storage	JEITA ED-4701 100 103	T_A=60°C, RH=90%	1000hours	#1	0/22
Low Temperature Storage	JEITA ED-4701 200 202	T_A=-40°C	1000hours	#1	0/22
Room Temperature Operating Life Condition 1		T_A=25°C, I_F=50mA Test board: See NOTES below	1000hours	#1	0/22
Room Temperature Operating Life Condition 2		T_A=25°C, I_F=160mA Test board: See NOTES below	500hours	#1	0/22
High Temperature Operating Life		T_A=100°C, I_F=50mA Test board: See NOTES below	1000hours	#1	0/22
Temperature Humidity Operating Life		60°C, RH=90%, I_F=50mA Test board: See NOTES below	500hours	#1	0/22
Low Temperature Operating Life		T_A=-40°C, I_F=50mA Test board: See NOTES below	1000hours	#1	0/22
Vibration	JEITA ED-4701 400 403	200m/s^2, 100~2000~100Hz, 4cycles, 4min, each X, Y, Z	48minutes	#1	0/22
Electrostatic Discharges	JEITA ED-4701 300 304	HBM, 2kV, 1.5kΩ, 100pF, 3pulses, alternately positive or negative		#1	0/22
Soldering Joint Shear Strength	JEITA ED-4702B 002 3	5N, 10±1sec		#1	0/22

NOTES:

1) Test board: FR4 board thickness=1.6mm, copper layer thickness=0.07mm, $R_{\theta JA}$≈31°C/W

2) 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=50mA	>Initial value×1.1
	Luminous Flux(Φ_V)	I_F=50mA	<Initial value×0.7
#2	Solderability	-	Less than 95% solder coverage

CAUTIONS

(1) Storage

Conditions		Temperature	Humidity	Time
Storage	Before Opening Aluminum Bag	≤30°C	≤90%RH	Within 1 Year from Delivery Date
	After Opening Aluminum Bag	≤30°C	≤70%RH	≤168hours
Baking		65±5°C	-	≥24hours

● The storage/packaging requirements for this LED are comparable to JEDEC Moisture Sensitivity Level (MSL) 3 or equivalent. Nichia used IPC/JEDEC STD-020 as a reference to rate the MSL of this LED.

● This LED uses a package that could absorb moisture; if the package absorbs moisture and is exposed to heat during soldering, it may cause the moisture to vaporize and the package to expand and the resulting pressure may cause internal delamination. This may cause the optical characteristics to degrade. To minimize moisture absorption in storage/transit, moisture-proof aluminum bags are used for the LEDs with a silica gel packet to absorb any air moisture in the bag. The silica gel beads turn blue to red as they absorb moisture.

● Once the moisture-proof aluminum bag is open, ensure that the LED is soldered to a PCB within the range of the conditions above. To store any remaining unused LEDs, use a hermetically sealed container with silica gel desiccants. Nichia recommends placing them back to the original moisture-proof bag and reseal it.

● If the "After Opening" storage time has been exceeded or any pink silica gel beads are found, ensure that the LED are baked before use. Baking should only be done once.

● This LED has silver-plated parts both inside and outside of the package. If the LEDs are exposed to a corrosive environment, it may cause the plated surface to tarnish causing issues (i.e. solderability, optical characteristics). Ensure that when storing LEDs, a hermetically sealed container is used. Nichia recommends placing them back to the original moisture-proof bag and reseal it.

● Ensure that when designing, there are no issues with the parts/materials used with the LEDs. The following must be taken into consideration:
  - After soldering LEDs to a PCB and/or installing them in a system, it is possible that the LEDs will be exposed to corrosive gases released from parts/materials used with the LEDs in the same assembly/system (e.g. rubber materials, cardboard boxes) and/or gases entering from the outside; the plated surface may tarnish depending on the gas component.
  - Small amounts of corrosive gas may be found in the air.
  - Resin materials may contain substances (e.g. halogens) that affect the plated surfaces of the LEDs.

● To prevent substances/gases from affecting the plated surface, ensure that the parts/materials used with the LEDs in the same assembly/system do not contain sulfur (e.g. gasket/seal, adhesive, etc.). If the plating becomes extremely corroded or contaminated, it may cause issues (e.g. electrical connection failures). If a gasket/seal is used, silicone rubber gaskets/seals are recommended; ensure that this use of silicone does not result in issues (e.g. electrical connection failures) caused by low molecular weight volatile siloxane.

● To avoid condensation, the LEDs must not be stored in 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 over a long period of time where the temperature is higher than normal room temperature.

(2) Directions for Use

- The circuit must be designed to ensure that the Absolute Maximum Ratings are not exceeded for each LED. The LEDs should be operated at a constant current per LED. In the case of operating at a constant voltage, Circuit B is recommended. If Circuit A is used, it may cause the currents flowing through the LEDs to vary due to the variation in the forward voltage characteristics of the LEDs on the circuit.
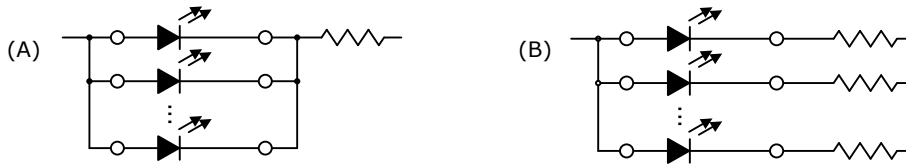
- This LED is designed to be operated at a forward current. Ensure that no voltage is applied to the LED in the forward/reverse direction while the LED is off. If the LEDs are used in an environment where reverse voltages are applied to the LED continuously, it may cause electrochemical migration to occur causing the LED to be damaged. When not in use for a long period of time, the system's power should be turned off to ensure that there are no issues/damage.
- To stabilize the LED characteristics while in use, Nichia recommends that the LEDs are operated at currents ≥ 10% of the sorting current.
- Ensure that transient excessive voltages (e.g. lighting surge) are not applied to the LEDs.
- If the LEDs are used for outdoor applications, ensure that necessary measures are taken (e.g. protecting the LEDs from water/salt damage and high humidity).

(3) 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.
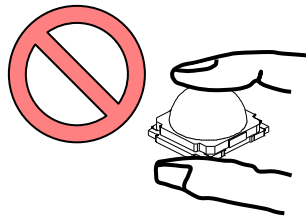
- Ensure that when handling the LEDs with tweezers, excessive force is not applied to the LED. Otherwise, it may cause damage to the resin (e.g. cut, scratch, chip, crack, delamination and deformation) and the wire to break causing a catastrophic failure (i.e. the LED not to illuminate).
- Ensure that when handling the LEDs with tweezers, the LED is held at the resin portion on the short sides. If the tweezers come in contact with the electrodes on the long sides, it may cause issues (e.g. deformation, electrical disconnection) resulting in a catastrophic failure (i.e. the LED not to illuminate).
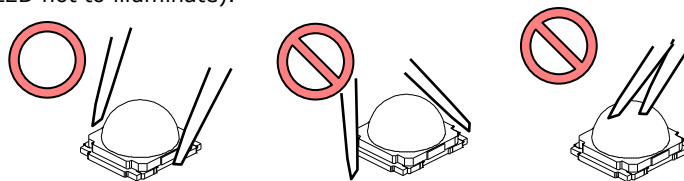
- Dropping may cause damage to the LED (e.g. deformation).
- Do not stack assembled PCBs together. Otherwise, it may cause damage to the resin (e.g. cut, scratch, chip, crack, delamination and deformation) and the wire to break causing a catastrophic failure (i.e. the LED not to illuminate).
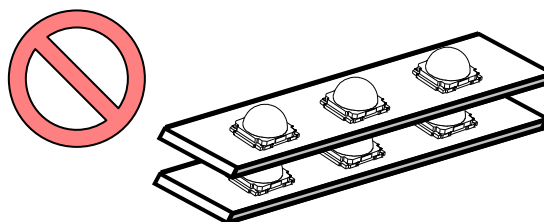
(4) Design Consideration

- If the LEDs are soldered to a PCB and the PCB assembly is bent (e.g. PCB depaneling process), it may cause the LED package to break. The PCB layout should be designed to minimize the mechanical stress on the LEDs when the PCB assembly is bent/warped.
- The amount of mechanical stress exerted on the LED from depaneling may vary depending on the LED position/orientation on the PCB assembly (e.g. especially in areas near V-groove scores). The PCB layout should be designed to minimize the mechanical stress on the LEDs when the PCB is separated into individual PCB assemblies.
- To separate a PCB populated with the LEDs, use a specially designed tool. Do not break the PCB by hand.
- Volatile organic compounds that have been released from materials present around the LEDs (e.g. housing, packing, adhesive, secondary lens, lens cover, etc.) may penetrate LED lens and/or internal pre-coating resin. If the LEDs are 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 and/or cause a color shift. In this case, ventilating the environment may improve the reduction in light output and/or color shift. Perform a light-up test of the chosen application for optical evaluation to ensure that there are no issues, especially if the LEDs are planned to be used in a hermetically sealed environment.

(5) 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. the LED to become dimmer or not to illuminate [i.e. catastrophic failure]). Ensure that when handling the LEDs, necessary measures are taken to protect them 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
- Ensure that all necessary measures are taken to prevent the LEDs from being exposed to transient excessive voltages (e.g. ESD, lightning surge):
    - tools, jigs, and machines that are used are properly grounded
    - appropriate ESD materials/equipment are used in the work area
    - the system/assembly is designed to provide ESD protection for the LEDs
- If the tool/equipment used is an insulator (e.g. glass cover, plastic, etc.), ensure that necessary measures have been taken to protect the LED from transient excessive voltages (e.g. ESD). The following examples are recommended measures to eliminate the charge:
    - Dissipating static charge with conductive materials
    - Preventing charge generation with moisture
    - Neutralizing the charge with ionizers
- To detect if an LED was damaged by transient excess voltages (i.e. an ESD event during the system's assembly process), perform a characteristics inspection (e.g. forward voltage measurement, light-up test) at low current (≤1mA).
- Failure Criteria: V_F<6.0V at I_F=0.5mA

    If the LED is damaged by transient excess voltages (e.g. ESD), it will cause:
    - the Forward Voltage (V_F) to decrease
    - the LED not to illuminate at a low current

(6) Thermal Management

- The Absolute Maximum Junction Temperature (T_J) must not be exceeded under any circumstances. The increase in the temperature of an LED while in operation may vary depending on the PCB thermal resistance and the density of LEDs on the PCB assembly. Ensure that when using the LEDs for the chosen application, heat is not concentrated in an area and properly managed in the system/assembly.

- The operating current should be determined by considering the temperature conditions surrounding the LED (i.e. T_A). Ensure that when operating the LED, proper measures are taken to dissipate the heat.

- The following equations can be used to calculate the LED temperature (i.e. T_J) once the saturation temperature at the junction has been reached.

　1) $T_J = T_A + R_{\theta JA} \cdot W$ 　　　　2) $T_J = T_S + R_{\theta JS} \cdot W$
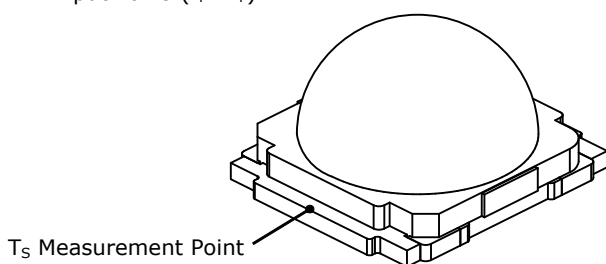
　　*T_J=LED Junction Temperature: °C

　　T_A=Ambient Temperature: °C

　　T_S=Soldering Temperature (Cathode Side): °C

　　$R_{\theta JA}$=Thermal Resistance from Junction to Ambient: °C/W

　　$R_{\theta JS}$=Thermal Resistance from Junction to T_S Measurement Point: °C/W

　　W=Input Power($I_F \times V_F$): W

T_S Measurement Point

(7) Cleaning

- Do not clean the LEDs with water, benzine and/or thinner.

- To clean the LEDs, use isopropyl alcohol (IPA). If another solvent is used, it may cause the LED package/resin to be damaged causing issues; ensure that sufficient verification is performed prior to use. Additionally, ensure that the solvent being used does not cause any other issues (e.g. CFC-based solvents are heavily regulated).

- If an LED is contaminated (e.g. dust/dirt), use a cloth soaked with isopropyl alcohol (IPA). Ensure that the cloth is firmly squeezed before wiping the LED.

- Do not clean the LEDs with an ultrasonic cleaner. If cleaning must be done, ensure that sufficient verification is performed by using a finished assembly with LEDs to determine cleaning conditions (e.g. ultrasonic power, LED position on the PCB assembly) that do not cause an issue.

(8) Eye Safety

- There may be two important international specifications that should be noted for safe use of the LEDs: IEC 62471:2006 Photobiological safety of lamps and lamp systems and IEC 60825-1:2001 (i.e. Edition 1.2) Safety of Laser Products - Part 1: Equipment Classification and Requirements. Ensure that when using the LEDs, there are no issues with the following points:
　- LEDs have been removed from the scope of IEC 60825-1 since IEC 60825-1:2007 (i.e. Edition 2.0) was published. However, depending on the country/region, there are cases where the requirements of the IEC 60825-1:2001 specifications or equivalent must be adhered to.
　- LEDs have been included in the scope of IEC 62471:2006 since the release of the specification in 2006.
　- Most Nichia LEDs will be classified as the Exempt Group or Risk Group 1 according to IEC 62471:2006. However, in the case of high-power LEDs containing blue wavelengths in the emission spectrum, there are LEDs that will be classified as Risk Group 2 depending on the characteristics (e.g. radiation flux, emission spectrum, directivity, etc.)
　- If the LED is used in a manner that produces an increased output or with an optic to collimate the light from the LED, it may cause damage to the human eye.

- If an LED is operated in a manner that emits a flashing light, it may cause health issues (e.g. visual stimuli causing eye discomfort). The system should be designed to ensure that there are no harmful effects on the human body.

(9) 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.).