NICHIA CORPORATION

SPECIFICATIONS FOR AUTOMOTIVE HEADLIGHT NICHIA LED MODULE

PART NO. NLSW03A04A

Applications

- RoHS Compliant
- IATF 16949 Compliant

This LED module is intended for use in digital micromirror device (DMD) systems. With a discrete LED component (i.e. P/N: NV3W470A) specifically designed to be used with DMDs, the LED module has an emission area optimal in size and structure (i.e. monolithic phosphor plate covering multiple LED die) for this application allowing for simple optical designs.

SPECIFICATIONS

(1) Absolute Maximum Ratings

Item	Symbol	Absolute Maximum Rating	Unit
Forward Current	I_F	5500	mA
Surge Forward Current	I_{FS}	7000	mA
Allowable Reverse Current	I_R	85	mA
Power Dissipation	P_D	71	W
Operating Temperature	T_{opr}	-40~125	°C
Storage Temperature	T_{stg}	-40~125	°C
Junction Temperature	T_J	150	°C

* Absolute Maximum Ratings at T_J=25°C.
* I_{FS} conditions with pulse width ≤0.01ms and duty cycle ≤0.5%.

(2) Initial Electrical/Optical Characteristics

Item		Symbol	Condition	Typ	Max	Unit
Forward Voltage		V_F	I_F=5000mA	10.8	-	V
Luminous Flux		Φ_v	I_F=5000mA	4000	-	lm
Average Luminance		L_v	I_F=5000mA	230	-	cd/mm^2
Chromaticity Coordinate	x	-	I_F=5000mA	0.322	-	-
	y		I_F=5000mA	0.335	-	
Thermal Resistance		$R_{\theta JB\_real}$	-	0.92	1.08	°C/W
		$R_{\theta JB\_el}$	-	0.72	0.82	

* Characteristics at T_J=25°C. The forward voltage, luminous flux, and the chromaticity coordinate are measured in a continuous square wave pulse mode with a pulse width of 0.05msec and a duty cycle of 1%.
* Luminous Flux value as per CIE 127:2007 standard.
* Chromaticity Coordinates as per CIE 1931 Chromaticity Chart.
* $R_{\theta JB}$ is the thermal resistance from junction to board (i.e. back of the PCB populated with the LED component).
* Thermal resistance values ($R_{\theta JB\_real}$) determined by considering the energy conversion efficiency(η_e=24%). Refer to JESD51.
* $R_{\theta JB\_el}$ is the thermal resistance when the thermal grease (i.e. P/N: G-779 manufactured by Shin-Etsu Chemical Co., Ltd. Thermal conductivity: 3.0W/m·K) is used. If a thermal film/sheet is used, the $R_{\theta JB\_el}$ will probably be larger than this $R_{\theta JB\_el}$ and Nichia will not guarantee the reliability of the LED modules.
* For more information about Nichia's thermal design requirements/suggestions, refer to CAUTIONS, (7) Thermal Management.

RANKS

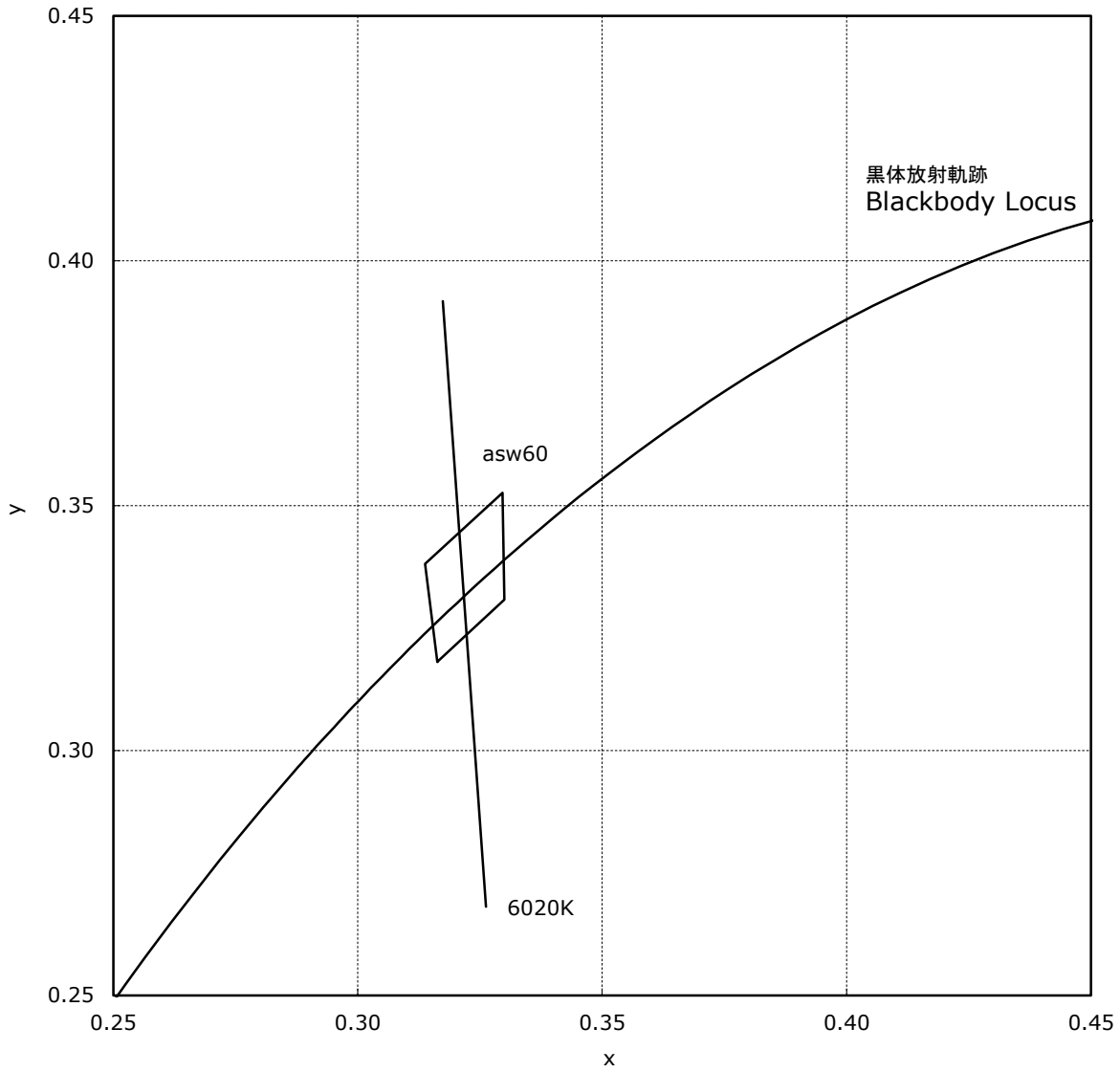
Item	Rank	Min	Max	Unit
Forward Voltage	-	8.5	12.5	V
Luminous Flux	J4000f2	4000	4300	lm
	J3700f2	3700	4000	

Color Rank

	Rank asw60			
x	0.3163	0.3138	0.3296	0.3300
y	0.3181	0.3381	0.3526	0.3308

* Ranks at T_J=25°C measured in a continuous square wave pulse mode with a pulse width of 0.05msec and a duty cycle of 1%.
* Forward Voltage Tolerance: ±0.13V
* Luminous Flux Tolerance: ±7%
* Chromaticity Coordinate Tolerance: ±0.005
* LED modules from the above ranks will be shipped. The rank combination ratio per shipment will be decided by Nichia.

CHROMATICITY DIAGRAM

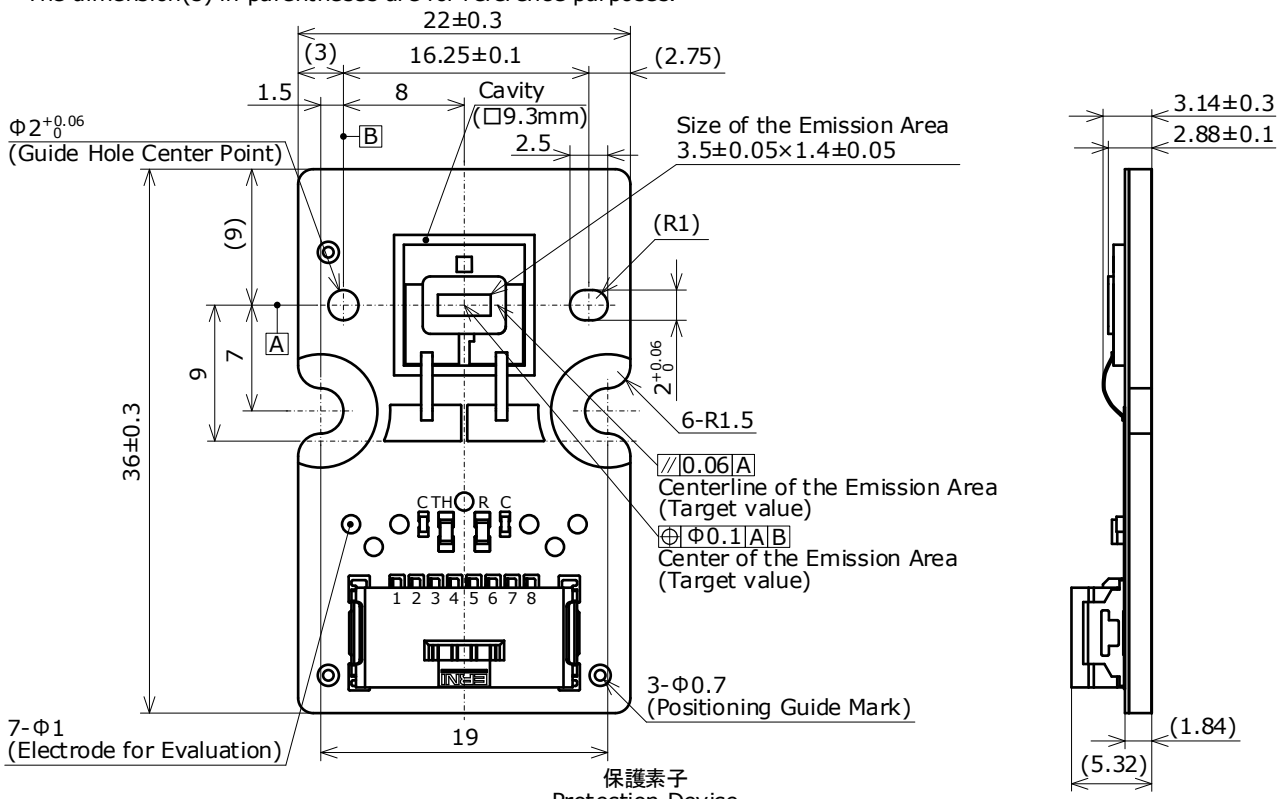


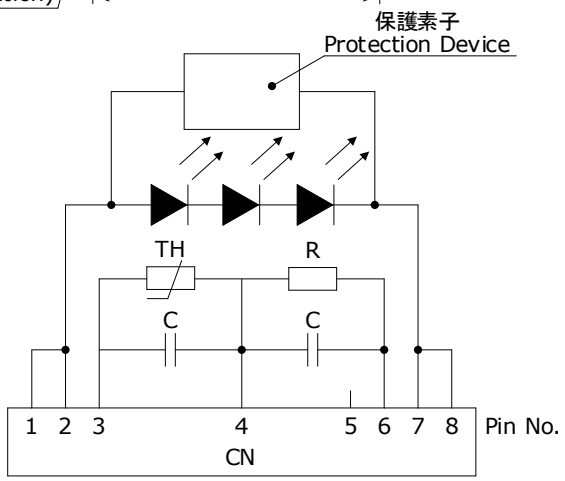
OUTLINE DIMENSIONS

＊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.

Part No. NLSW03A04A
No. STS-DA7-15547E

(単位 Unit: mm，公差 Tolerance: ±0.2)





品名 Model	供給元 Supplier	型名 Part Number	備考 Remarks
白色LED White LED	日亜化学工業株式会社 NICHIA CORPORATION	NV3W470A	-
基板 PCB	-	-	Material: Cu
チップコンデンサ(C) Chip Capacitor(C)	太陽誘電株式会社 TAIYO YUDEN CO., LTD.	UMK105B7103KVHF MCASU105SB7103KFNA01	C=0.01μF a) SIZE: 1005
サーミスタ(TH) Thermistor(TH)	パナソニック株式会社 Panasonic Corporation	ERTJ1VG103FM	R=10kΩ a) SIZE: 1608
チップ抵抗(R) Chip Resistor(R)	パナソニック株式会社 Panasonic Corporation	ERJS03F4301V	R=4.3kΩ a) (Luminous Flux Rank: J4000f2) SIZE: 1608
		ERJS03F6801V	R=6.8kΩ a) (Luminous Flux Rank: J3700f2) SIZE: 1608
コネクタ(CN) Connector(CN)	TE Connectivity (ERNI Electronics)	474811	-

＊T_A=25°Cでの値です。
Characteristics at T_A=25°C.
＊表面処理仕様 無電解Auメッキ、レジスト 黒色
Surface finish: Electroless Au plating, Color of the solder mask: Black
a)メーカー公称値です。
Manufacturer's nominal values.

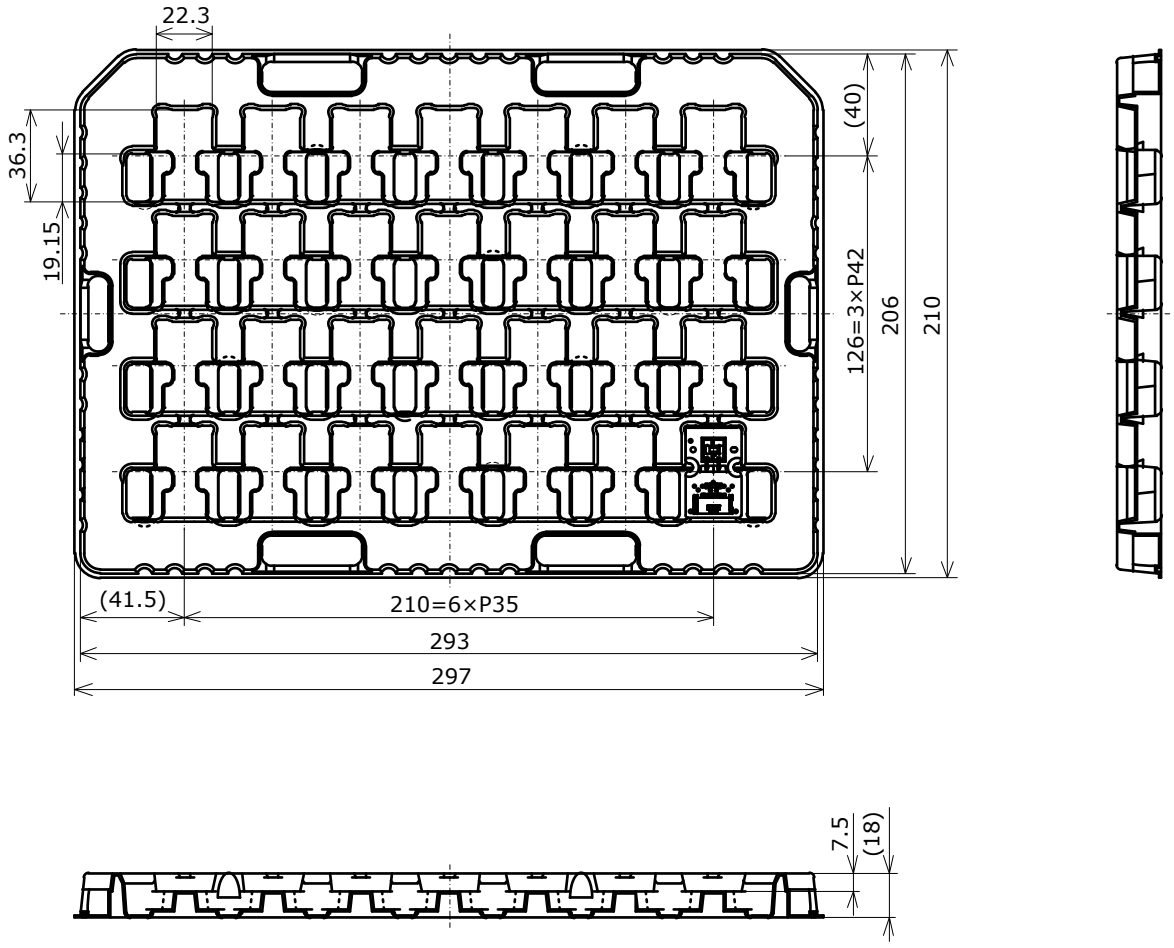
TRAY DIMENSIONS

＊ 数量は1トレイにつき 28個入りです。
Tray Size: 28pcs

＊ 寸法は参考です。
All dimensions shown are for reference only and are not guaranteed.

Part No. NLSW03A04A
No. STS-DA7-15940A

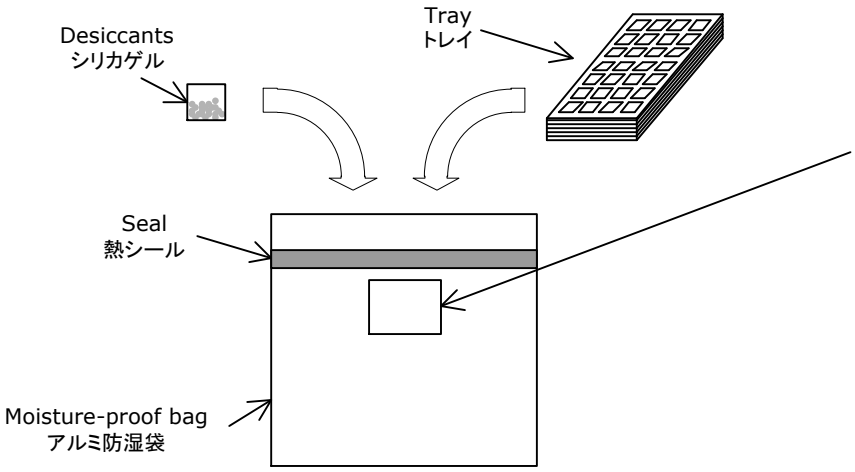
(単位 Unit: mm)



PACKAGING - TRAY PACK

Trays are shipped with desiccants in heat-sealed moisture-proof bags.
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。

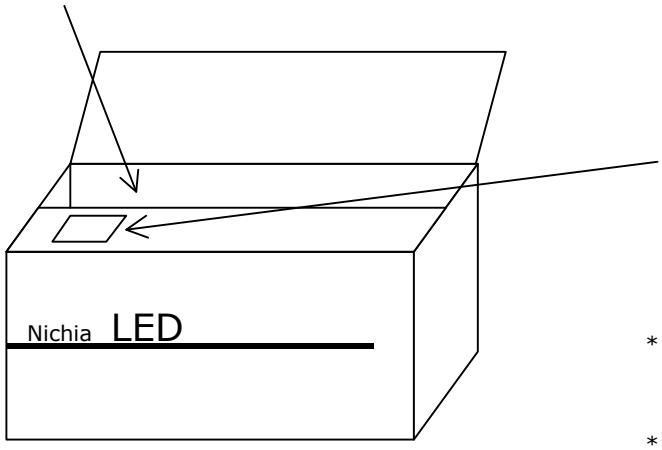
Part No. Nxxxxxxx
No. STS-DA7-15941



Label ラベル

NICHIA
PARTS FOR HEADLIGHT
PART NO.: Nxxxxxxx
****
LOT: YMxxxx-RRR
QTY.: PCS
RoHS
NICHIA CORPORATION 491 OKA, KAMINAKA, ANAN, TOKUSHIMA, JAPAN

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



Label ラベル

NICHIA
PARTS FOR HEADLIGHT
PART NO.: Nxxxxxxx
****
RANK: RRR
QTY.: PCS
RoHS
NICHIA CORPORATION
491 OKA, KAMINAKA, ANAN, TOKUSHIMA, JAPAN

* ******* is the customer part number.
If not provided, it will not be indicated on the 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。
* For details, see "LOT NUMBERING CODE" in this document.
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。

* Products shipped on trays are packed in a moisture-proof bag.
They are shipped in cardboard boxes to protect them from external forces during transportation.
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。
* Do not drop or expose the box to external forces as it may damage the products.
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 expose to water. The box is not water-resistant.
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。
* Using the original package material or equivalent in transit is recommended.
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。

LOT NUMBERING CODE

Lot Number is presented by using the following alphanumeric code.

YMxxxx - RRR

Y - Year

Year	Y
2022	M
2023	N
2024	O
2025	P
2026	Q
2027	R

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

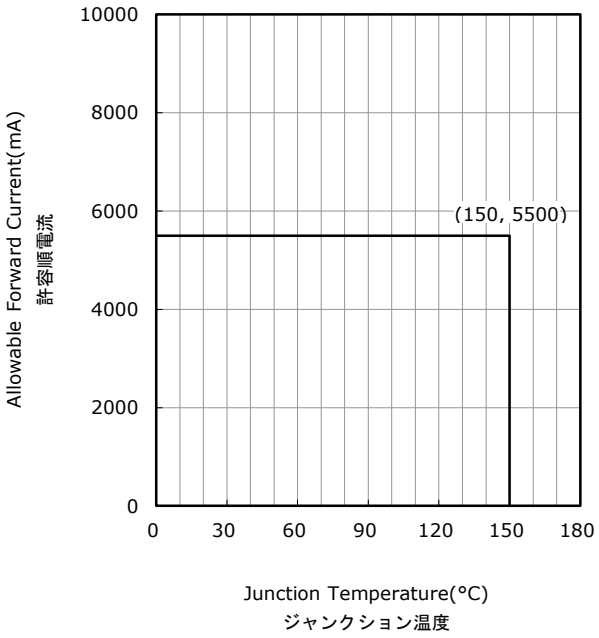
xxxx-Nichia's Product Number

RRR-Ranking by Luminous Flux, Ranking by Color Coordinates

DERATING CHARACTERISTICS

Part No. NLSW03A04A
No. STS-DA7-16026A

Junction Temperature vs Allowable Forward Current
ジャンクション温度-許容順電流特性

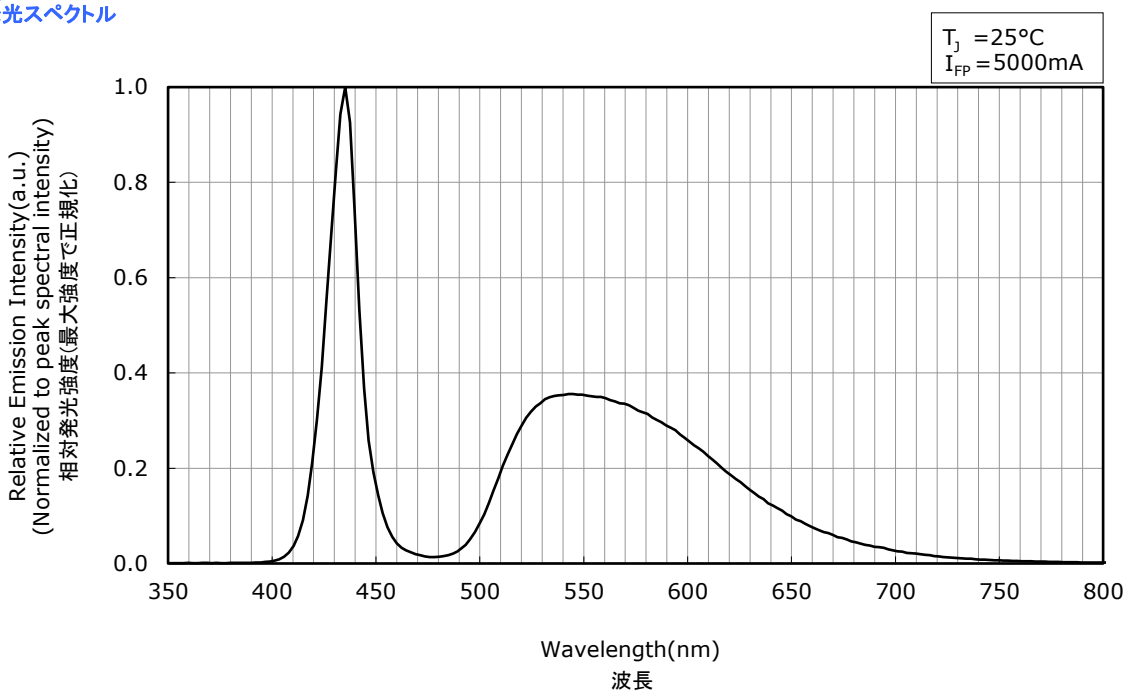


OPTICAL CHARACTERISTICS

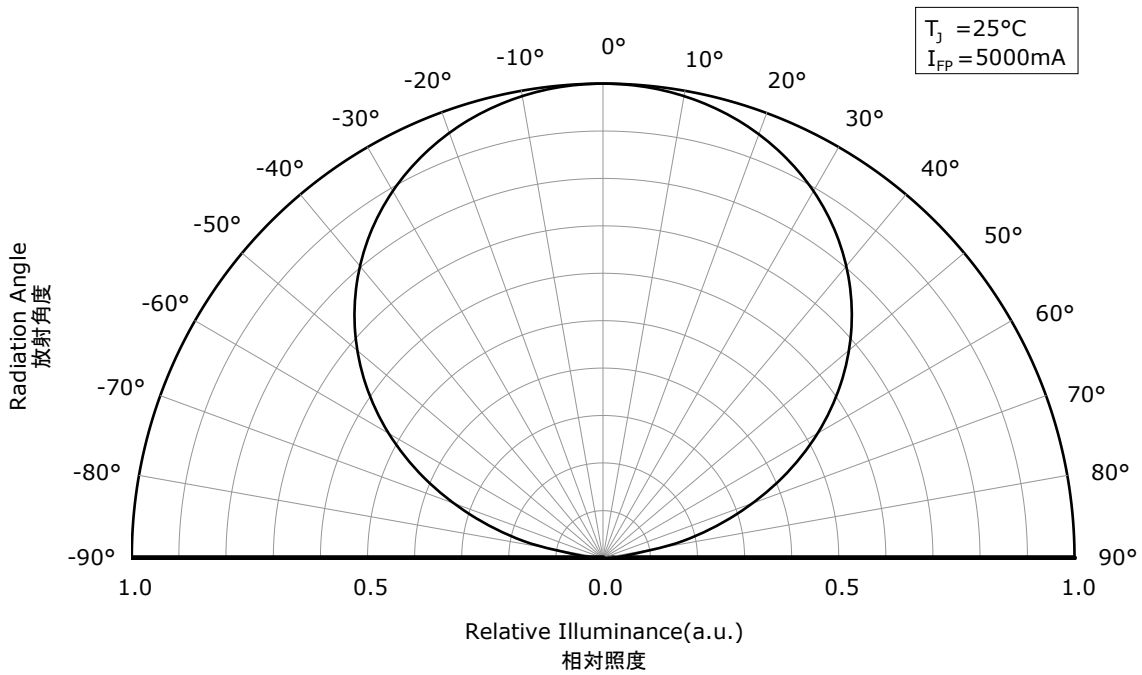
Part No. NLSW03A04A
No. STS-DA7-15548B

* All characteristics shown are for reference only and are not guaranteed.
  本特性は参考です。
* Characteristics measured in a continuous square wave pulse mode with a pulse width of 0.05msec and a duty cycle of 1%.
  パルス幅0.05msec、デューティー比1%の連続矩形波により測定しています。

Spectrum
発光スペクトル



Directivity
指向特性

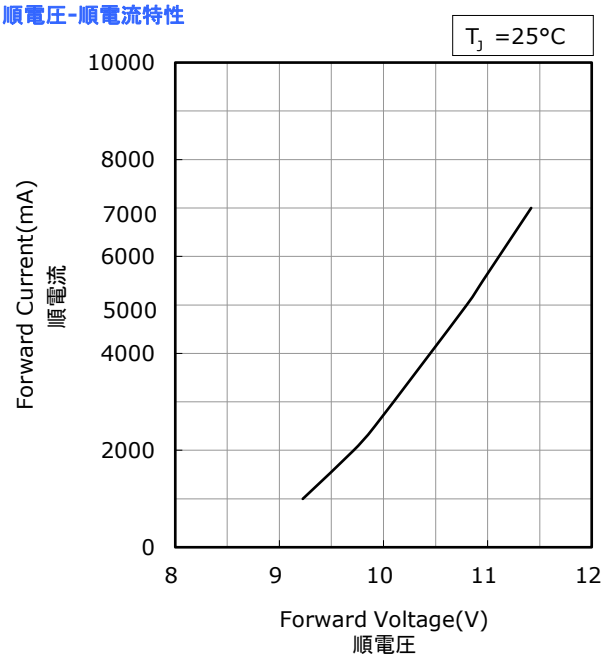


FORWARD CURRENT CHARACTERISTICS / TEMPERATURE CHARACTERISTICS

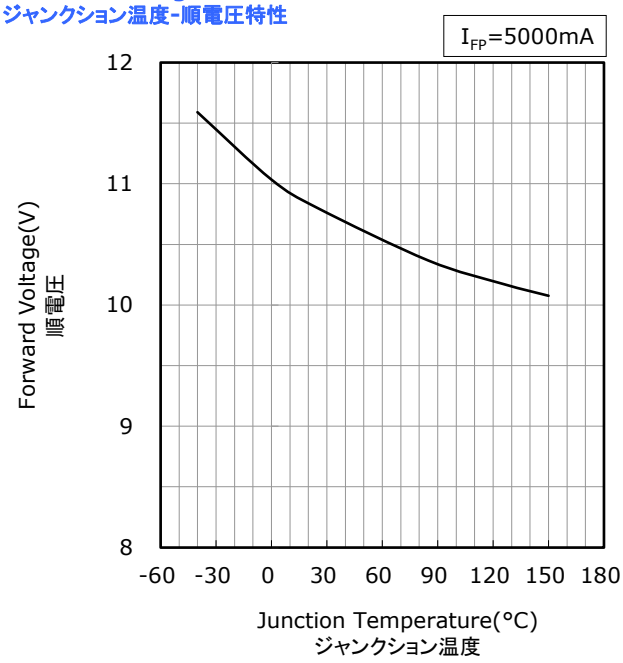
Part No. NLSW03A04A
No. STS-DA7-15549B

* All characteristics shown are for reference only and are not guaranteed.
本特性は参考です。
* Characteristics measured in a continuous square wave pulse mode with a pulse width of 0.05msec and a duty cycle of 1%.
パルス幅0.05msec、デューティー比1%の連続矩形波により測定しています。

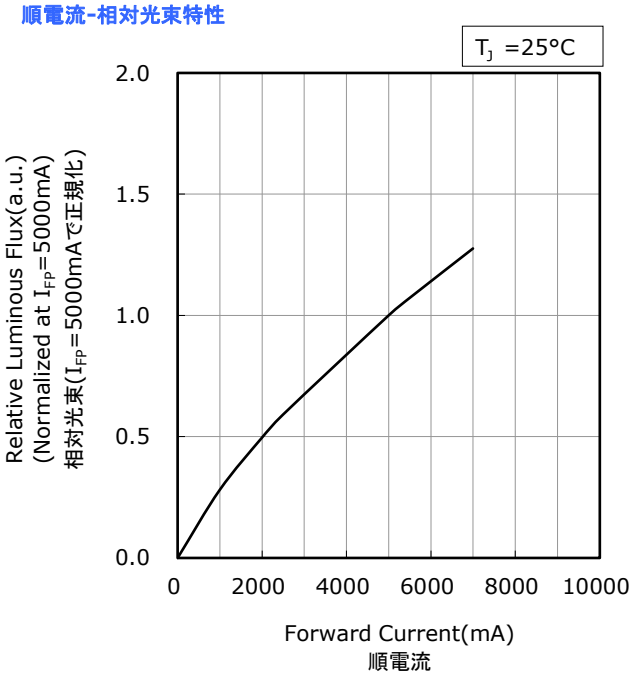
Forward Voltage vs Forward Current
順電圧-順電流特性



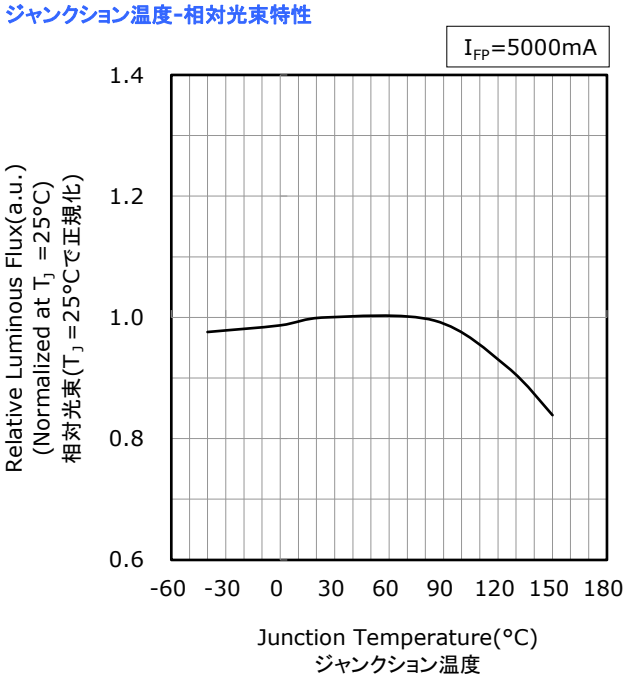
Junction Temperature vs Forward Voltage
ジャンクション温度-順電圧特性



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



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

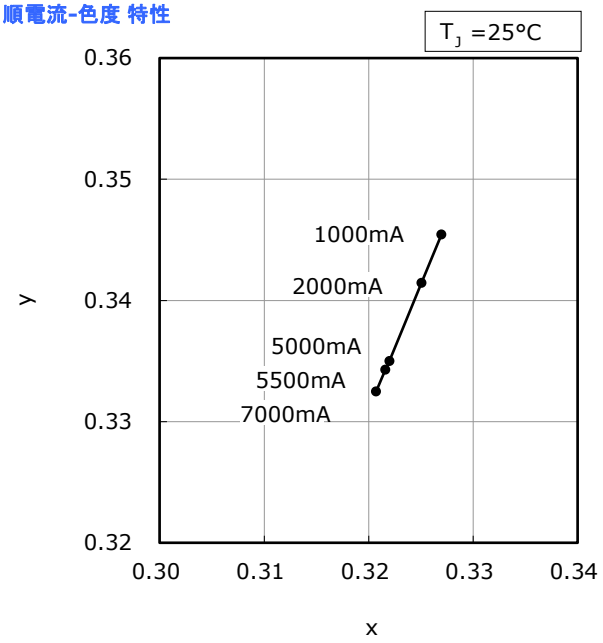


FORWARD CURRENT CHARACTERISTICS / TEMPERATURE CHARACTERISTICS

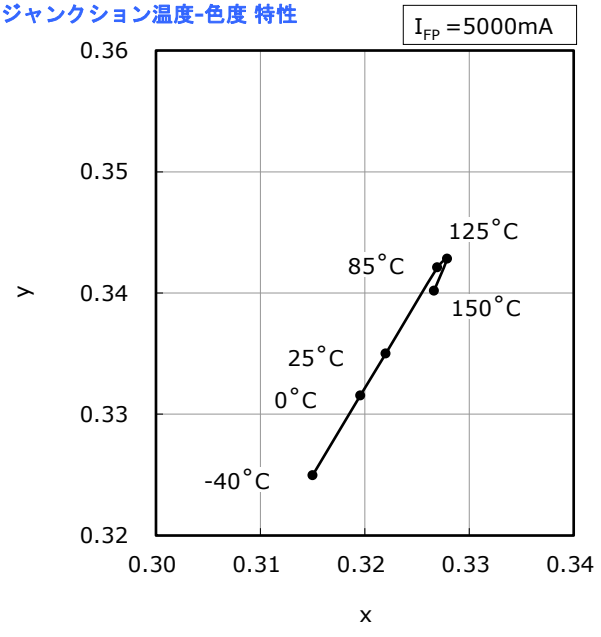
Part No. NLSW03A04A
No. STS-DA7-15550B

* All characteristics shown are for reference only and are not guaranteed.
本特性は参考です。
* Characteristics measured in a continuous square wave pulse mode with a pulse width of 0.05msec and a duty cycle of 1%.
パルス幅0.05msec、デューティー比1%の連続矩形波により測定しています。

Forward Current vs Chromaticity Coordinate
順電流-色度 特性



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



RELIABILITY

(1) Tests and Results

Test	Reference Standard	Test Conditions	Test Duration	Failure Criteria #	Units Failed/Tested
Thermal Shock(Air to Air)		-40°C to 125°C, 15min dwell	100cycles	#1	0/4
High Temperature Storage	JEITA ED-4701 200 201	T_A=125°C	1000hours	#1	0/4
Temperature Humidity Storage	JEITA ED-4701 100 103	T_A=85°C, RH=85%	1000hours	#1	0/4
Low Temperature Storage	JEITA ED-4701 200 202	T_A=-40°C	1000hours	#1	0/4
Room Temperature Operating Life		T_A=25°C, I_F=5500mA, T_J=150°C	1000hours	#1	0/4
High Temperature Operating Life	JEDEC JESD22-A101	T_A=125°C, I_F=1100mA, T_J=150°C	1000hours	#1	0/4
Temperature Humidity Operating Life	JEDEC JESD22-A101	85°C, RH=85%, I_F=4000mA, T_J=150°C	1000hours	#1	0/3
Low Temperature Operating Life	JEDEC JESD22-A108	T_A=-40°C, I_F=5500mA	1000hours	#1	0/4

NOTES:

1) The LED modules were attached to a heatsink for the operating life tests, secured with both screws and thermal grease:
   Thermal grease: G-779 (manufactured by Shin-Etsu Chemical Co., Ltd.)
   Screw: M2.6
   Tightening torque: 0.3N·m
2) Measurements are performed after allowing the LED modules to return to room temperature.

(2) Failure Criteria

Criteria #	Items	Conditions	Failure Criteria
#1	Forward Voltage(V_F)	I_F=5000mA	>U.S.L.×1.1
	Luminous Flux(Φ_V)	I_F=5000mA	<L.S.L.×0.7

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

CAUTIONS

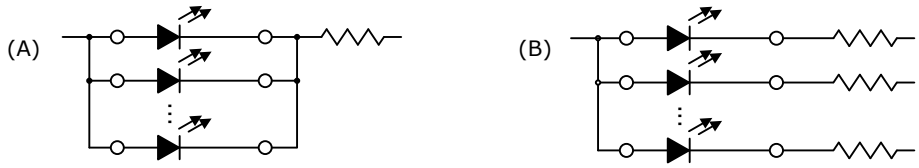
(1) Storage

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

- Once the moisture-proof aluminum bag is open, ensure that the LED module is assembled into a housing (i.e. mounted on a heatsink) within the range of the conditions above. To store any remaining unused LED modules, use a hermetically sealed container with silica gel desiccants. Nichia recommends placing them back to the original moisture-proof bag and reseal it.
- This LED module has metal parts (e.g. electrodes, plating, silver bonding material, bonding ribbons, solder joints, etc.). If those metal parts are exposed to a corrosive environment, it may cause them to tarnish causing issues. Once the moisture-proof bag is opened, the remaining unused LED modules must be stored in a hermetically sealed container. Nichia recommends placing them back to the original moisture-proof bag and reseal it.
- To prevent substances/gases from affecting the metal parts (e.g. electrodes, plating, silver bonding material, bonding ribbons, solder joints, etc.) ensure that the parts/materials (e.g. gasket/seal, adhesive, etc.) used with the LED modules in the same assembly/system do not contain sulfur. If those metal parts are 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 LED modules must not be stored in areas where temperature and humidity fluctuate greatly.
- Do not store the LED modules in a dusty environment.
- Do not expose the LED modules 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

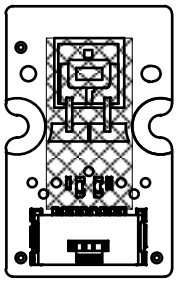
- The circuit must be designed to ensure that the Absolute Maximum Ratings are not exceeded for each LED module. The LED modules should be operated at a constant current per LED module. In the case of operating at a constant voltage, Circuit B is recommended. If Circuit A is used, it may cause the currents flowing through the LED modules to vary due to the variation in the forward voltage characteristics of the LED modules on the circuit.



- The LED component used within this LED module is designed to be operated at a forward current. Ensure that no voltage is applied to the LED module in the forward/reverse direction while the LED module is off. If the LED modules are used in an environment where reverse voltages are applied to the LED module continuously, it may cause electrochemical migration to occur causing the LED module 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 module characteristics while in use, Nichia recommends that the LED modules are operated at currents ≥10% of the sorting current.
- Ensure that transient excessive voltages (e.g. lightning surge) are not applied to the LED modules.
- If the LED modules are used for outdoor applications, ensure that necessary measures are taken (e.g. protecting the LED modules from water/salt damage and high humidity).

(3) Handling Precautions

- Do not touch any placed components/objects in the prohibited area (i.e. LED component, electronic components, area covered with the black resin). This may cause the LED module to malfunction (e.g. the LED module not to illuminate). For details on where the prohibited area is, see the figure below.
- Do not apply an external force ≥10.45N to the connector. This may cause the LED module to malfunction.
- Nichia strongly recommends that the LED modules are picked up by the sides of the connector.
- Do not handle the LED modules with bare hands:
  - this may contaminate the surface and have an effect on the optical characteristics,
  - this may cause static electricity to build up leading to a malfunction (e.g. causing the LED module not to illuminate).
- Ensure that when handling the LED modules with tweezers, excessive force is not applied to the LED module. Otherwise, it may cause damage to the resin of the LED module (e.g. cut, scratch, chip, crack, delamination and deformation) and the internal connection to fail causing a catastrophic failure (i.e. the LED module not to illuminate).
- Dropping may damage the LED module leading to a malfunction (e.g. causing the LED module not to illuminate).
- Do not stack the LED modules on top of one another, regardless of whether the LED modules are attached to heatsinks or not. Otherwise, it may cause the LED modules (e.g. connector, components, solder joints, bonding ribbons, electrodes, etc.) to be damaged, chipped, cracked, and/or deformed leading to malfunction or disconnection of the LED component/other components, and in some cases causing the LED module not to illuminate.



Prohibited Area

(4) Assembly Precautions

- When securing the LED module to a heatsink, insert both screws into the holes and partially tighten them, then fully tighten them. If an excessive torque is used, it may cause the LED module to deform, the plating to delaminate, and in some cases, the LED module may not illuminate.
- Ensure that an appropriate screw size is used. Nichia recommends using M2.6 screws. For the details, refer to the OUTLINE DIMENSIONS section. During assembly, do not touch the LED component or the other component parts.
- Once the screws have been fully tightened, do not remove or loosen them. This may cause the plating to delaminate.
- During and after inserting a connector (i.e. receptacle) into the connector on the LED module (i.e. the plug), ensure that excessive external force is not applied to the plug; it may cause the plug to be damaged.
- Ensure that excessive force is not applied to the cable harness. Otherwise, this may cause the connector to become damaged and/or detached from the PCB.

(5) Design Consideration

- Volatile organic compounds that have been released from materials present around the LED modules (e.g. housing, gasket/seal, adhesive, secondary lens, lens cover, grease, etc.) may penetrate the LED module emitting surface. If the LED modules are being used in a hermetically/near-hermetically sealed environment, these volatile compounds can discolor after being exposed to heat and/or photon energy and it may greatly reduce the LED module 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 prior to use to ensure that there are no issues, this test should be performed taking into consideration the conditions/environments in which the end-product containing these LED modules will actually be used.

(6) Electrostatic Discharge (ESD)

- The LED component used within this LED module is sensitive to transient excessive voltages (e.g. ESD, lightning surge). If this excessive voltage occurs in the circuit, it may cause the LED module to be damaged causing issues (e.g. the LED module to become dimmer or not to illuminate [i.e. catastrophic failure]). Ensure that when handling the LED modules, 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 LED modules 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 LED modules
- 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 modules 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 module 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 module is damaged by transient excess voltages (e.g. ESD), it will cause:
  - the Forward Voltage (V_F) to decrease
  - the LED module not to illuminate at a low current

(7) Thermal Management

- The Absolute Maximum Junction Temperature (T_J) must not be exceeded under any circumstances. The increase in the temperature of the LED modules while in operation may vary depending on the material of the heatsink being used and other conditions (e.g. with/without a cooling fan). Ensure that when using the LED modules 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 module (i.e. T_A). Ensure that when operating the LED modules, proper measures are taken to dissipate the heat.
- Ensure that there are no holes/openings and/or cavities/recesses on the surface of the housing/heatsink to attach the LED modules and if necessary, the surface is leveled before mounting the LED modules.
- Nichia recommends using thermal grease (i.e. P/N: G-779 manufactured by Shin-Etsu Chemical Co., Ltd. Thermal conductivity: 3.0W/m·K) for the interface between the LED module and housing/heatsink. If the LED modules are attached to a housing/heatsink without a thermal interface material, it may cause the heat dissipation to decrease resulting in the LED modules failing to meet the specifications; additionally, if a thermal film/sheet is used as the thermal interface material, the $R_{\theta JB\_el}$ will probably be larger than the specified $R_{\theta JB\_el}$ and Nichia will not guarantee the reliability of the LED modules.
- When applying the recommended thermal grease, the thermal grease should be applied evenly and in a manner that covers the entire back surface of the LED module to ensure effective heat dissipation.
- The following equation can be used to calculate the LED component junction temperature once the saturation temperature at the junction has been reached:

$T_J=T_{TH}+R_{\theta JTH}\cdot W$

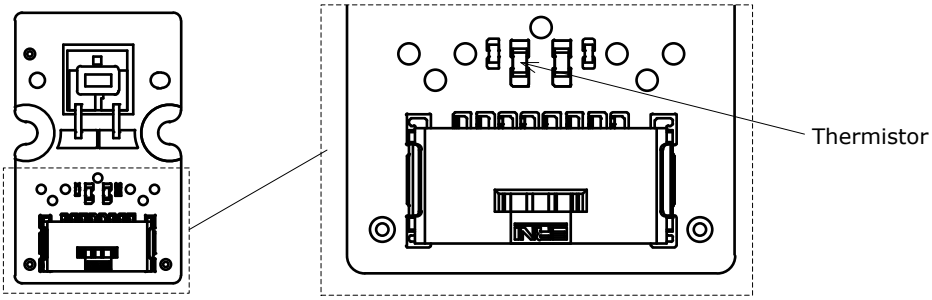
*T_J= LED component junction temperature: °C

T_{TH}=Thermistor temperature: °C

$R_{\theta JTH}$=Thermal Resistance from Junction to T_{TH} Measurement Point: °C/W

Note: The $R_{\theta JTH}$ will vary depending on the LED module operating current (I_F).

W=Input Power (I_FxV_F) when the saturation temperature at the junction has been reached: W



LED Module Operating Current	$R_{\theta JTH}$ (°C/W)
I_F=5A	1.64
I_F=4.5A	1.68
I_F=4A	1.71
I_F=3.5A	1.74
I_F=3A	1.77
I_F=2.5A	1.78

How to determine the T_{TH}

1. Apply a very low pulse current to the thermistor.
   Recommended current: 0.1mA
2. Measure the voltage drop across the thermistor.
3. Calculate the resistance of the thermistor (i.e. R_{TH}) using $R_{TH}(\Omega)=V(V)/I(A)$.
4. Determine the T_{TH} using the resistance vs. temperature characteristics of the thermistor (P/N: ERTJ1VG103FM manufactured by Panasonic Corporation) and the calculated R_{TH}.

(8) 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, 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. Proceed with caution when viewing directly any LEDs driven at high current or viewing LEDs with optical instruments which may greatly increase the damage to human eyes.
- Viewing a flashing light may cause eye discomfort. When incorporating the LED module into chosen application, be careful to avoid adverse effects on the human body caused by light stimulation.

(9) Miscellaneous

- Nichia warrants that the discrete LED modules will meet the requirements/criteria as detailed in the Reliability section within this specification. If the LED modules 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 LED modules 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 module 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 module in question is not disassembled or removed from the heatsink/system if it has been attached to the heatsink/system. If a breach of this warranty is proved, Nichia will provide the replacement for the non-conforming LED module 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 module is intended to be used for general lighting, household appliances, electronic devices (e.g. mobile communication devices) and automobiles; it is not designed or manufactured for use in applications that require safety critical functions (e.g. aircraft, combustion equipment, life support systems, nuclear reactor control system, safety devices, spacecraft, submarine repeaters, traffic control equipment, trains, vessels, etc.). If the LED modules are planned to be used for these applications, unless otherwise detailed in the specification, Nichia will neither guarantee that the LED module is fit for that purpose nor be responsible for any resulting property damage, injuries and/or loss of life/health.
- The customer will not reverse engineer, disassemble or otherwise attempt to extract knowledge/design information from the LED module.
- All copyrights and other intellectual property rights in this specification in any form are reserved by Nichia or the right holders who have granted Nichia permission to use the content. Without prior written permission from Nichia, no part of this specification may be reproduced in any form or by any means.
- Both the customer and Nichia will agree on the official specifications for the supplied LED modules before any programs are officially launched. Without this agreement in writing (i.e. Customer Specific Specification), changes to the content of this specification may occur without notice (e.g. changes to the foregoing specifications and appearance, discontinuation of the LED modules, etc.).