

# Data sheet

Part number : VFHA1104LS-TR



2011/65/EU, (EU)2015/863  
10 Substances regulation compliant



Lead-free solder heat resistant product

Package	PLCC-2 package Outer dimension 3.5 x 2.8 x 1.9mm ( L x W x H )
Product features	<ul style="list-style-type: none"> <li>•Wide range temperature applicable product</li> <li>•High reliability (for automotive applications and other high-reliability required applications)</li> <li>•Lead-free soldering compatible</li> <li>•RoHS: 2011/65/EU, (EU)2015/863 compliant</li> </ul>

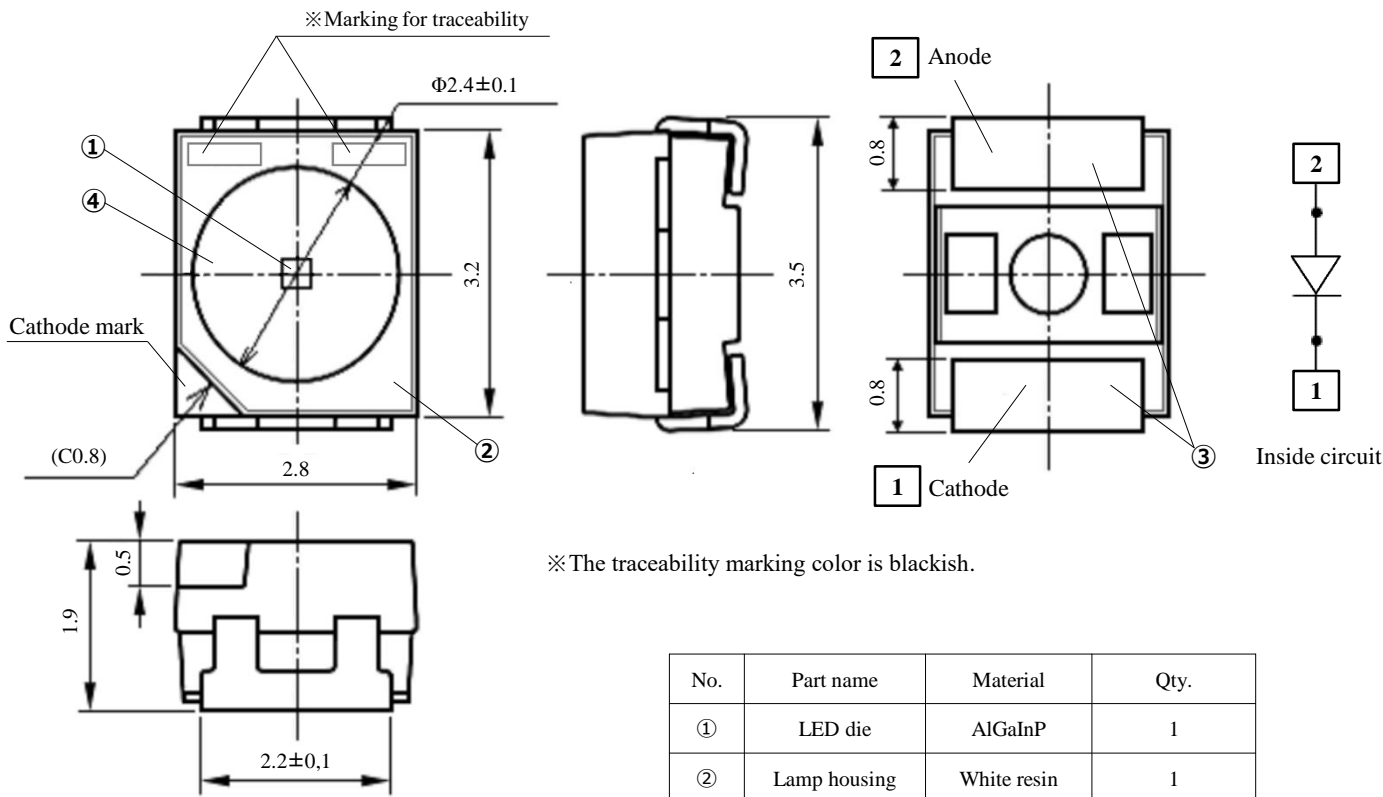
## Recommended applications

- Automotive interior: Switch and buttons , meter panel, car audio , HVAC, other various indicator etc.

Outline dimensions

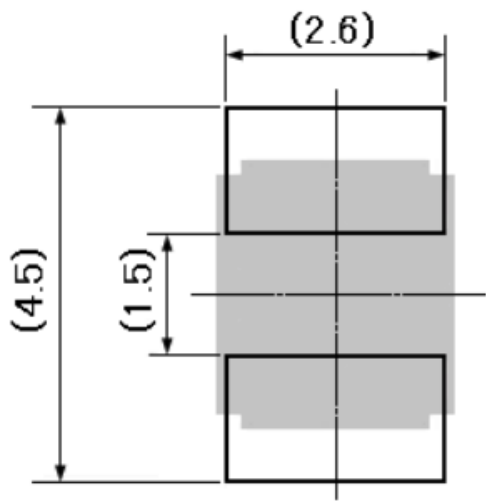
VFHA1104LS-TR

Unit : mm  
Weight : 33mg  
Tolerance : ±0.2



Recommended soldering pattern

Unit : mm



## Specifications

## VFHA1104LS-TR

## 【 Product Overview 】

Die Material	AlGaInP
Emitting Color	Orange
Resin Color (Emitting Area)	Water Clear
Resin Color (Lamp Housing)	White

## 【 Absolute Maximum Ratings 】

(Ta=25°C)

ITEM	SYMBOL	MAXIMUM RATINGS	UNITS	
Power Dissipation	Pd	78	mW	
Forward Current	I <sub>F</sub>	30	mA	
Repetitive Peak Forward Current "10ms,1/20duty"	I <sub>FRM</sub>	100	mA	
I <sub>F</sub> Derate Linearly from "85°C"	ΔI <sub>F</sub>	0.86	mA/°C	
I <sub>FRM</sub> Derate Linearly from "85°C"	ΔI <sub>FRM</sub>	2.86	mA/°C	
Allowable Reverse Voltage	V <sub>R</sub>	5	V	
Operating Temperature	T <sub>opr</sub>	-40 to +100	°C	
Storage Temperature	T <sub>stg</sub>	-40 to +120	°C	
Electrostatic Discharge Threshold "HBM"	ESD	1,000	V	Note1
Soldering Temperature "Reflow Soldering"	T <sub>sld</sub>	260	°C	Note2

Note 1 ESD testing method : EIAJ4701/300(304) Human Body Model(HBM) 1.5kΩ,100pF

Note 2 Please refer to page 8, Soldering conditions.

## 【 Thermal Characteristics 】

(Ta=25°C)

ITEM	SYMBOL	TYP.	MAX.	UNITS	
Thermal Resistance 【Junction - Ambient】	R <sub>th(j-a)</sub>	350	-	°C/W	Note3
Thermal Resistance 【Junction - Solder point】	R <sub>th(j-s)</sub>	200	-	°C/W	
Junction Temperature	T <sub>j</sub>	-	120	°C/W	

Notes3 Rth(j-a) Measurement Condition  
Substrate:FR-4 ( t=1.6mm )  
Pattern Size : 16mm<sup>2</sup>

# Specifications

# VFHA1104LS-TR

## 【 Electro-Optical Characteristics 】

(Ta=25°C)

ITEM	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS	
Forward Voltage	$V_F$	$I_F = 20\text{mA}$	-	2.0	2.5	V	Notes 4
Reverse Current	$I_R$	$V_R = 5\text{V}$	-	-	100	$\mu\text{A}$	
Luminous Intensity	$I_V$	$I_F = 20\text{mA}$	120	170	220	mcd	Notes 5
Luminous Flux	$\Phi_V$	$I_F = 20\text{mA}$	-	0.54	-	lm	
Peak Wavelength	$\lambda_p$	$I_F = 20\text{mA}$	-	610	-	nm	
Dominant Wavelength	$\lambda_d$	$I_F = 20\text{mA}$	603	606	609	nm	Notes 6
Spectral line Half Width	$\Delta\lambda$	$I_F = 20\text{mA}$	-	20	-	nm	
Half Intensity Angle	$\Delta\theta_x$	$I_F = 20\text{mA}$	-	120	-	deg.	Notes 7
	$\Delta\theta_y$		-	120	-		

Notes 4 【Tolerance :  $\pm 0.1\text{V}$ 】

Notes 5,6 Please refer to following each sorting chart.

Above the table of Luminous Intensity ( $I_V$ ) values and Dominant Wavelength ( $\lambda_d$ ) values are the setup value of the selection machine. 【Tolerance :  $I_V \pm 10\%$ 、 $\lambda_d \pm 1\text{nm}$ 】

Notes 7 Viewing Angle at 50%  $I_V$ ,  $\Delta\theta_x$ ; Housing long side axis,  $\Delta\theta_y$ ; Housing short side axis

## 【 Sorting Chart for Luminous Intensity and Dominant Wavelength 】

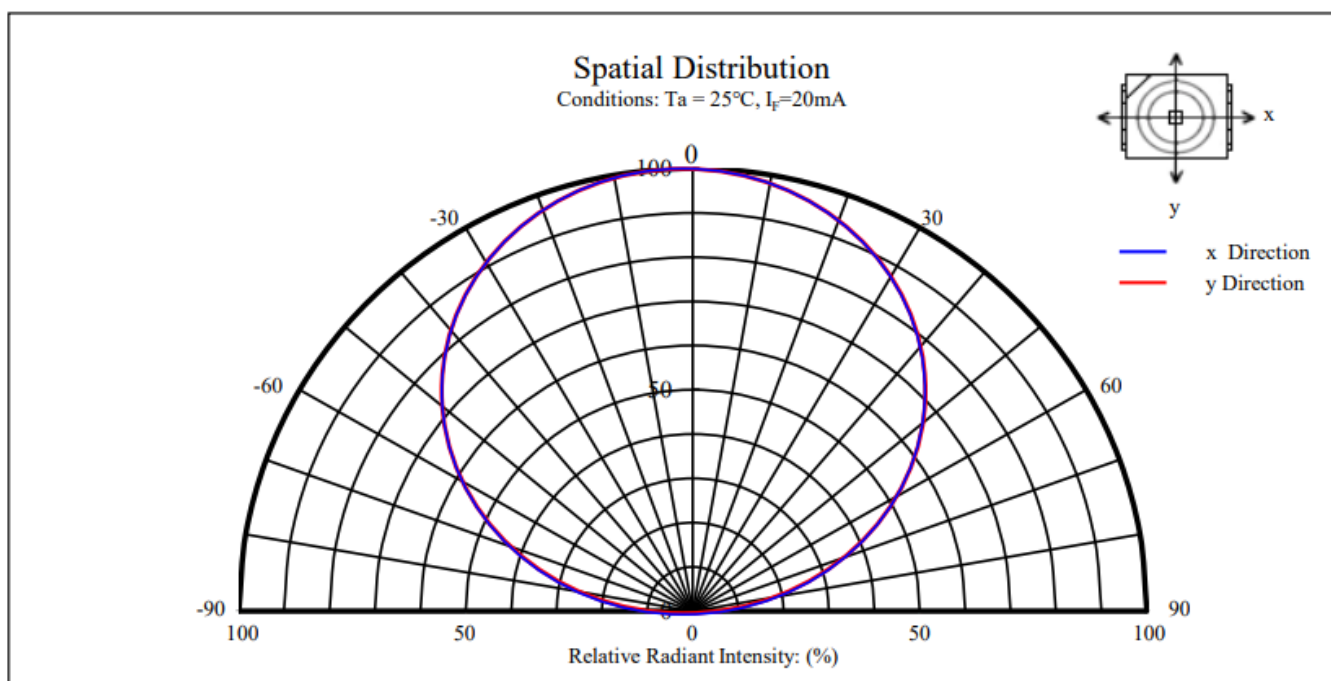
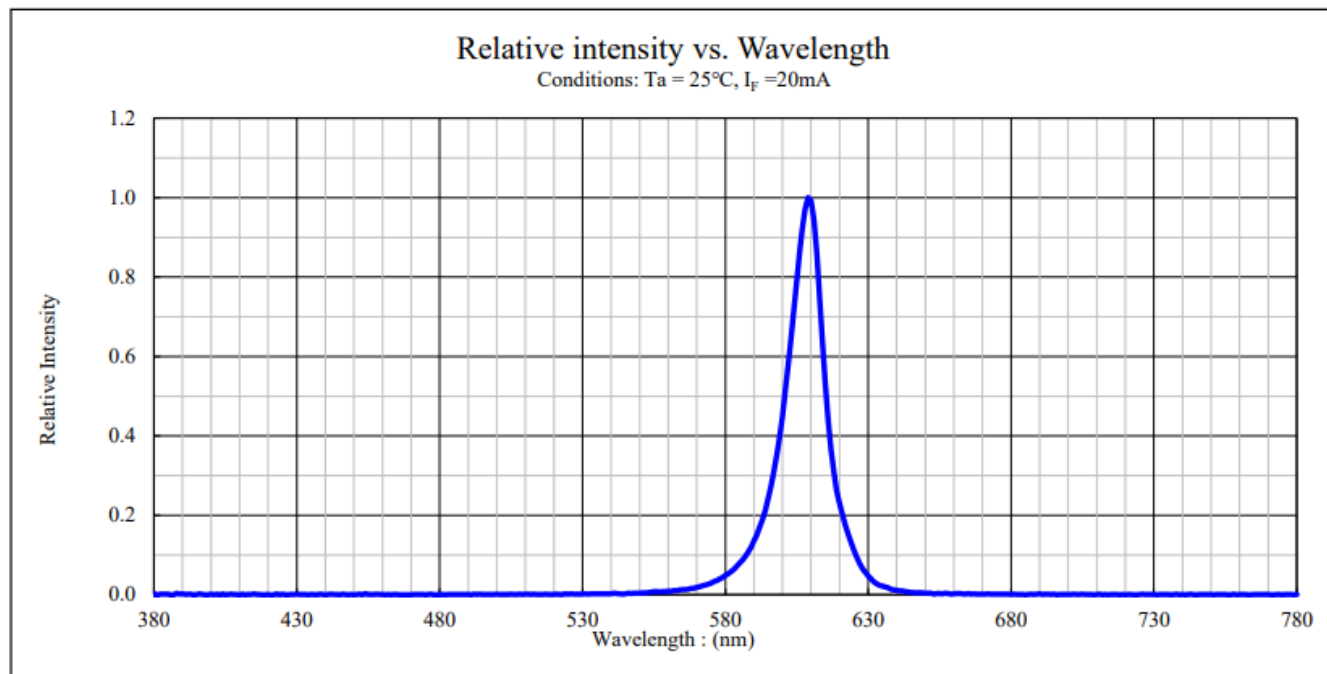
LED's shall be sorted out into the following ranks of Luminous Intensity and Dominant Wavelength.

Luminous Intensity ( $I_V$ ) Rank				Dominant Wavelength ( $\lambda_d$ ) Rank			
Rank	Luminous Intensity $I_V(\text{mcd})$		Conditions	Rank	Dominant Wavelength $\lambda_d(\text{nm})$		Conditions
	MIN.	MAX.			MIN.	MAX.	
C2	120	150	$T_a=25^\circ\text{C}$ , $I_F=20\text{mA}$	C	603	606	$T_a=25^\circ\text{C}$ , $I_F=20\text{mA}$
C3	150	180		D	606	609	
C4	180	220					

Above the table of Luminous Intensity ( $I_V$ ) values and Dominant Wavelength ( $\lambda_d$ ) values are the setup value of the selection machine. 【Tolerance :  $I_V \pm 10\%$ 、 $\lambda_d \pm 1\text{nm}$ 】

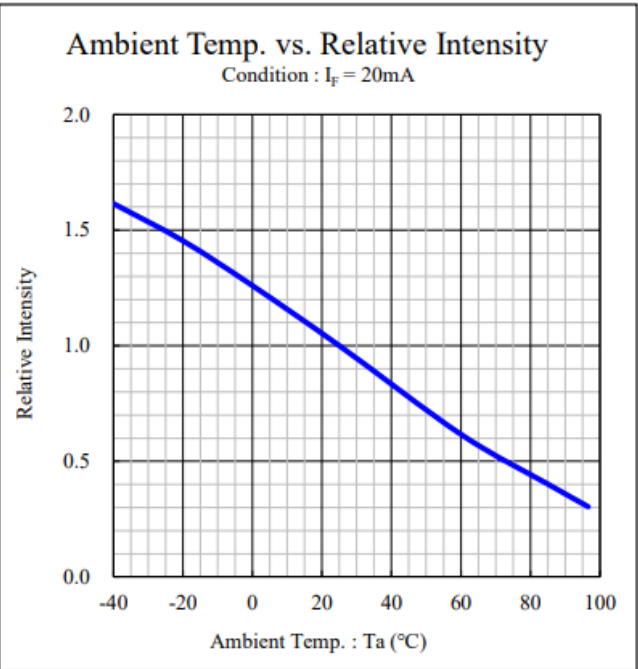
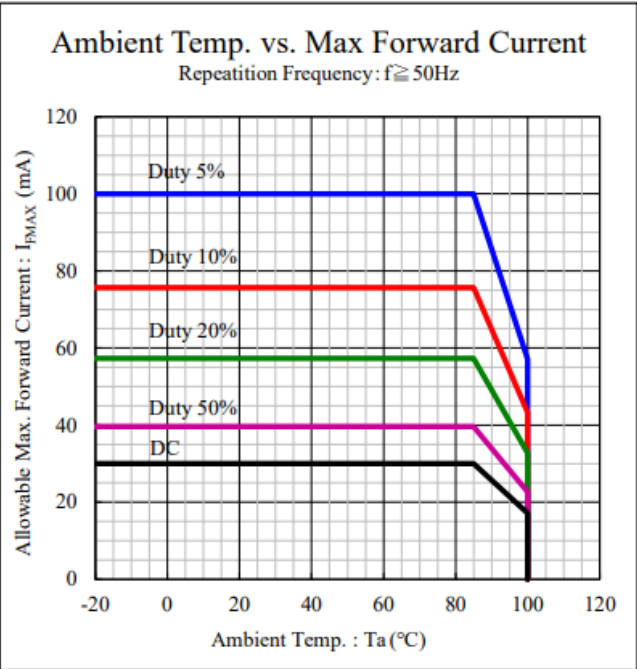
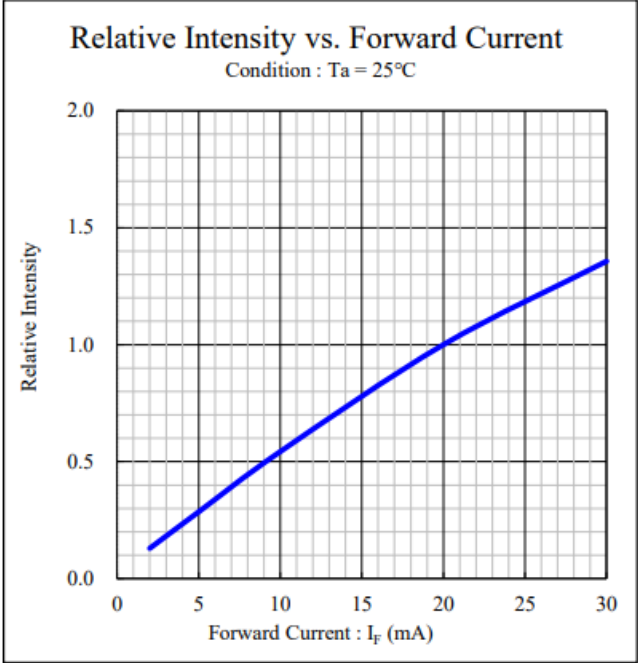
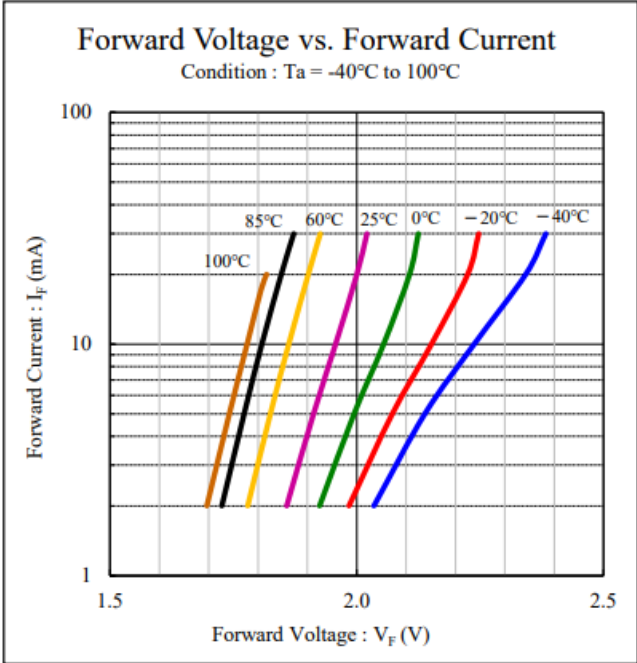
# Technical Data

VFHA1104LS-TR



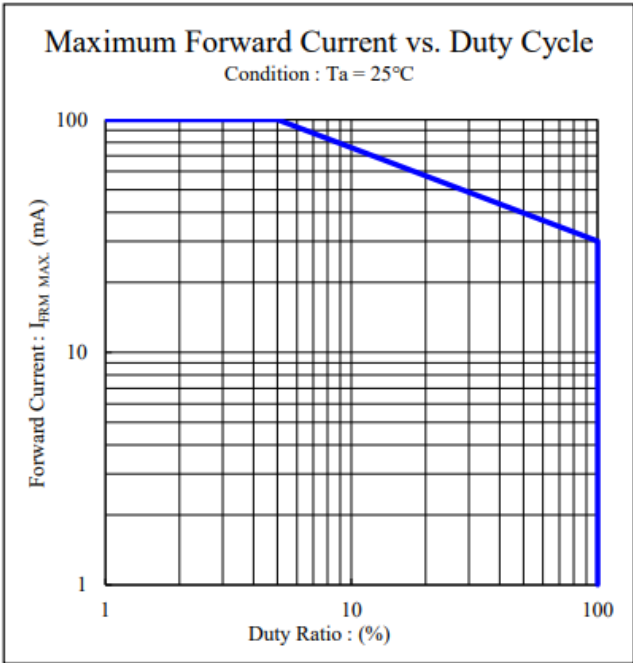
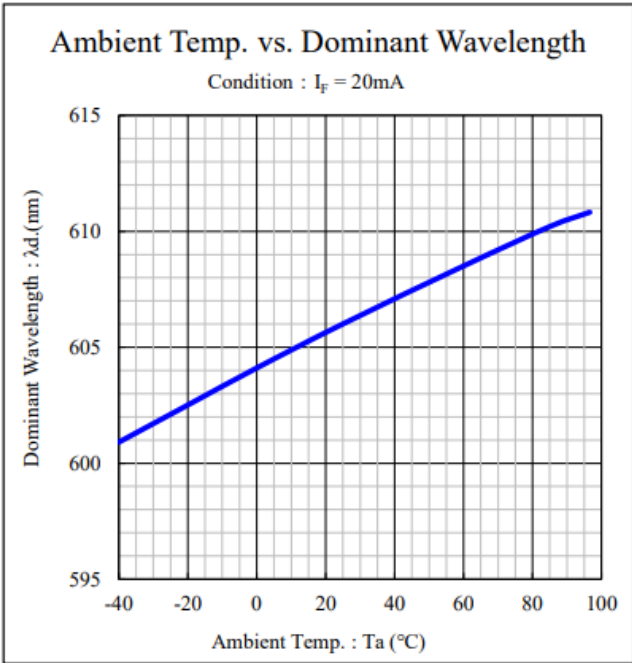
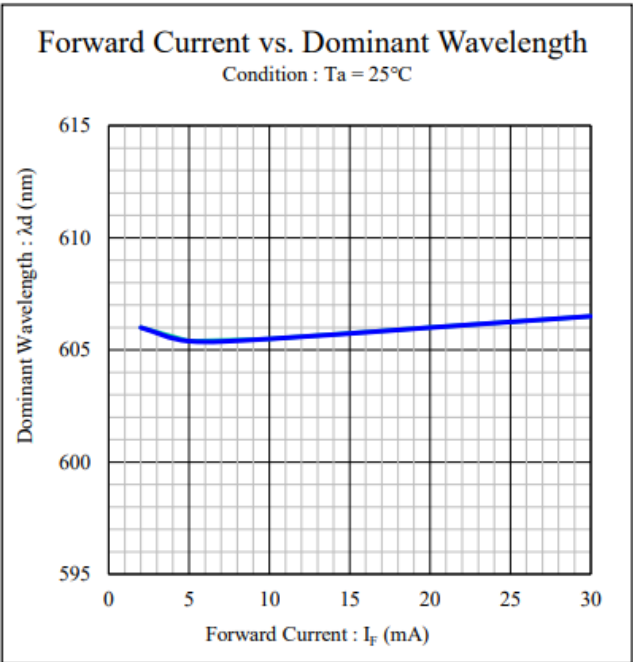
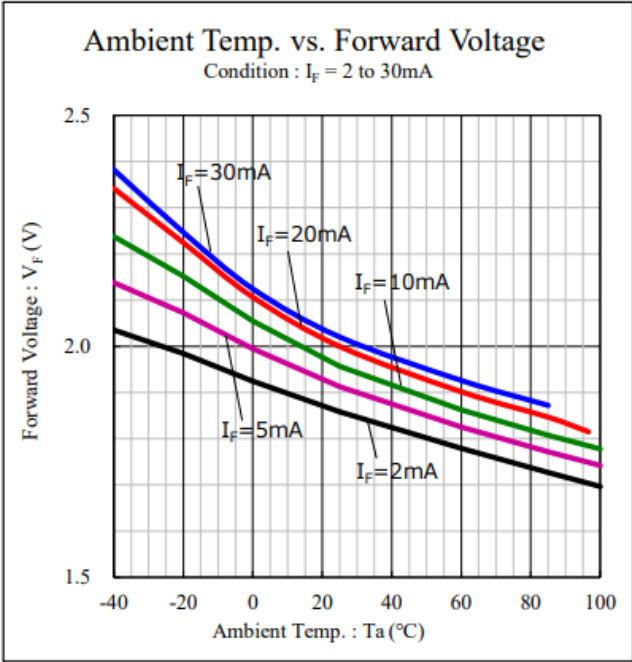
# Technical Data

# VFHA1104LS-TR



# Technical Data

# VFHA1104LS-TR



## Soldering condition

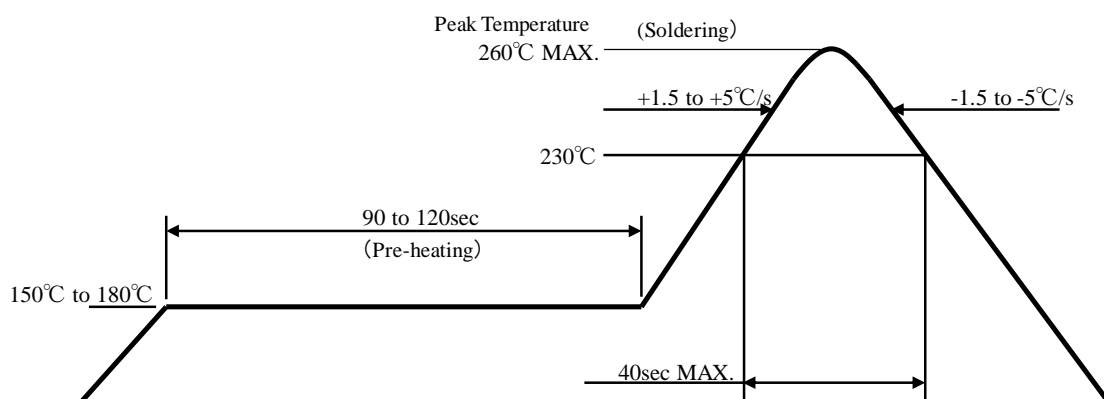
VFHA1104LS-TR

### 【Soldering Precaution】

(acc.to EIAJ-4701/300)

1. Heat stress during soldering will influence the reliability of LEDs, however that effect will vary on heating method. Also, if components of varying shape are soldered together, it is recommended to set the soldering pad temperature according to the component most vulnerable to heat (e.g., surface mount LED).
2. LED parts including the resin are not stable immediately after soldering ( when they are not at room temperature), any mechanical stress may cause damage to the product. Please avoid such stress after soldering, especially stacking of the boards which may cause the boards to warp and any other types of friction with hard materials.
3. Recommended temperature profile for the reflow soldering is listed as the temperature of the resin surface. Temperature distribution varies on heating method, PCB material, other components in the assembly, and mounting density .  
Please do not repeat the heating process in reflow process more than 2 times.

### 【Recommended Reflow Soldering Condition 】



Note 1 Temperature profile for the reflow should be set to the surface temperature of resin which is on the top of LED. This should be the maximum temperature for soldering. Lowering the heating temperature and decreasing heating time is very effective in achieving higher reliability.

Note 2 The reflow soldering process should be done up to 2 times Max. When second process is performed, interval between first and second process should be as short as possible to prevent absorption of moisture to resin of LED. The second soldering process should not be done until LEDs have returned to room temperature (by nature-cooling) after first soldering process.



## Soldering condition

VFHA1104LS-TR

4. If soldering manually, the peak temperature changes according to the size of land and the shape of soldering iron tip. Therefore please confirm there is no problem before usage. Also, Stanley recommends using a soldering iron equipped with temperature control and the peak temperature to be lowered.  
During the actual soldering process, make sure that the soldering iron never touches the LED itself, and avoid the LED's electrode temperature reaching above the temperature of the solder pad.  
All repairs must be performed only once in the same spot, and please avoid reusing components.
5. In soldering process, immediately after iron tip is cleaned, please make sure that the soldering iron reaches the appropriate temperature, then use it. Also, please avoid applying any types of pressure to the soldered components before the solder is cooling and hardening, as it may deteriorate solder performance and solder quality.

### 【Recommended manual soldering condition】

Temperature of iron tip	350°C max.
Soldering duration, time	3sec. max., 1 time

6. When using adhesive material for tentative fixatives, thermosetting resin or Ultraviolet radiation(UV) setting resin with heat shall be recommended.  
《Curing condition, Temperature:150°C max. / Time:120sec.max.》
7. Flow soldering (dip soldering) is not guaranteed for this product.
8. Please confirm in advance there is no problem by assessment on your side if cleaning process is necessary.  
We can not accept any quality issues caused by the cleaning process.  
As this product uses the low hardness silicone resin for the lens, please avoid cleaning to give pressure on the surface of the resin.  
Please make sure ultrasonic cleaning is not recommended for this product as well.  
We will recommend isopropyl alcohol as a solvent used for cleaning.  
Some chemicals, including Freon substitute detergent could corrode the lens or the casing surface, which cause discoloration, cloud, crack and so on.  
Please review the reference chart below for cleaning. If water is used to clean (including the final cleaning process), please use pure water (not tap water), and completely dry the component before using.

Cleaning agents	Recommended / Not recommended
Isopropyl Alcohol	✓ Recommended
Trichloroethylene	x Not recommended
Chloroethene	x Not recommended
Acetone	x Not recommended
Thinner	x Not recommended

## Handling precautions

VFHA1104LS-TR

### 【For electrostatic discharge (ESD)】

LED with an InGaN die is sensitive to voltage surges generated by On/Off status change and friction with synthetic materials, which may cause severe damage to the die or undermine its reliability. Damaged products may experience conditions such as extremely high reverse voltage, decrease of forward rise voltage, deterioration in optical characteristics.

Stanley InGaN products are packed with anti-static components. However, following precautions must be taken into account upon product shipment.

#### 1. Electrification/static electricity protection

In order to avoid product (die) damage from static electricity caused by unprotected handling by operator and other charged materials coming in contact with the product, Stanley recommends taking the following precautions.

- ① Do not place electrified non-conductive materials near the LED product.  
Avoid LED products from coming into contact with metallic materials.( Should the metallic material be electrified , the sudden surge voltage will most likely damage the product.)
- ② Avoid a working process which may cause the LED product to rub against other materials.
- ③ Install ground wires for any equipment, where they can be installed, with measures to avoid static electricity surges.
- ④ Prepare a ESD protective area by placing a Conductive Mattress (1MΩ MAX.) and Ionizer to remove any static electricity.
- ⑤ Operators should wear a protective wrist-strap.
- ⑥ Operators should wear conductive work-clothes and shoes.
- ⑦ To handle the products directly, Stanley recommends the use of ceramic, and not metallic, tweezers.

#### 2. Working environment

- ① A dry environment is more likely to cause static electricity. Although a dry environment is ideal for storage state of LED products, Stanley recommends an environment with approximately 50% humidity after the soldering process.
- ② Recommended static electricity level in the working environment is less than 150V, which is the same value as Integrated Circuits (which are sensitive to static electricity).

## Handling precautions

VFHA1104LS-TR

### 【Other precautions】


1. Stanley LED Lamps have semiconductor characteristics and are designed to ensure high reliability. However, the performance may vary depending on usage conditions
2. Absolute Maximum Ratings are set to prevent LED lamps from failing due to excess stress( temperature, current, voltage, etc.). Usage conditions must not exceed the ratings for a moment, nor do reach one item of absolute maximum ratings simultaneously.
3. In order to ensure high reliability from LED Lamps, variable factors that arise in actual usage conditions should be taken into account for designing. ( Derating of TYP., MAX Forward Voltage, etc.)
4. Please insert Protective Resistors into the circuit in order to stabilize LED operation and to prevent the device from igniting due to excess current.
5. Please avoid the stick of foreign material because molding resin in the products have adhesiveness. Also please don't touch lens portion.
6. Please check the actual performance in the assembly because the Specification Sheets are described for LED device only.
7. Please refrain from looking directly at the light source of LED at high output, as it may harm your vision.
8. The products are designed to operate without failure in recommended usage conditions. However, please take the necessary precautions to prevent fire, injury, and other damages should any malfunction or failure arise.
9. The products are manufactured to be used for ordinary electronic equipment. Please contact our sales staff beforehand when exceptional quality and reliability are required, and the failure or malfunction of the products might directly jeopardize life or health ( such as for airplanes, aerospace, transport equipment, medical applications, nuclear reactor control systems and so on).
10. When there is a process of supersonic wave welding etc. after mounting the product, there is a possibility of affecting on the reliability of junction part in package (junction part of die bonding and wire bonding). Please make sure there is no problem before using.
11. The formal specification sheets shall be valid only by exchange of documents signed by both parties.

## Handling precautions

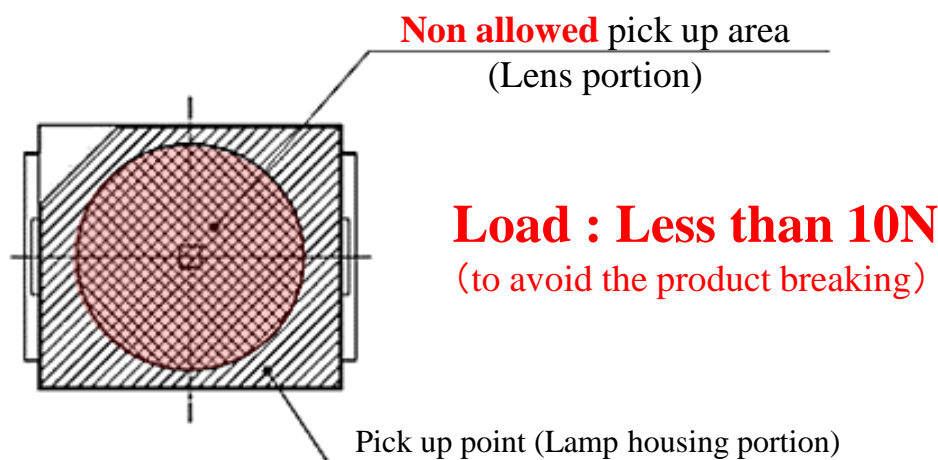
VFHA1104LS-TR

### 【Handling precautions for product mounting】

#### <Recommendation>

1. Picking up point with nozzle : Lamp housing of the product (  area : Shown below)

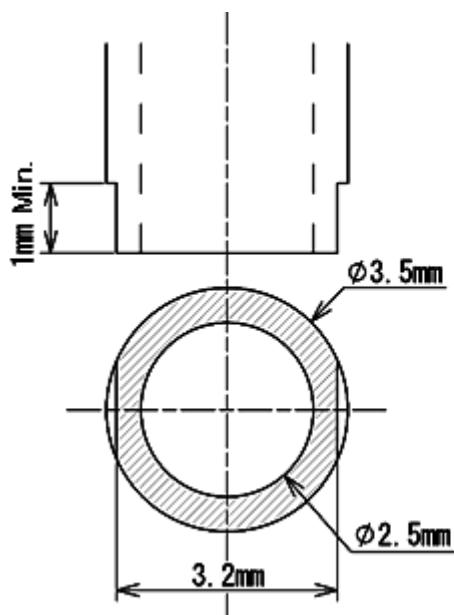
The pick up point is lamp housing only because the silicone resin used for the lens is soft.  
(If the nozzle makes contact with the lens, the products might be destroyed)



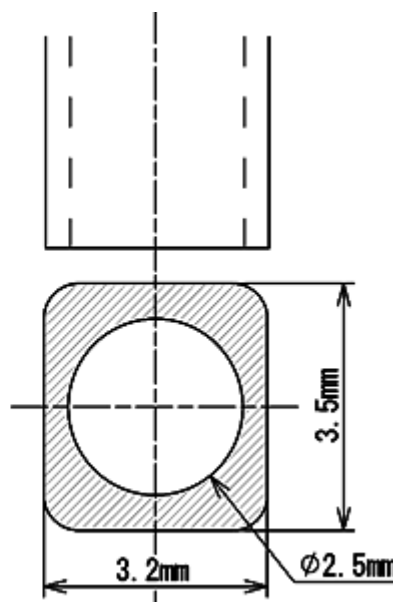
Please adjust the load, the pick up point, the nozzle diameter and etc. before mounting because the over load can cause the breakage of the lamp housing.

2. Recommended nozzle shape

a



b



※ Nozzle with chamfering is recommended

## Packaging specifications

VFHA1104LS-TR

This product is baked (moisture removal) before packaging, and is shipped in moisture-proof packaging (as shown below) to minimize moisture absorption during transportation and storage. However, with regard to storing the products, Stanley recommends the use of dry-box under the following conditions is recommended. Moisture-proof bag as the packaging is made of anti-static material but packaging box is not.

### 【Recommended storage condition / products warranty period】

Temperature	+5~30°C
Humidity	Under 70%

In the case of the package unopened, please use within **6 months** **【Recommended storage condition】**. Please avoid rapid transition from low temp. condition to high temp. condition and storage in corroding and dusty environment.

### 【Time elapsed after package opening】

The package should not be opened until immediately prior to its use, and please keep the time frame between package opening and soldering which is **【maximum 672h】**.

If the device needs to be soldered twice, both soldering operations must be completed within the 72h.

If any components should remain unused, please reseal the package and store them under the conditions described in the **【 Recommended Storage Condition 】** above.

This product must be required to perform baking process (moisture removal) for **at 48h (min.) to 72h (max.) at 60±5 degrees Celsius** if following conditions apply.

1. In the case of silica gel (blue) which indicates the moisture level within the package, changes or loses its blue color.
2. In the case of time passes for 672h after the package is opened once.

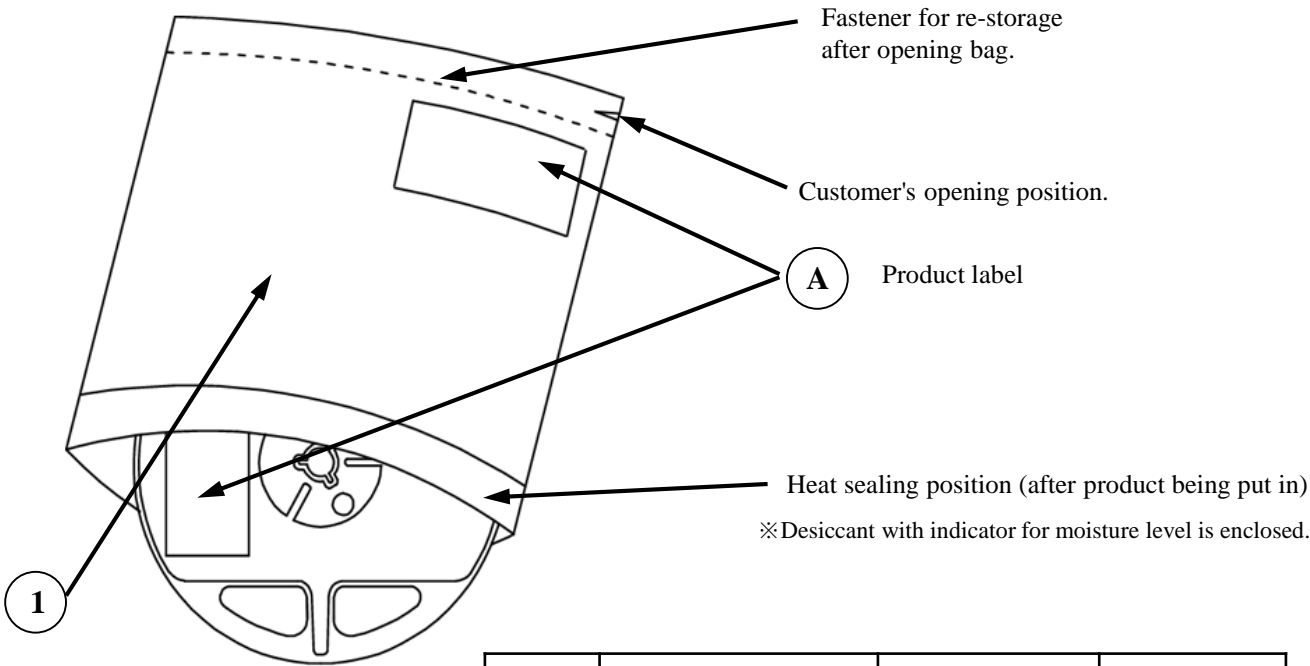
Baking process should be performed after LED having been taken out of the package.

Baking may be performed in the tape-reel form, however if it is performed with the reel stacked over one another, it may cause deformation of the reels and taping materials and later obstruct mounting. Please handle only once it has returned to room temperature. Provided that, baking process shall be 2 times max.

Packaging specifications

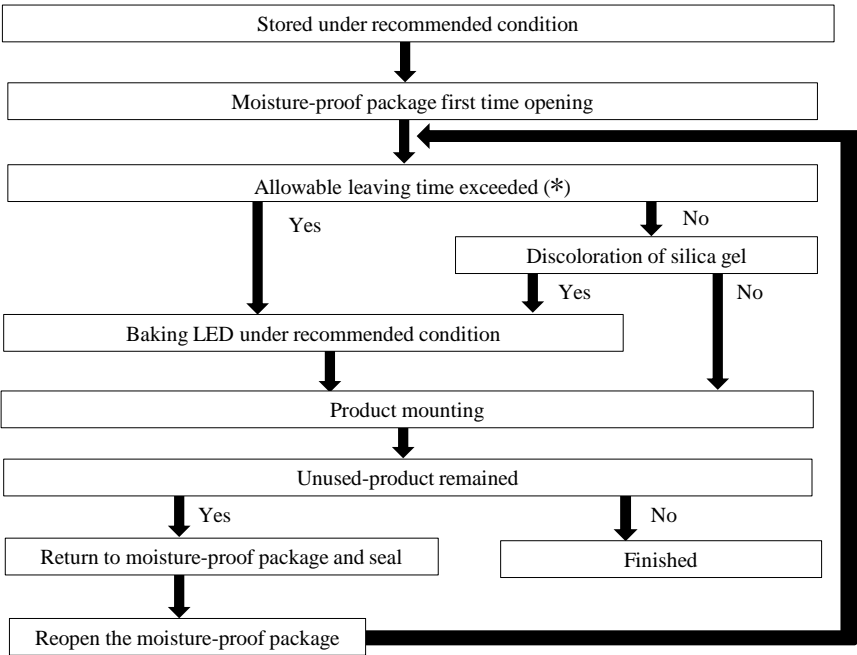
VFHA1104LS-TR

【Moisture-proof packaging specification】



No.	Part name	Material	Remarks
①	Moisture-proof bag with Aluminum layer	PET+Al+PE	with ESD protection

【Flow chart-package opening to mounting】



Allowable leaving time means the maximum allowable leaving time after opening package, which depends on each LED type. The allowable leaving time should be calculated from the first opening of package to the time when soldering process is finished. When judging if the allowable leaving time has exceeded or not, please subtract the soldering time. The allowable leaving time after reopening should be calculated from the first opening of package, or from the time when baking process is finished.

## Packaging specifications

VFHA1104LS-TR

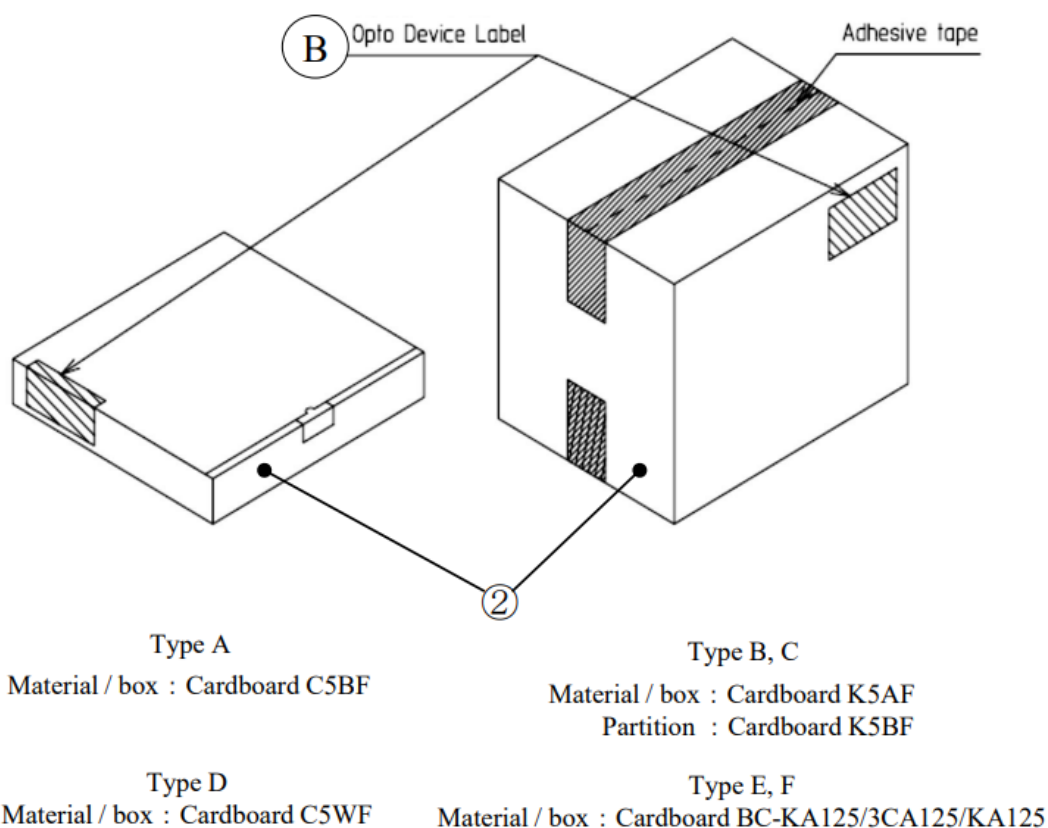
## 【Packing box】

(RoHS2 / ELV Compliant)

Box type	Outline dimension L × W × H (mm)	Capacity of the box
Type A	280 × 265 × 45	3 reels
Type B	310 × 235 × 265	15 reels
Type C	440 × 310 × 265	30 reels
Type D	305 × 270 × 65	3 reels
Type E	370 × 280 × 270	30 reels
Type F	530 × 380 × 270	60 reels

The above measurements are reference values.

The box is selected out of the above table by shipping quantity.



No.	Part name	Material	Remarks
②	Packing box	Corrugated cardboard	without ESD protection

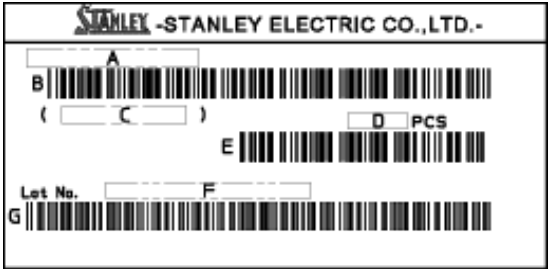
Packaging specifications

VFHA1104LS-TR

(acc.to JIS-X0503(Code-39))

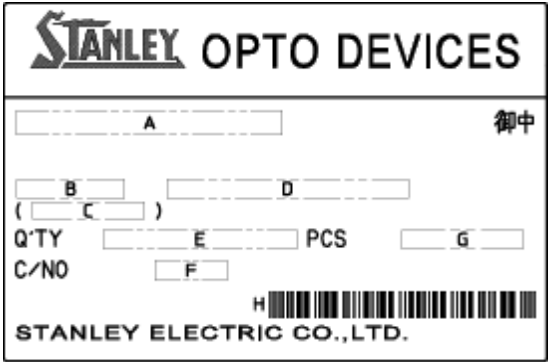
【Label specification】

A Product label



- A. Parts number
- B. Bar-code for parts number
- C. Parts code (In-house identification code for each parts number)
- D. Packed parts quantity
- E. Bar-Code for packed parts quantity
- F. Lot number & rank
- (Please refer to lot number notational system for details )
- G. Bar-code for lot number & rank

B Opto device label



- A. Customer name
- B. Parts type
- C. Parts code
- D. Parts number
- E. Packed parts quantity
- F. Carton number
- G. Shipping date
- H. Bar-code for In-house identification number

<Remarks> Bar-code font : acc.to Code-39(JIS-X0503)

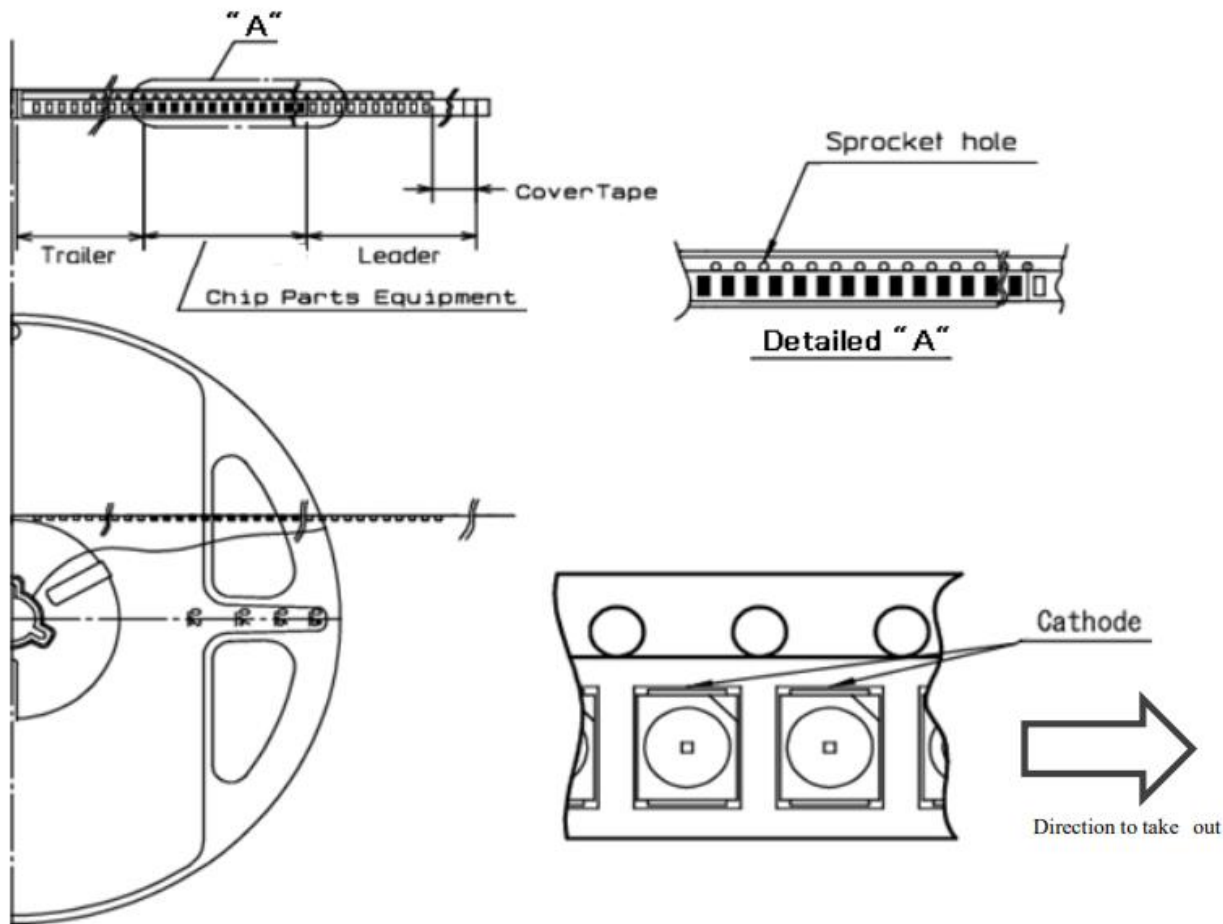


Taping and reel specifications

VFHA1104LS-TR

(acc.to JIS-C0806-03)

【Appearance】



Note  
"-TR" means Cathode Side of LEDs; should be placed on the sprocket-hole side.

Items		Specifications	Remarks
Leader area	Cover-tape	Cover-tape shall be longer than <b>320mm</b> without carrier-tape	The end of cover-tape shall be held with adhesive tape.
	Carrier-tape	Empty pocket shall be more than <b>20 pieces</b> .	Please refer to the above figure for Taping & reel orientation .
Trailer area		Empty pocket shall be more than <b>15 pieces</b> .	The end of taping shall be inserted into a slit of the hub.

## Taping and reel specifications

VFHA1104LS-TR

(acc.to JIS-C0806-03)

## 【 Qty. per reel】

2,000parts/reel

Minimum Qty. per reel might be 500 parts when getting less than 3,000 parts.

In such case, parts of 500-unit-qty. shall be packed in a reel and the qty. shall be identified on the label

## 【Mechanical strength】

Cover-tape adhesive strength shall be 0.1 ~ 1.0N ( An angle between carrier-tape and cover-tape shall be 170 deg. ).

Both tapes shall be so sealed that the contained parts will not come out from the tape when it is bent at a radius of 15mm.

## 【 Others】

Reversed-orientation, Up-side down placing, side placing and out of spec. parts mix shall not be held.

Empty pocket per reel shall be defined as follows.

Qty./reel	Max. qty. of empty pocket	Remarks
500	1	-
1,000	1	-
1,500	1	-
2,000	2	No continuance

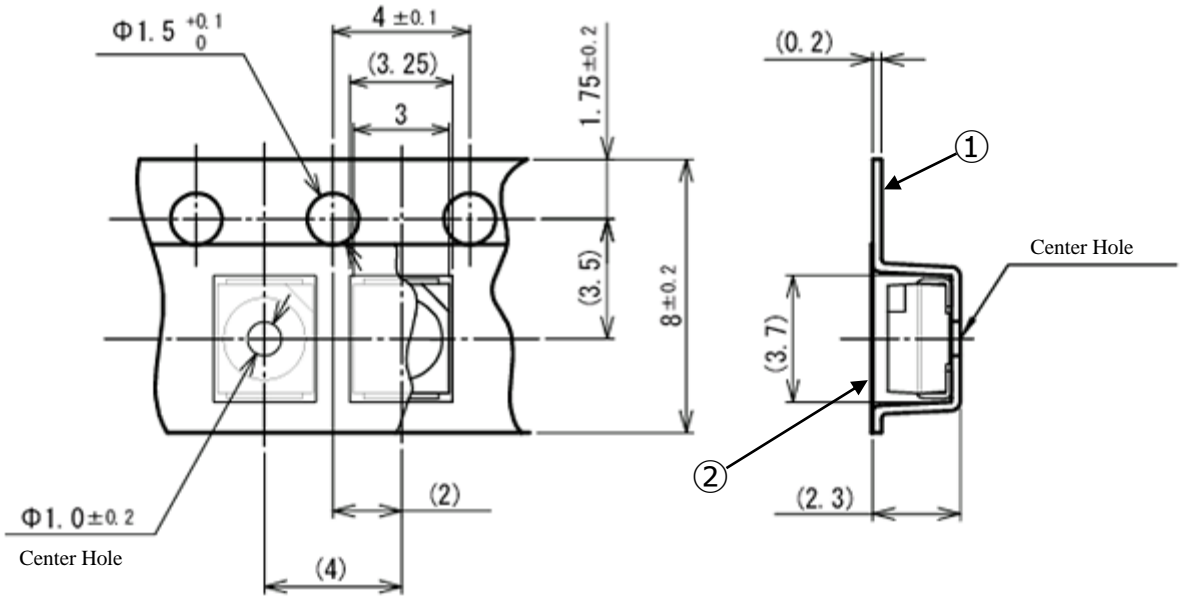
# Taping and reel specifications

VFHA1104LS-TR

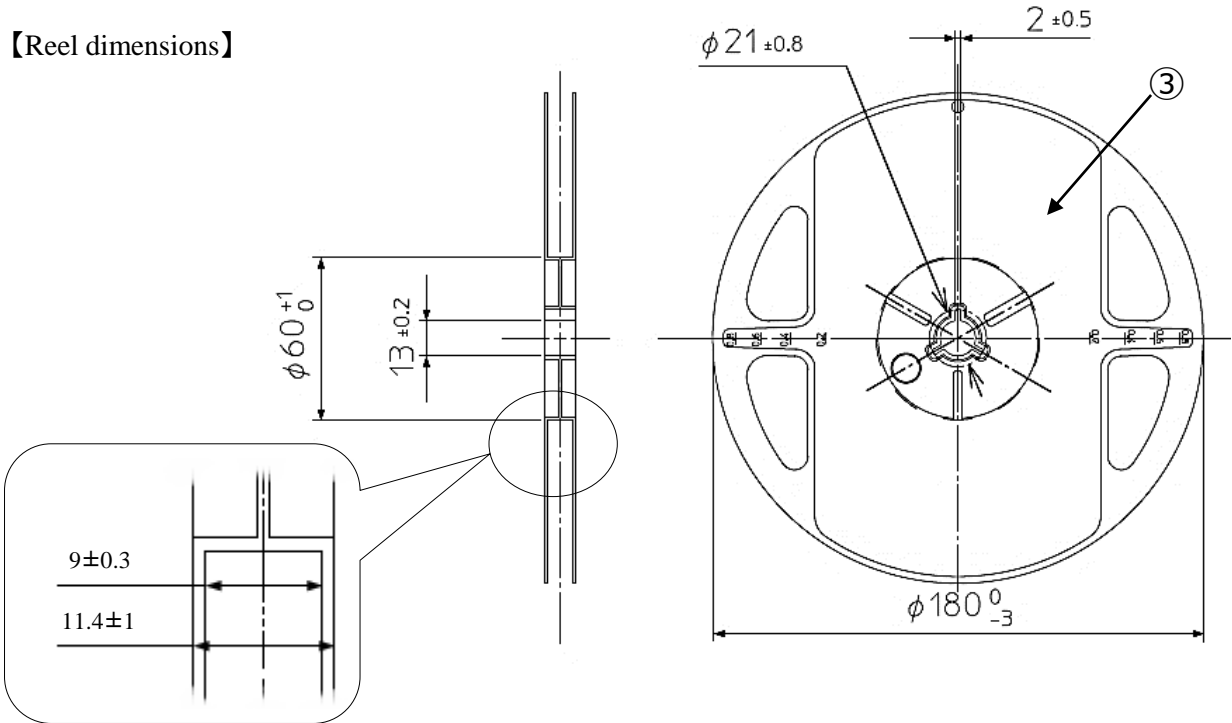
(acc.to JIS-C0806-03)

Unit: mm

## 【Taping dimensions】



## 【Reel dimensions】



No.	Part name	Remarks
①	Carrier-tape	with ESD protection
②	Cover-tape	with ESD protection
③	Carrier-reel	with ESD protection

## Lot number notational system

VFHA1104LS-TR

①	②	③	④	⑤	⑥	⑦	⑧	⑨							

① - 1digit : Production location (mark identify alphabet)

② - 1digit : Production year (The last digit of production year 2024→4, 2025→5, 2026→6, 2027→7 ...)

③ - 2digits : Production month (Jan. to Sep. , should be 01,02,03 ...)

④ - 2digits : Production date

⑤ - 3digits : Serial number

⑥ - 2digits : Tape and reel following number

⑦ - 2digits : Luminous intensity rank.

(If luminous intensity rank is 1 digit, "-" shall be dashed on the place for the second digit.

If there is no identified rank, "- -" is used to indicate.)

⑧ - 2digits : Chromaticity coordinates rank

(If chromaticity coordinates rank is 1 digit, "-" shall be dashed on the place for the second digit.

If there is no identified rank, "- -" is used to indicate.)

⑨ - 1digit : VF Rank (If rank is not defined, "-" is described.)

## Compliance with RoHS2/ELV

VFHA1104LS-TR

This product is in compliance with RoHS / ELV.

Prohibition substance and it's criteria value of RoHS / ELV are as follows.

- RoHS instruction ... Refer to following 1 to 10.
- ELV instruction ... Refer to following 1 to 4.

2011/65/EU, (EU)2015/863

No.	Substance group name	Maximum permissible concentration value
1	Lead and its compounds	1,000ppm (0.1%)
2	Cadmium and its compounds	100ppm (0.01%)
3	Mercury and its compounds	1,000ppm (0.1%)
4	Hexavalent chromium compounds	1,000ppm (0.1%)
5	PBB : Polybrominated Biphenyls	1,000ppm (0.1%)
6	PBDE : Polybrominated Biphenyl Ethers	1,000ppm (0.1%)
7	DEHP : Bis (2-ethylhexyl) phthalate	1,000ppm (0.1%)
8	BBP : Butyl benzyl phthalate	1,000ppm (0.1%)
9	DBP : Dibutyl phthalate	1,000ppm (0.1%)
10	DIBP : Diisobutyl phthalate	1,000ppm (0.1%)

## Reliability Testing Result

## VFHA1104LS-TR

## 1. Reliability testing result

No.	Test item	Test condition	Duration	Failure
1	High temperature operating life	$T_j=125^{\circ}\text{C}$ , $I_F(\text{VCSEL})=1\text{A}$ , $V_R(\text{PD})=5\text{V}$	1,000h	0/18
2	Low temperature operating life	$T_a=-40^{\circ}\text{C}$ , $I_F(\text{VCSEL})=2\text{A}$ , $V_R(\text{PD})=5\text{V}$	1,000h	0/18
3	High temperature humidity bias operating life 1	$T_a=85^{\circ}\text{C}$ , 85%RH, $I_F(\text{VCSEL})=1\text{A}$ (30min ON - 30min OFF), $V_R(\text{PD})=5\text{V}$	1,000h	0/18
4	High temperature humidity bias operating life 2	$T_a=85^{\circ}\text{C}$ , 85%RH, $I_F(\text{VCSEL})=0.4\text{A}$ , $V_R(\text{PD})=5\text{V}$	1,000h	0/18
5	Pulse operating life	$T_s=55^{\circ}\text{C}$ , $t_w=100\mu\text{s}$ , 3%duty, $I_F(\text{VCSEL})=10\text{A}$ , $V_R(\text{PD})=5\text{V}$	1,000h	0/18
6	Gas exposure test	$\text{H}_2\text{S}$ 15ppm, $T_a=40^{\circ}\text{C}$ , 90% Rh	96h	0/18
7	Thermal shock	$T_a=-40^{\circ}\text{C}$ (15min) to $125^{\circ}\text{C}$ (15min)	1,000cycles	0/18
8	Resistance to reflow soldering	Moisture soak : Jecdec Level 3 Preheating : 150 to $180^{\circ}\text{C}$ 120sec Max. Soldering : $260^{\circ}\text{C}$ 5sec	2times	0/18
9	Thermal shock operating cycle	$T_a=-40^{\circ}\text{C}$ (15min) to $85^{\circ}\text{C}$ (15min) $I_F(\text{VCSEL})=1\text{A}$ , $V_R(\text{PD})=5\text{V}$ (5min on - 5min OFF)	1,000cycles	0/18
10	Thermal & high temperature cycle	$T_a=-30$ to $80^{\circ}\text{C}$ , 90%RH, $I_F(\text{VCSEL})=0.4\text{A}$ , $V_R(\text{PD})=5\text{V}$ (5min ON - 5min OFF)	30cycles	0/18
11	Electric static discharge	HBM ( $C=100\text{pF}$ , $R_2=1.5\text{k}\Omega$ , $\pm 2\text{kV}$ )	3times each polarity	0/18

## 2. Failure criteria

Item		Symbol	Acceptance criteria
VCSEL	Total radiant flux	$\Phi_e$	Measured value > initial value $\times 1.2$ , measured value < initial value $\times 0.8$
	Forward voltage	$V_F$	Measured value > initial value $\times 1.1$ , measured value < initial value $\times 0.9$
	Reverse current	$I_R$	Measured value $\geq$ Specification value $\times 2.5$
PD	Dark current	$I_d$	Measured value $\geq$ Specification value $\times 2.5$
VCSEL + PD (Coupling characteristics)	Photo current	$I_p$	Measured value > initial value $\times 1.2$ , measured value < initial value $\times 0.8$
Appearance		—	Notable discoloration, deformation or cracks

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