



## Features

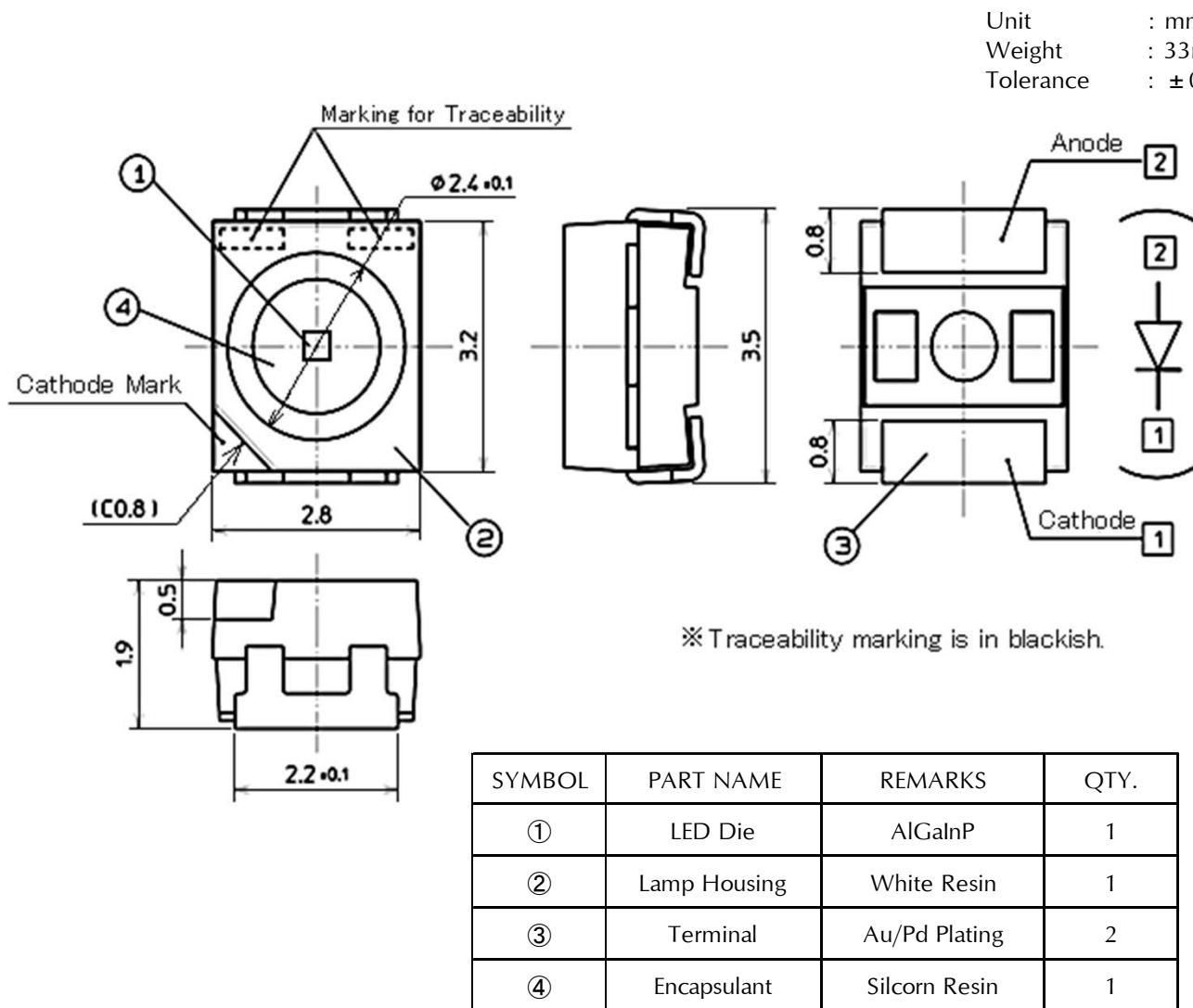
|                  |                                                                                                                                                                                                                                                                     |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Package          | PLCC-2 Type,<br>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<br/>(for automotive applications and other high-reliability required applications)</li><li>Lead-free soldering compatible</li><li>RoHS compliant</li></ul> |

## Recommended Applications

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

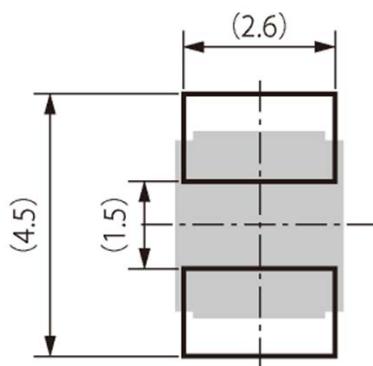
## Outline Dimensions

VFSR1104LS-TR



## Recommended Pad

Unit : mm  
Tolerance :  $\pm 0.2$



## 【 Product Overview 】

|                             |             |
|-----------------------------|-------------|
| Die Material                | AlGaNp      |
| Emitting Color              | Red         |
| Resin Color( Emitting Area) | Water Clear |
| Resin Color(Lamp Housing)   | White       |

## 【 Absolute Maximum Ratings 】

(Ta=25°C)

| ITEM                                               | SYMBOL             | MAXIMUM RATINGS | UNITS |
|----------------------------------------------------|--------------------|-----------------|-------|
| Power Dissipation                                  | P <sub>d</sub>     | 217             | mW    |
| Forward Current                                    | I <sub>F</sub>     | 70              | mA    |
| Repetitive Peak Forward Current<br>"10ms,1/20duty" | I <sub>FRM</sub>   | 100             | mA    |
| I <sub>F</sub> Derate Linearly from "75°C"         | Δ I <sub>F</sub>   | 1.56            | mA/°C |
| I <sub>FRM</sub> Derate Linearly from "75°C"       | Δ I <sub>FRM</sub> | 2.22            | mA/°C |
| Reverse Voltage                                    | V <sub>R</sub>     | 5               | V     |
| Operating Temperature                              | T <sub>opr</sub>   | -40 ~ +100      | °C    |
| Storage Temperature                                | T <sub>stg</sub>   | -40 ~ +120      | °C    |
| Electrostatic Discharge Threshold "HBM"            | ESD                | 1,000           | V     |
| Soldering Temperature<br>"Reflow Soldering"        | T <sub>sld</sub>   | 260             | °C    |

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               | MIN. | TYP. | MAX. | UNITS |
|-------------------------------------------------|----------------------|------|------|------|-------|
| Thermal Resistance<br>【Junction - Ambient】      | R <sub>th(j-a)</sub> | -    | 200  | -    | °C/W  |
| Thermal Resistance<br>【Junction - Solder point】 | R <sub>th(j-s)</sub> | -    | 100  | -    | °C/W  |
| Junction Temperature                            | T <sub>j</sub>       | -    | -    | 120  | °C    |

Note3 R<sub>th(j-a)</sub> Measurement Condition

Substrate:FR-4 ( t=1.6mm )

Pattern Size : 16mm<sup>2</sup>

Note3

## 【 Electro and Optical Characteristics 】

| (Ta=25°C)                |                  |              |       |       |       |         |
|--------------------------|------------------|--------------|-------|-------|-------|---------|
| ITEM                     | SYMBOL           | CONDITIONS   | MIN.  | TYP.  | MAX.  | UNITS   |
| Forward Voltage          | $V_F$            | $I_F = 50mA$ | 1.8   | 2.2   | 2.8   | V       |
| Reverse Current          | $I_R$            | $V_R = 5V$   | -     | -     | 5     | $\mu A$ |
| Luminous Intensity       | $I_V$            | $I_F = 50mA$ | 1,500 | 2,000 | 2,700 | mcd     |
| Luminous Flux            | $\Phi_V$         | $I_F = 50mA$ | -     | 5.8   | -     | lm      |
| Peak Wavelength          | $\lambda_p$      | $I_F = 50mA$ | -     | 636   | -     | nm      |
| Dominant Wavelength      | $\lambda_d$      | $I_F = 50mA$ | 620   | 626   | 632   | nm      |
| Spectral Line Half Width | $\Delta\lambda$  | $I_F = 50mA$ | -     | 20    | -     | nm      |
| Half Intensity Angle     | $\Delta\theta_x$ | $I_F = 50mA$ | -     | 120   | -     | deg.    |
|                          | $\Delta\theta_y$ |              | -     | 120   | -     |         |

※ Above the table of Luminous Intensity ( $I_V$ ) values and Dominant Wavelength ( $\lambda_d$ ) values are the setup value of the selection machine.

【Tolerance :  $I_V \pm 10\%$ 、 $\lambda_d \pm 1nm$ 】

Note 4,5 Please refer to the attached sheets, each sorting chart.

Note 6 Viewing Angle at 50%  $I_V$ ,  $\Delta\theta_x$  ; Housing long side axis,  $\Delta\theta_y$  ; Housing short side axis

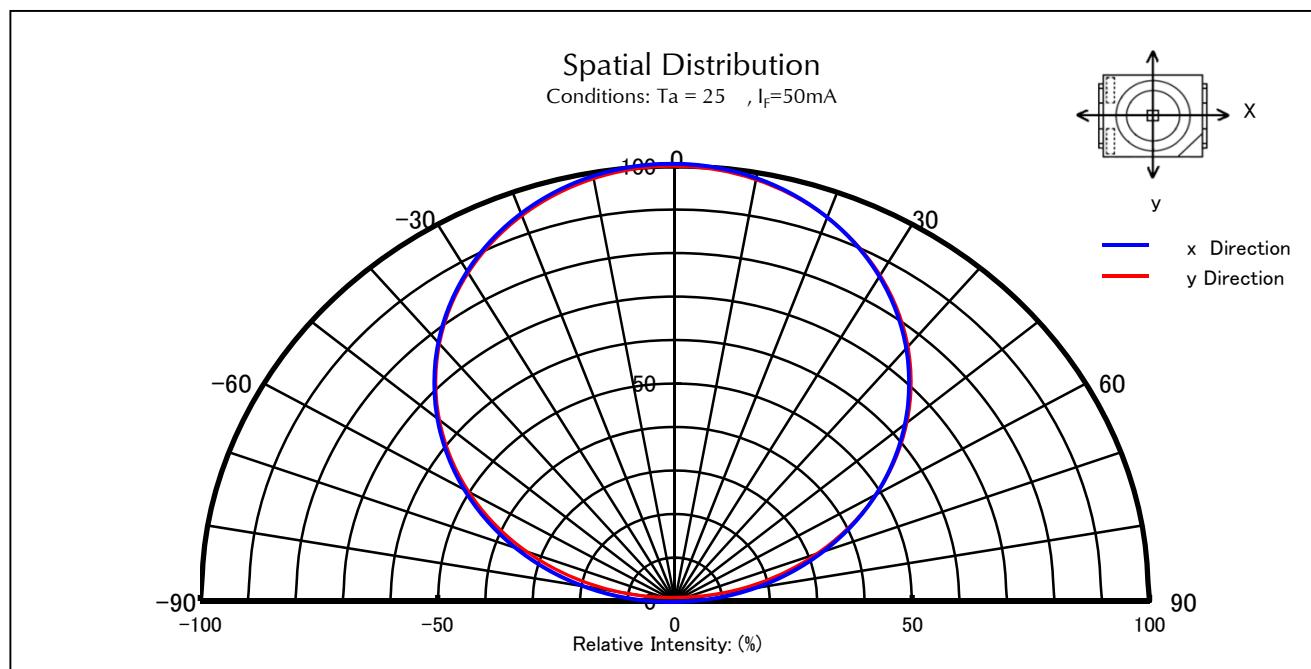
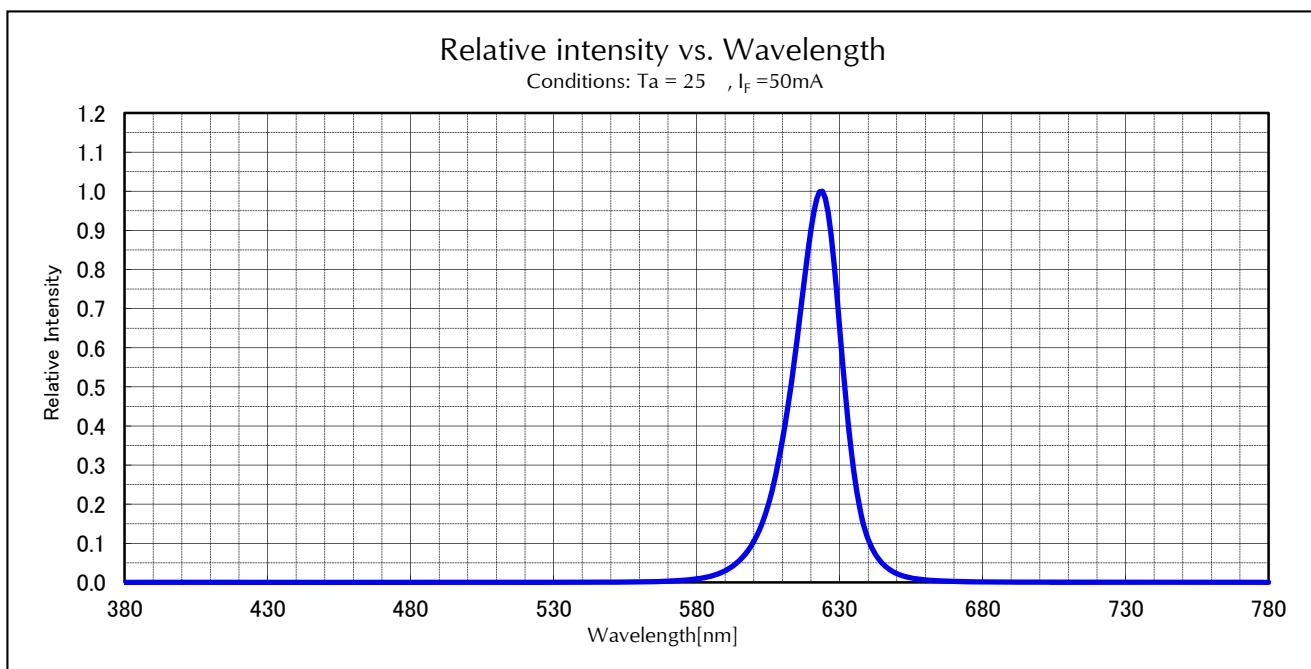
## 【 Sorting Chart for Luminous Intensity and Dominant Wavelength 】

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 |                  |      | Conditions |  |
|-----------------------------------|-------------|-------|------------------------------------------|------------------|------|------------|--|
| Rank                              | $I_V$ (mcd) |       | Conditions                               | $\lambda_d$ (nm) |      |            |  |
|                                   | MIN.        | MAX.  |                                          | MIN.             | MAX. |            |  |
| D3                                | 1,500       | 1,800 | $I_F = 50mA$<br>$Ta = 25^\circ C$        | A                | 620  | 626        |  |
| D4                                | 1,800       | 2,200 |                                          | B                | 626  | 632        |  |
| D5                                | 2,200       | 2,700 |                                          |                  |      |            |  |

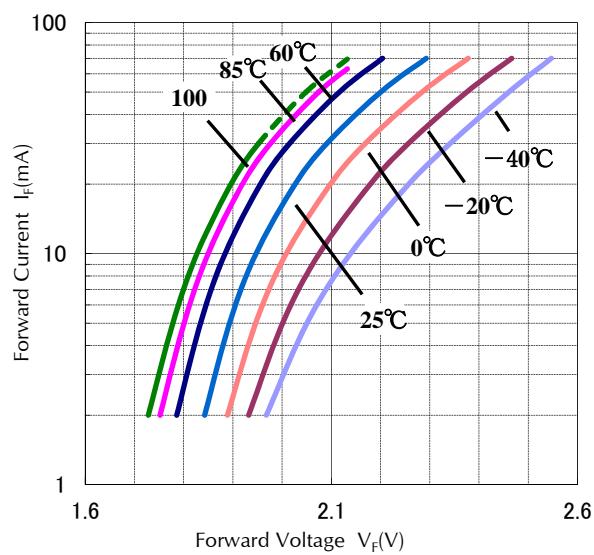
Above Luminous Intensity ( $I_V$ ) values and Dominant Wavelength ( $\lambda_d$ ) values are the setup value of the selection machine.

【Tolerance :  $I_V = \pm 10\%$ ,  $\lambda_d = \pm 1nm$ 】



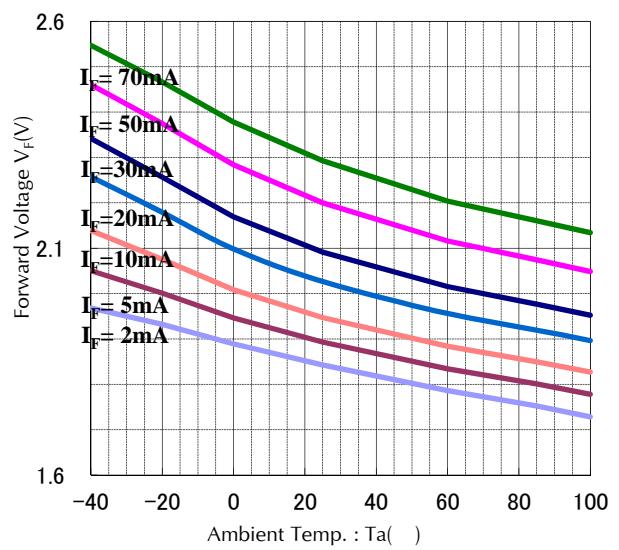
## Forward Voltage vs. Forward Current

Condition :  $T_a = -40 \sim 100$



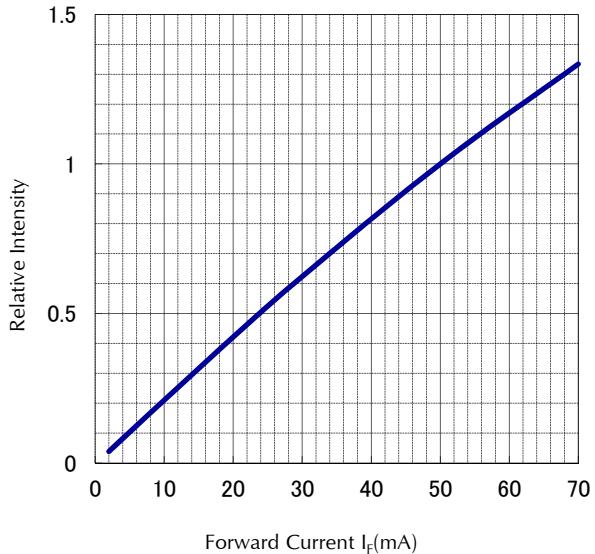
## Ambient Temp. vs. Forward Voltage

Condition :  $I_F = 2mA \sim 70mA$



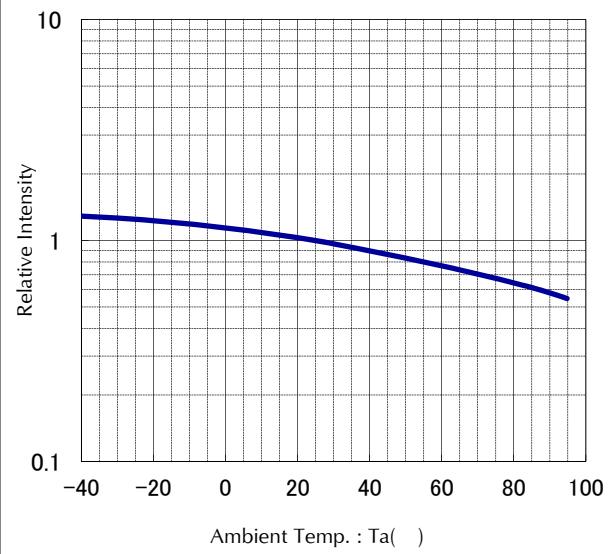
## Forward Current vs. Relative Intensity

Condition :  $T_a = 25$



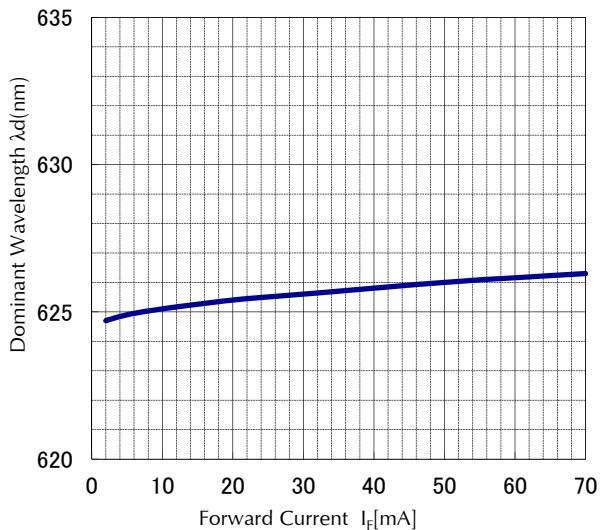
## Ambient Temp. vs. Relative Intensity

Condition :  $I_F = 50mA$



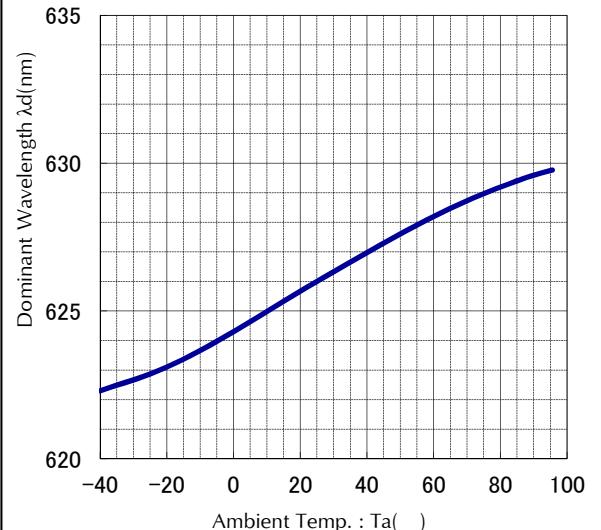
## Forward Current vs. Dominant Wavelength

Condition :  $T_a = 25$



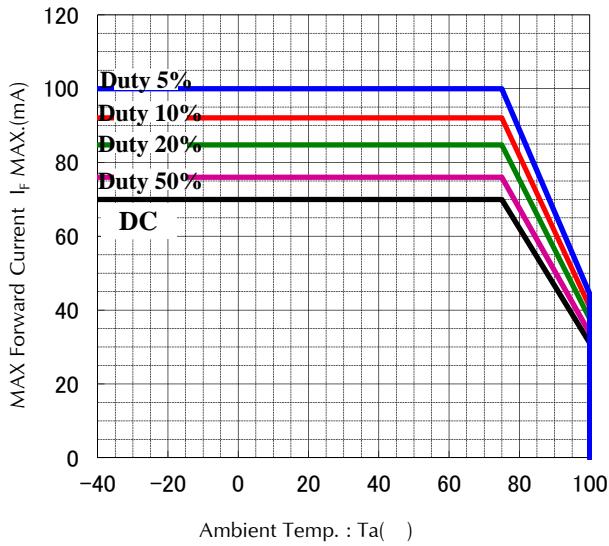
## Ambient Temp. vs. Dominant Wavelength

Condition :  $I_F = 50$ mA

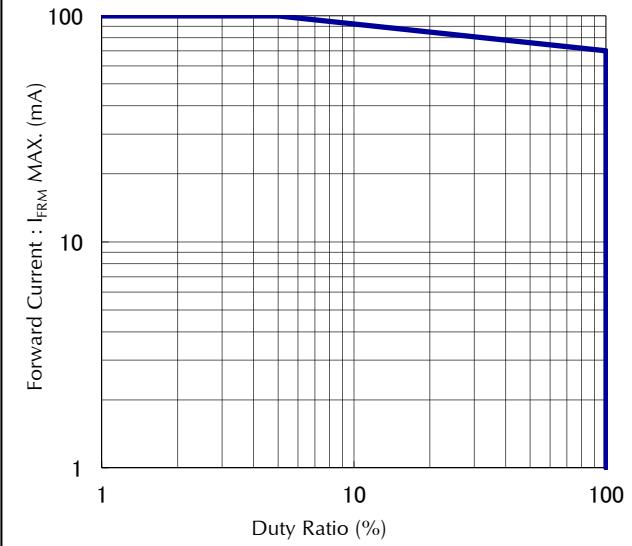


## Ambient Temperature vs. Maximum Forward Current

Repetition Frequency:  $f = 50$ Hz



## Maximum Forward Current vs. Duty Cycle

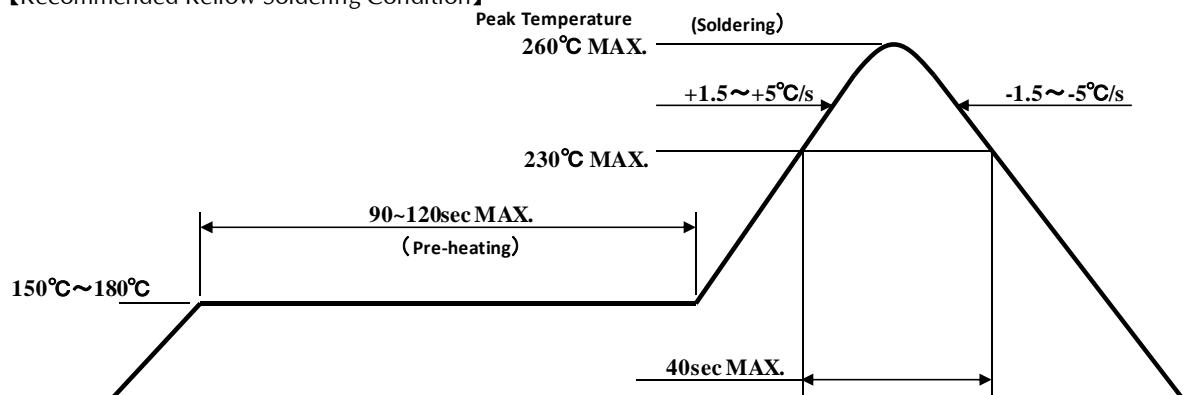


## 【Soldering Precaution】

(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 twice.

## 【Recommended Reflow Soldering Condition】



Note 1 Recommended temperature profile for the reflow soldering is listed as the temperature of the resin surface. 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 twice(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.

4. If soldering manually, Stanley recommends using a soldering iron equipped with temperature control. During the actual soldering process, make sure that the soldering iron never touch the LED itself, and avoid the LED's electrode heating temperature reaching above the heating 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 before using. Also, please avoid applying any type of pressure to the soldered components before the solder has been cooled and hardened, as it may deteriorate solder performance and solder quality.

### 【Recommended Manual Soldering Condition】

|                          |                   |
|--------------------------|-------------------|
| Temperature of Iron Tip  | 350 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.  
《The curing condition, Temperature:150 Max./Time:120sec.Max.》
7. Flow soldering (dip soldering) is not recommended for this product.
8. Isopropyl alcohol is recommended 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.

| Chemical          | Adaptability |
|-------------------|--------------|
| Isopropyl Alcohol | ○            |
| Trichloroethylene | ×            |
| Chlorothene       | ×            |
| Acetone           | ×            |
| Thinner           | ×            |



## 【Other Precautions】

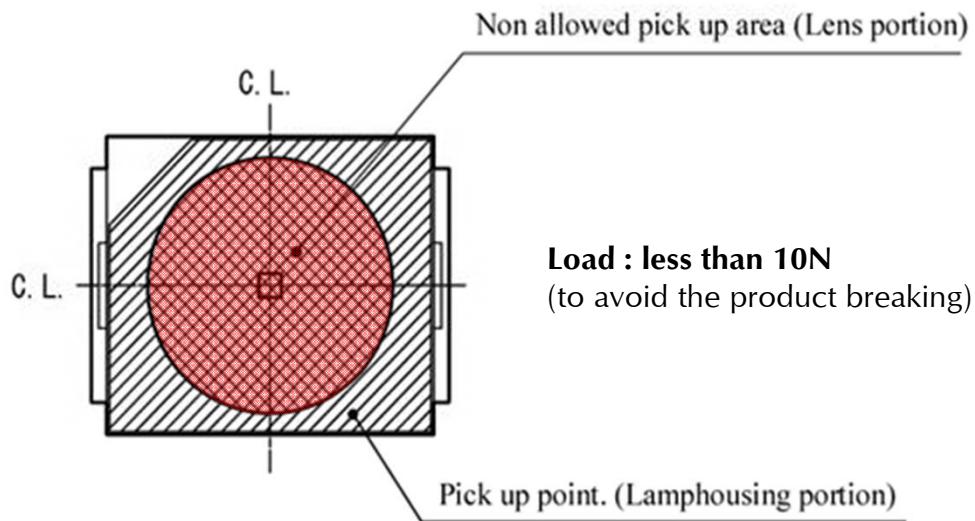
1. Stanley LED Lamps have semiconductor characteristics and are designed to ensure high reliability. However, the performance may vary depending on usage conditions
2. Absolute Maximum Ratings are set to prevent LED lamps from failing due to excess stress( temperature, current, voltage, etc.). Usage 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 for Product Mounting】

<Recommendation>

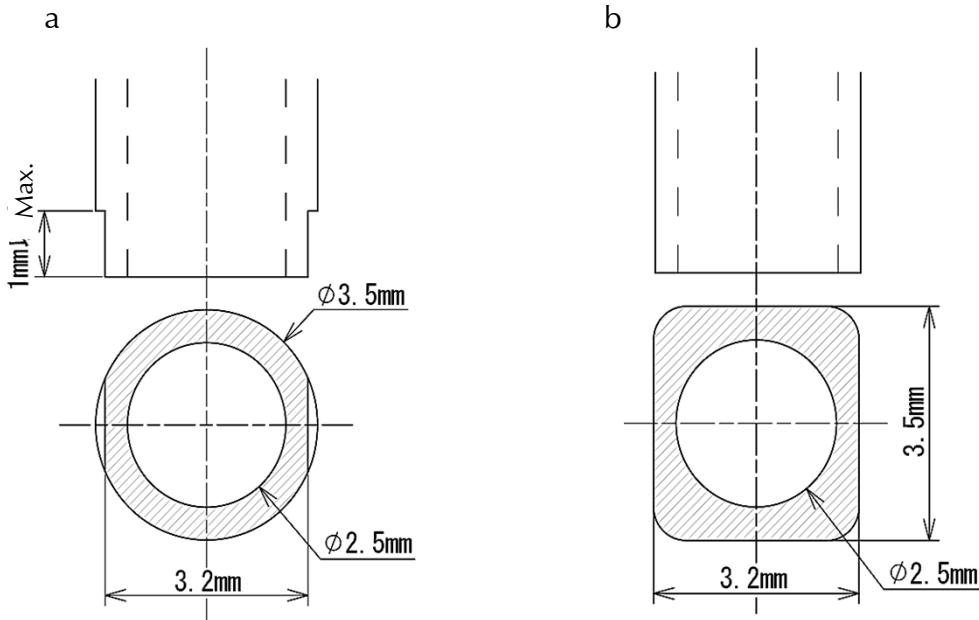
1. Picking up point with nozzle: Lamp housing of the product (  area)  
(Shown below)

The picking up point should be within lamp housing portion, 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, etc. before mounting because the over load can cause the breakage of the lamp housing.

## 2. Recommended Nozzle shape



Nozzle with chamfering is recommended



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     |
| Humidity    | Under 70% |

In the case of the package unopened , 6 months under 【 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 as is 【maximum 4weeks(672h)】.  
If the device needs to be soldered twice, both soldering operations must be completed within the 4weeks(672h).

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

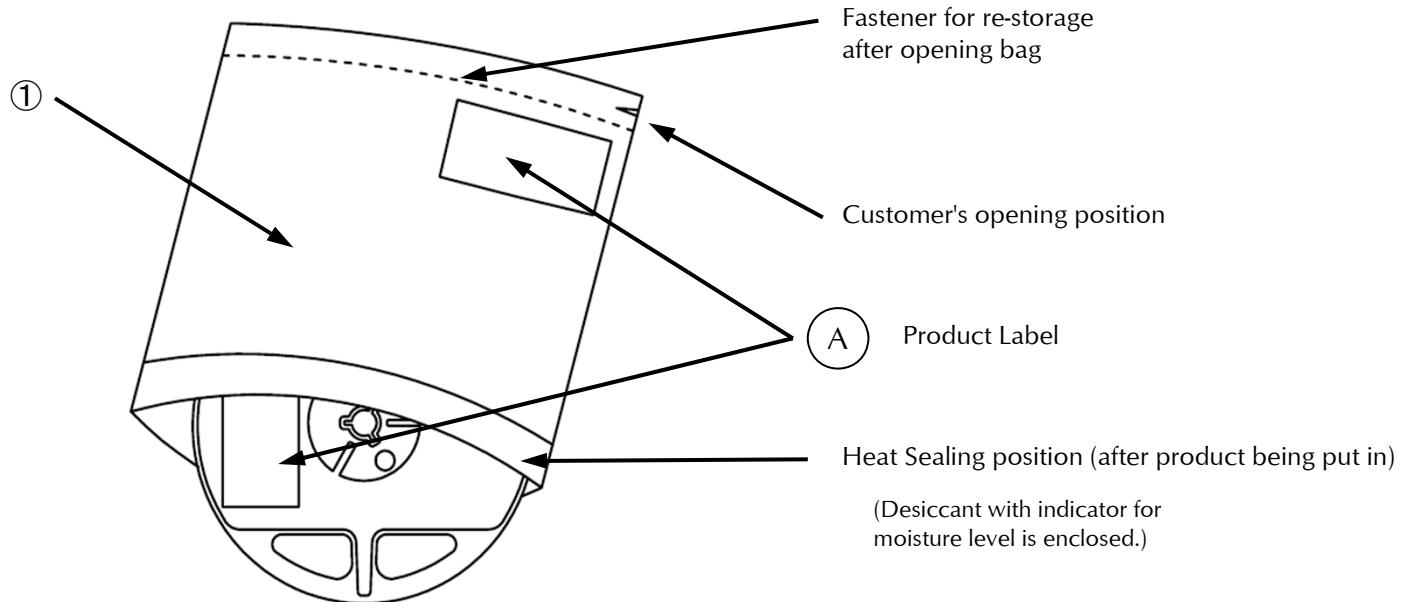
This product must be required to perform baking process (moisture removal) for at 48h( MIN.)~72h(MAX.) at  $60 \pm 5$  degrees Celsius if following conditions apply.

- 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 4weeks(672h) after the package is opened once.

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

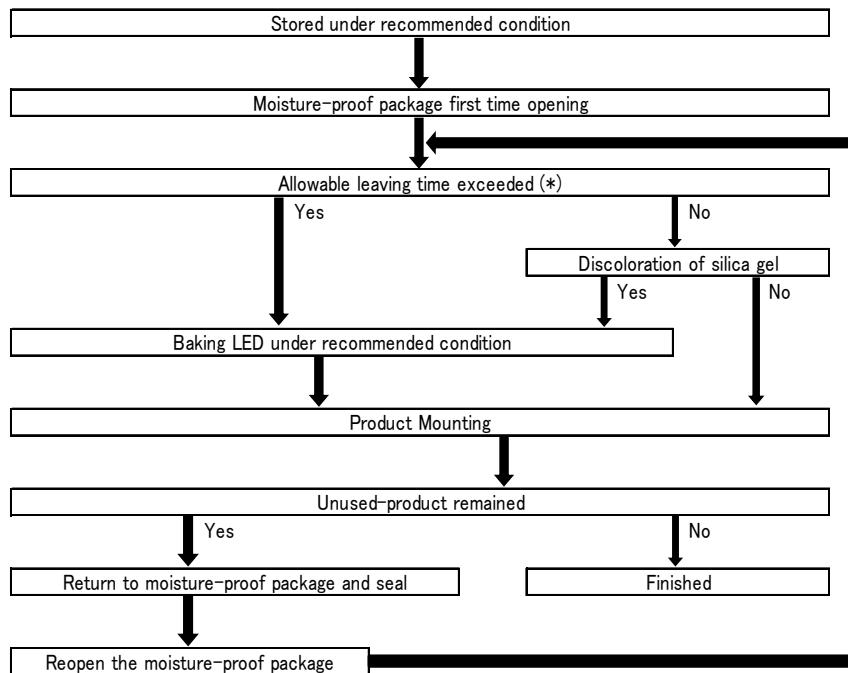
Baking may be performed in the tape-reel form , however if it is performed with the reel stacked over one another, it may cause deformation of the reels and taping materials and later obstruct mounting. Please handle only once it has returned to room temperature. Provided that, baking process shall be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

## 【Moisture-proof Packaging Specification】



| SYM. | 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.

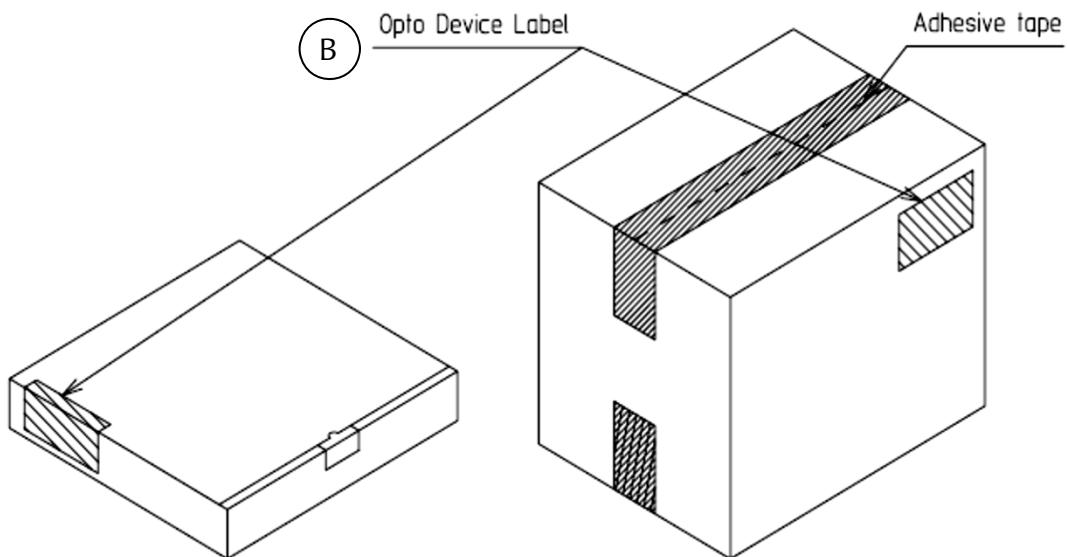
## 【Packing box】

( RoHS・ELV Compliant)

| Box Type | Outline dimension<br>L × W × H (mm) | Capacity of the box |
|----------|-------------------------------------|---------------------|
| Type A   | 280 × 265 × 45 (mm)                 | 3 reels             |
| Type B   | 310 × 235 × 265 (mm)                | 15 reels            |
| Type C   | 440 × 310 × 265 (mm)                | 30 reels            |

The above measures are all the reference values.

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



Type A

Material / box : Cardboard C5BF

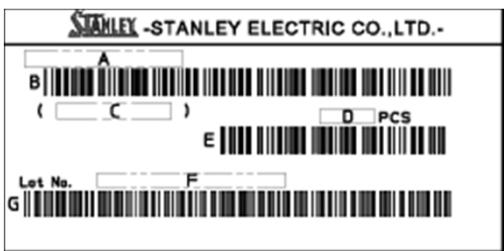
Type B,C

Material / box : Cardboard K5AF  
Partition : Cardboard K5AF

## 【Label Specification】

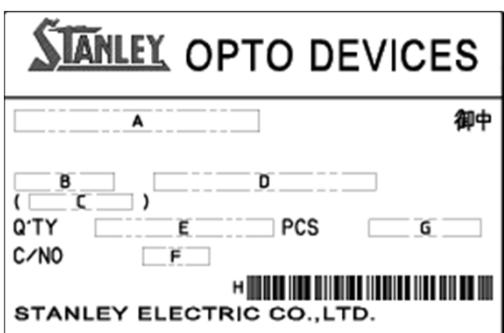
( acc.to JIS-X0503(Code-39) )

### (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  
(refer to Lot Number Notational System for details )
- G. Bar-Code for Lot number & Rank

### (B) Opto device label

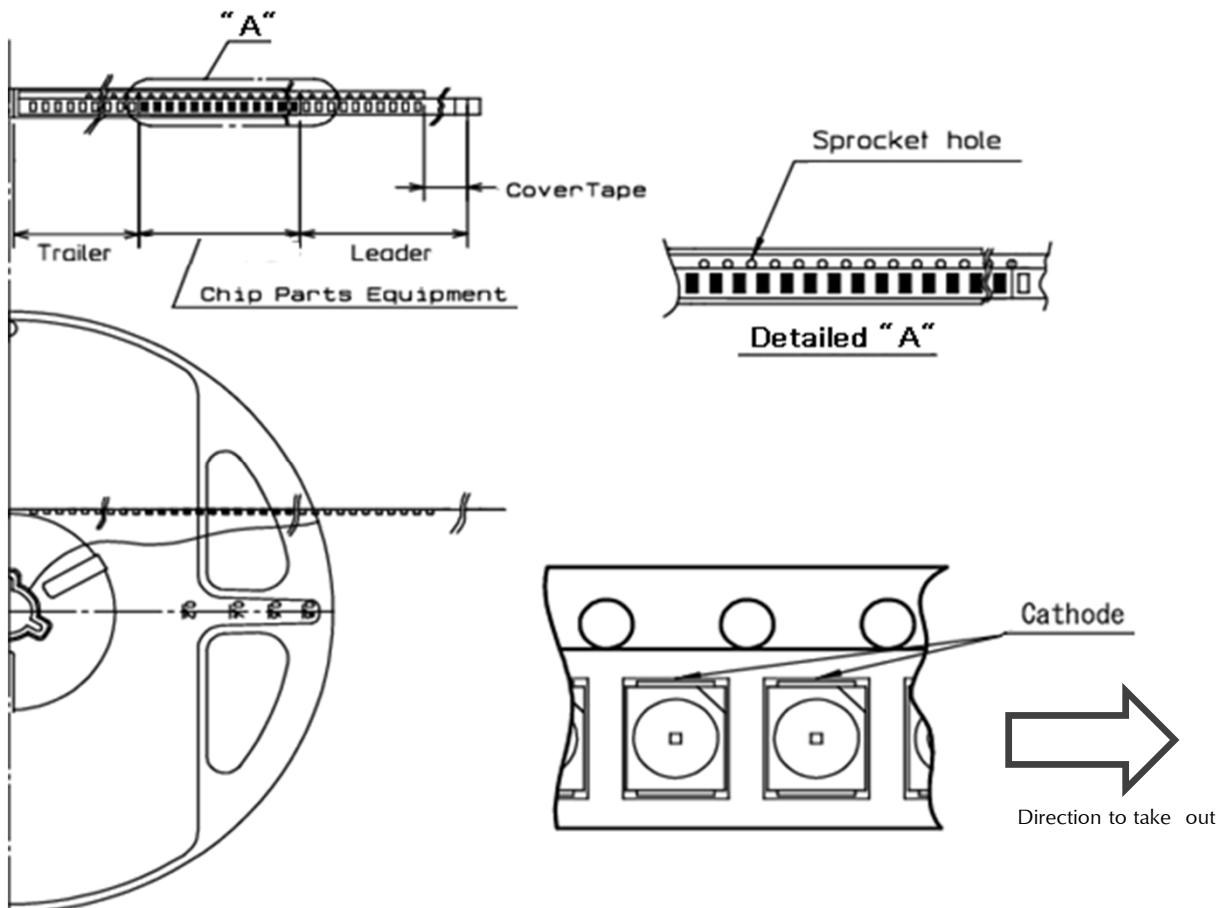


- A. Customer Name
- B. Parts Type
- C. Parts Code
- D. Parts Number
- E. Packed Parts Quantity
- F. Carton Number
- G. Shipping Date
- H. Bar-Code for In-house identification Number

<Remarks> Bar-code font : acc.to Code-39(JISX0503)

(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 320mm without carrier-tape | The end of cover-tape shall be held with adhesive tape.          |
|              | Carrier-tape | Empty pocket shall be more than 20 pieces.                 | Please refer to the above figure for Taping & reel orientation . |
| Trailer area |              | Empty pocket shall be more than 15 pieces.                 | The end of taping shall be inserted into a slit of the hub.      |



(acc.to JIS-C0806-03)

## 【Qty. per Reel】

2,000parts/reel

Minimum Qty. per reel might be 500 parts when getting less than 2,000 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】

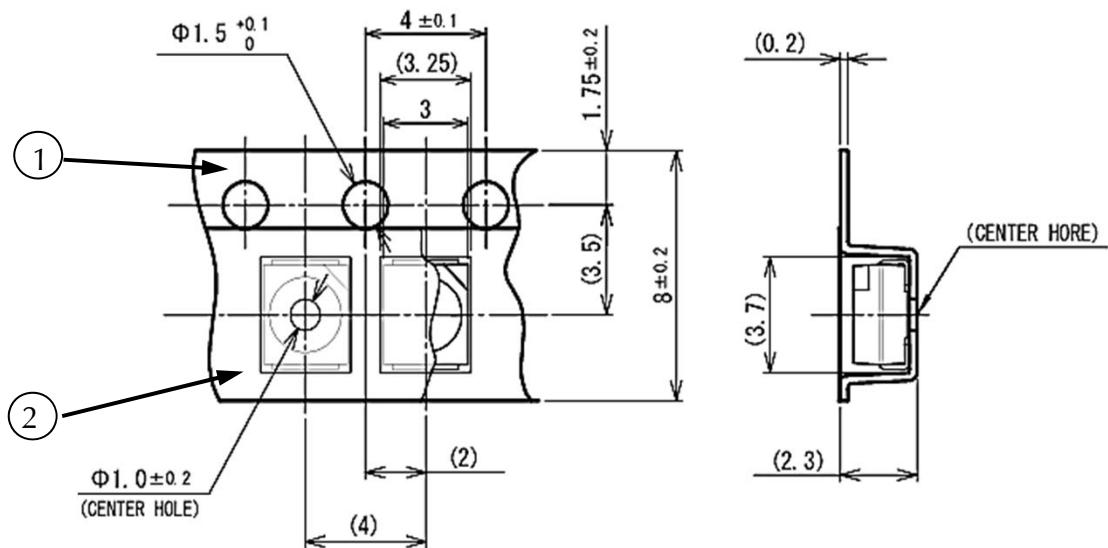
Reversed-orientation, Up-side down placing, side placing and out of spec. parts mixing shall not be held. Max. qty. of empty pocket per reel shall be defined as follows.

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

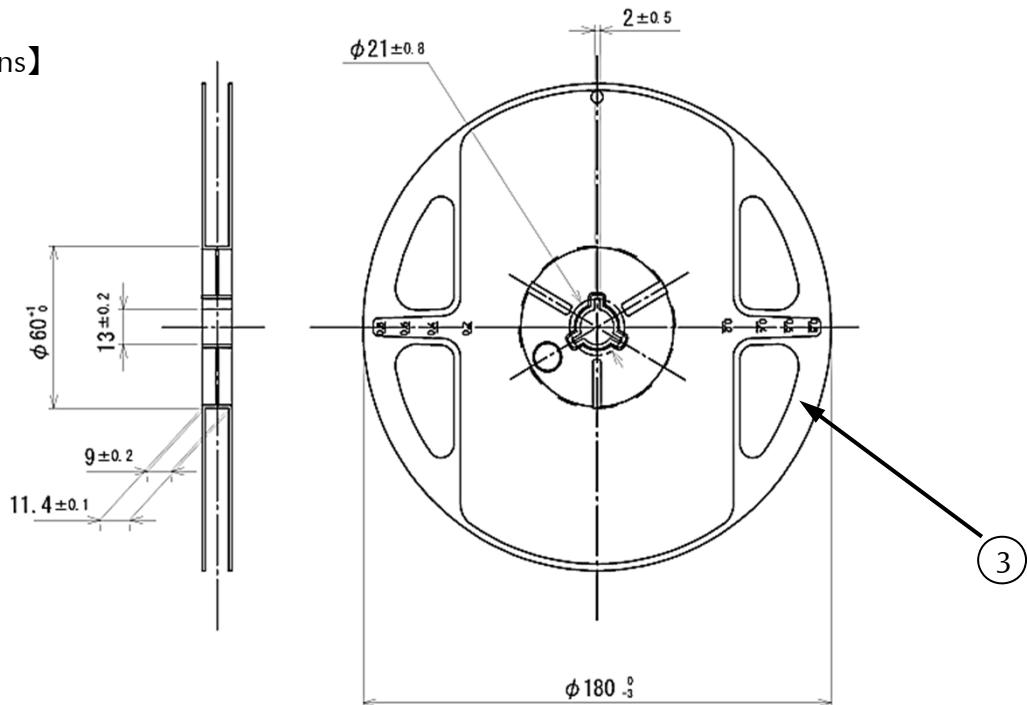
(acc.to JIS-C0806-03)

【Taping Dimensions】

Unit : mm



【Reel Dimensions】

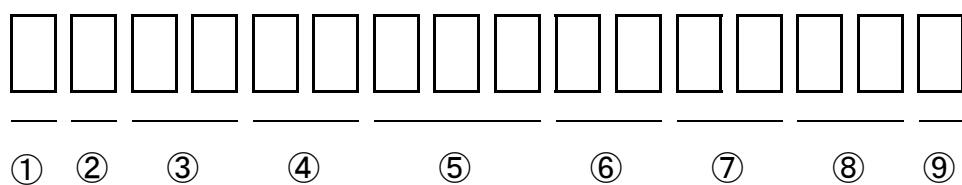


| SYMBOL | PART NAME    | REMARKS             |
|--------|--------------|---------------------|
| ①      | Carrier-tape | with ESD protection |
| ②      | Cover-tape   | with ESD protection |
| ③      | Carrier-reel | with ESD protection |



## Lot Number Notational System

VFS□1104LS-TR



① - 1digit : Production Location (Mark identify alphabet)

② - 1digit : Production Year (Last digit of Production Year 2009 9, 2010 0, 2011 1, ···)

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 intensity rank, "—" is used to indicate.)

⑧ - 2digits : Chromaticity Rank

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

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

⑨ - 1 digit : Option Rank (Stanley normally print "-" to indicate)



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)～(6).
- ELV instruction ..... Refer to following (1)～(4).

|     | Substance Group Name      | Criteria Value |
|-----|---------------------------|----------------|
| (1) | Lead and its compounds    | 1,000ppm Max   |
| (2) | Cadmium and its compounds | 100ppm Max     |
| (3) | Mercury and its compounds | 1,000ppm Max   |
| (4) | Hexavalent chromium       | 1,000ppm Max   |
| (5) | PBB                       | 1,000ppm Max   |
| (6) | PBDE                      | 1,000ppm Max   |

## 1. Reliability Testing Result

| Test Item                                  | Reference Standard     | Test Condition                                                                                   | Failure                   |
|--------------------------------------------|------------------------|--------------------------------------------------------------------------------------------------|---------------------------|
| Room Temperature Operating Life            | EIAJ ED-4701 /100(101) | Ta=25 $I_F=70\text{mA}$                                                                          | 1,000h 0 / 20             |
| High Temperature Operating Life            | EIAJ ED-4701 /100(101) | Ta=85 $I_F=50\text{mA}$                                                                          | 1,000h 0 / 20             |
| Low Temperature Operating Life             | EIAJ ED-4701/100(101)  | Ta=-40 $I_F=70\text{mA}$                                                                         | 1,000h 0 / 20             |
| Wet High Temperature Operating Life        | EIAJ ED-4701/100(102)  | Ta=60 90% $I_F=70\text{mA}$                                                                      | 1,000h 0 / 20             |
| High Temperature Storage Life              | EIAJ ED-4701/200(201)  | Ta=120                                                                                           | 1,000h 0 / 20             |
| Low Temperature Storage Life               | EIAJ ED-4701/200(202)  | Ta=-40                                                                                           | 1,000h 0 / 20             |
| Wet High Temperature Storage Life          | EIAJ ED-4701/100(101)  | Ta=60 Rh=90%                                                                                     | 1,000h 0 / 20             |
| Thermal Shock                              | EIAJ ED-4701/100(105)  | Ta=-40 ~120 (each 15min)                                                                         | 1,000cycles 0 / 20        |
| Thermal Shock Operating                    | EIAJ ED-4701/100(105)  | Ta=-40 (OFF) ~85 ( $I_F=50\text{mA}$ ON) (each 15min)                                            | 1,000cycles 0 / 20        |
| Cycled Temperature Humidity Operating Life | EIAJ ED-4701/200(203)  | Ta=-30 ~ 80 95(2h) 8h/cycle $I_F=57\text{mA}$ 5min on-off                                        | 30 cycles 0 / 20          |
| Resistance to Reflow Soldering             | EIAJ ED-4701/300(301)  | Moisture Soak : 30 70% 4weeks(672h) / Preheating : 150~180 90-120sec MAX. / Soldering : 260 peak | 2times 0 / 20             |
| Electrostatic Discharge (ESD)              | EIAJ ED-4701/300(304)  | $C=100\text{pF}$ $R2=1.5\text{k}\Omega \pm,2000\text{V}$                                         | once each polarity 0 / 10 |
| Vibration, Variable Frequency              | EIAJ ED-4701/400(403)  | 98.1m/s <sup>2</sup> (10G) 100~2,000Hz 20min XYZ                                                 | Each direction 0 / 10     |

Reference Test

## 2. Failure Criteria

| Item                | Symbol | Condition         | Failure Criteria                                      |
|---------------------|--------|-------------------|-------------------------------------------------------|
| Luminous Intensity  | $I_V$  | $I_F=50\text{mA}$ | Testing Min. Value < Standard Min. Value $\times 0.5$ |
| Forward Voltage     | $V_F$  | $I_F=50\text{mA}$ | Testing Max. Value Standard Max. Value $\times 1.2$   |
| Reserve Current     | $I_R$  | $V_R=5\text{V}$   | Testing Max. Value Standard Max. Value $\times 2.5$   |
| Cosmetic Appearance | -      | -                 | Notable discoloration, deformation and cracking       |

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