1. Scope of Application
This data sheet is applied to the LED package, model CLL040-1818A1-403M1A2.

2. Part code

CLL 040 - 18 18 A1 - 40 3 M1 A2
[1] [2] [3] [4] [5] [6]

[1] Part Code

[2] Dies in series quantity

[3] Dies in parallel quantity

[4] Correlated color temperature

[5] Chromaticity range

[6] CRI

## < Features >

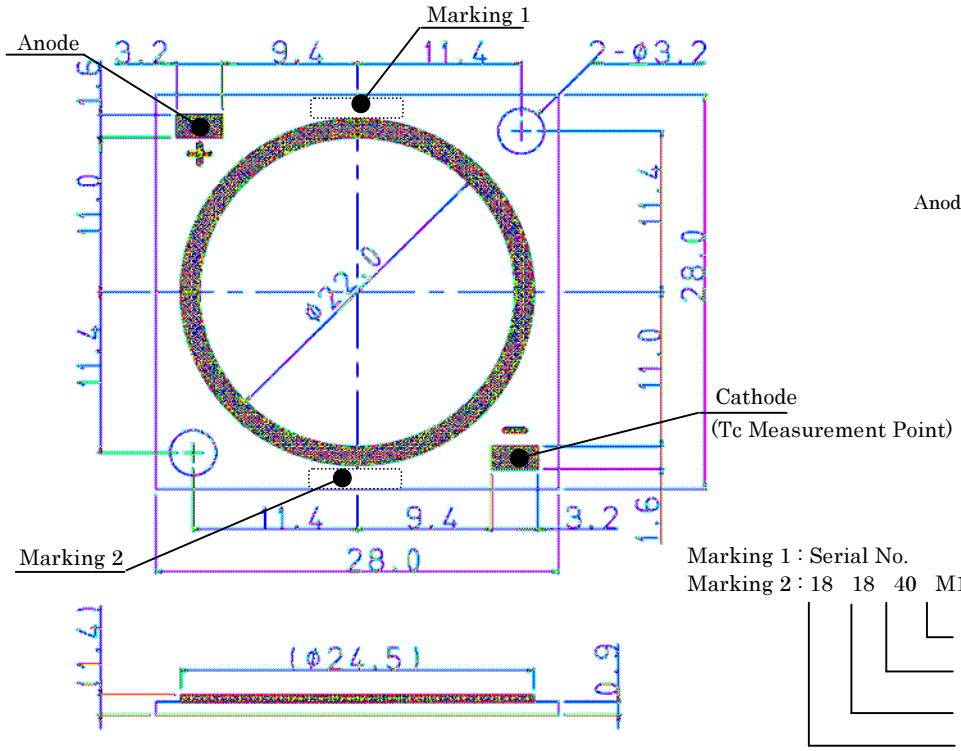
- External Dimensions: 28.0×28.0×1.4 mm
- Internal Structure: Aluminum Base Chip on Board
- Connection to Heat Sink: By M3 screw (Recommended)

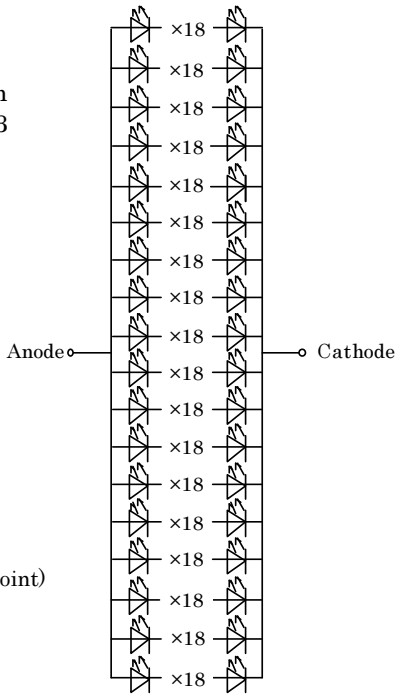
- Luminous Flux: 5965 lm @ 1080 mA
- CCT: 4000 K (ANSI C78.377 Compliant, in 3-Step MacAdam Ellipse)
- CRI: Ra 80 min.
- Thermal Resistance: 0.4 C/W

- RoHS Compliant
- IEC62031 / Edition 1.0 / 2008 // LED modules for general lighting - Safety specifications Compliant
- IEC62471 / First Edition / 2006-07 // Photobiological safety of lamps and lamp systems / Exempt level
- IES LM-80

## 3. Outline drawing · Marking

Unit : mm
Tolerances unless otherwise specified : +/-0.3




Marking 1 : Serial No.
Marking 2 : 18 18 40 M1

- CRI : Ra 80min.
- Correlated color temperature : 4000K
- Dies in parallel quantity : 18
- Dies in series quantity : 18

## 4. Performance

### (1) Absolute Maximum Rating

| Parameter | Symbol | Rating Value | Unit | |
|---|---|---|---|---|
| Input Power | Pi | 144.3 | W | *1 |
| Forward Current | $I_F$ | 2160 | mA | *1 |
| Reverse Current | $I_R$ | 1 | mA | |
| Operating Temperature | $T_{op}$ | -30 ~ +85 | C | |
| Storage Temperature | $T_{st}$ | -40 ~ +100 | C | |
| Case Temperature | Tc | 100 | C | *2 |
| Junction Temperature | Tj | 150 | C | *3 |

*1 Input power and forward current are the values when the LED is used within the range of the derating curve in this data sheet.
*2 Refer to 3. Outline drawing for Tc measurement point
*3 D.C. Current : Tj = Tc + Rj-c X Pi

| Symbol | CITILED |
|---|---|
| Name | CLL040-1818A1-403M1A2 |
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(2) Electro-optical Characteristics Tc=25C

| Parameter | Symbol | Condition | Min. | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Forward Voltage | $V_F$ | $I_F$=1080mA | 50.4 | 54.9 | 59.8 | V |
| Luminous Flux | $\Phi_V$ | $I_F$=1080mA | 5070 | 5965 | - | lm |
| CRI | Ra | $I_F$=1080mA | 80 | - | - | – |
| Thermal Resistance | Rj-c | Junction-Case | - | 0.4 | - | C/W |

Chromaticity coordinates ( Condition : IF=1080mA, Tc = 25C)

| Center | |
|---|---|
| x | y |
| 0.3818 | 0.3797 |
| Oval parameter | |
| a | 0.00939 |
| b | 0.00402 |
| θ° | 54.00 |

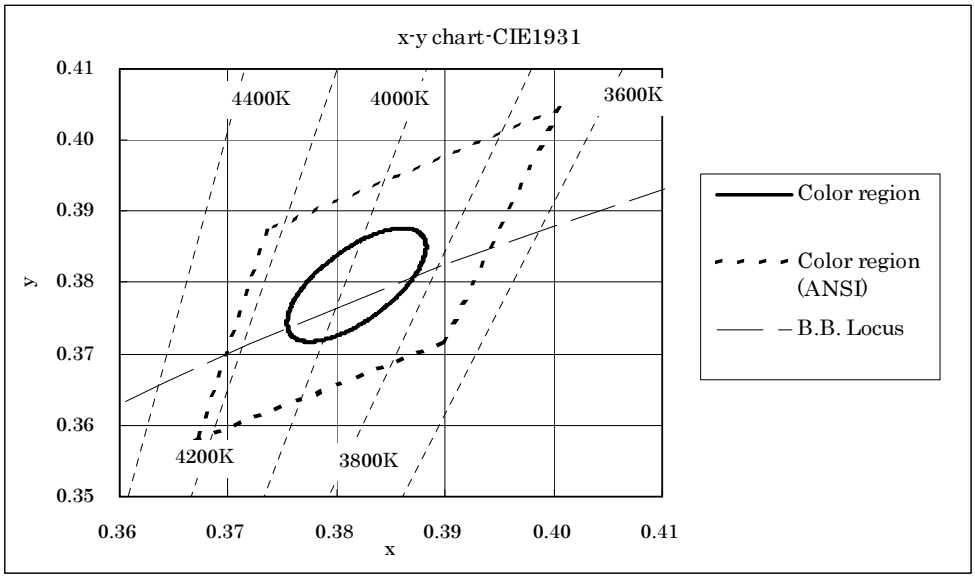
Reference (ANSI C78.377)

| | | x | y |
|---|---|---|---|
| 4000K | Center | 0.3818 | 0.3797 |
| | a | 0.4006 | 0.4044 |
| | b | 0.3736 | 0.3874 |
| | c | 0.3670 | 0.3578 |
| | d | 0.3898 | 0.3716 |

*Color region stay within MacAdam "3-step" ellipse from the chromaticity center.

*The chromaticity center refers to ANSI C78.377:2008.
Please refer to ANSI C78.377 for the chromaticity center.

*θ is the angle between the major axis of the ellipse and the x-axis,
and a and b are the major and minor semi-axes of an ellipse. (Ref. IEC 60081:1997 AnnexD)




Note: The tolerance of measurement at our tester is $V_F$+/-3% , Φv+/-10% , Chromaticity(x,y)+/-0.005 and Ra+/-1.

| Symbol | CITILED |
|---|---|
| Name | CLL040-1818A1-403M1A2 |
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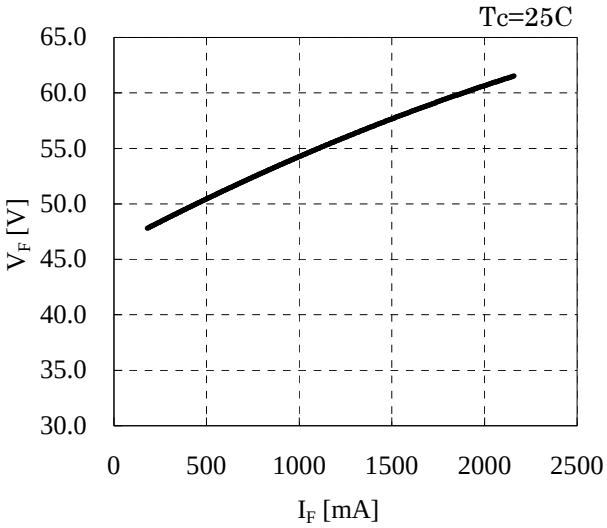
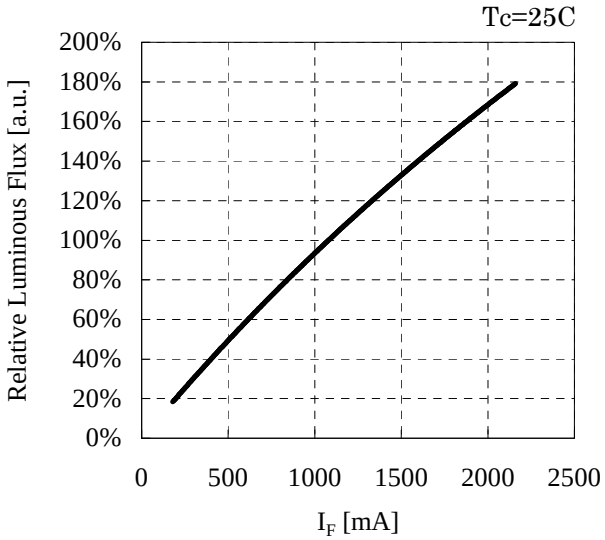
## 5. Characteristics

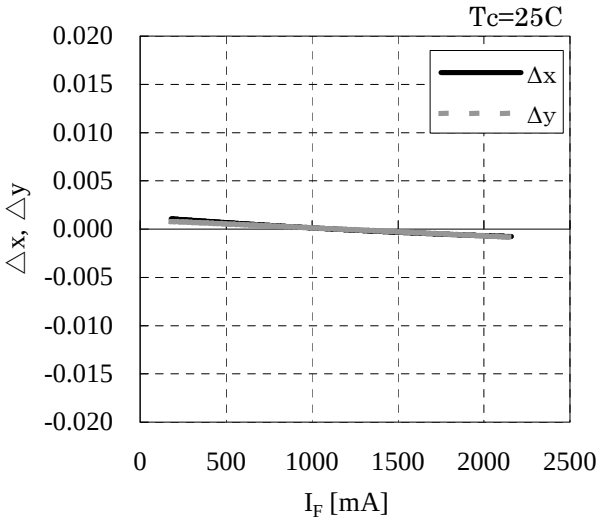
Forward Current vs. Forward Voltage



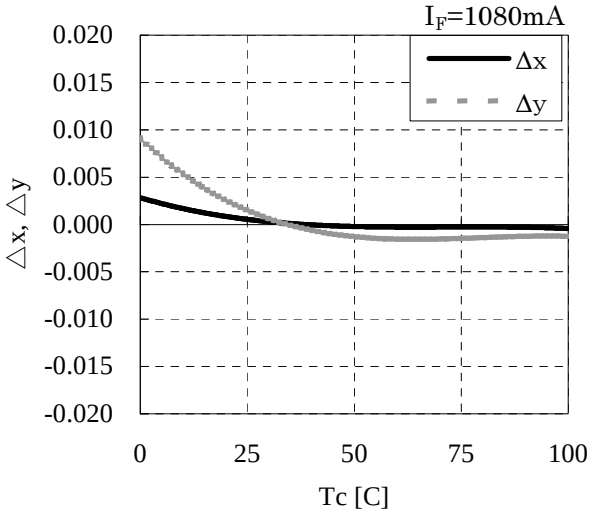

Forward Current vs. Relative Luminous Flux




Forward Current vs. Chromaticity Coordinate




Case Temperature vs. Chromaticity Coordinate




| Symbol | CITILED |
|---|---|
| Name | CLL040-1818A1-403M1A2 |
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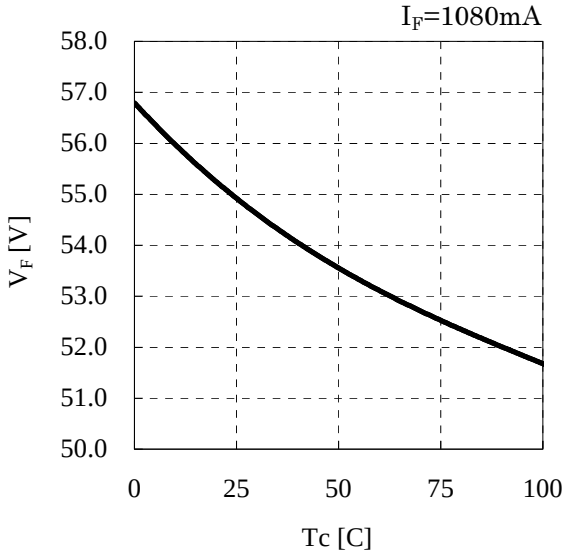
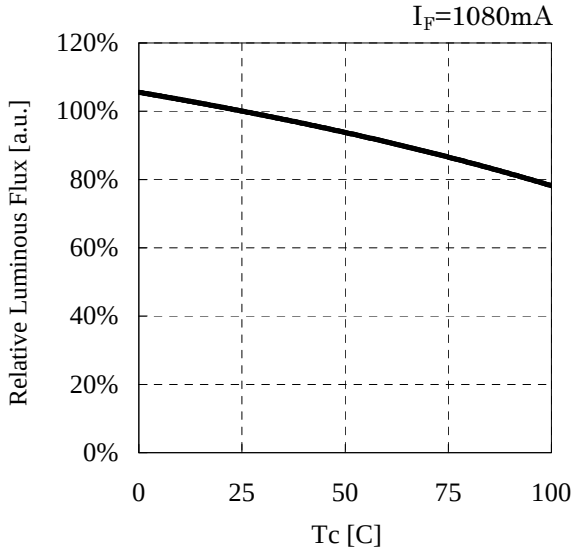
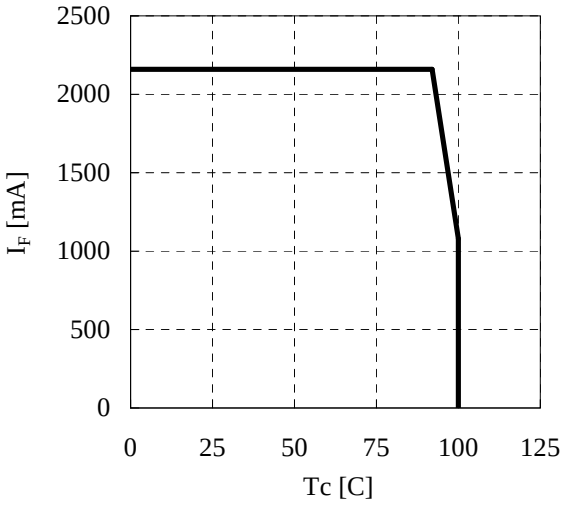
Case Temperature vs. Forward Voltage



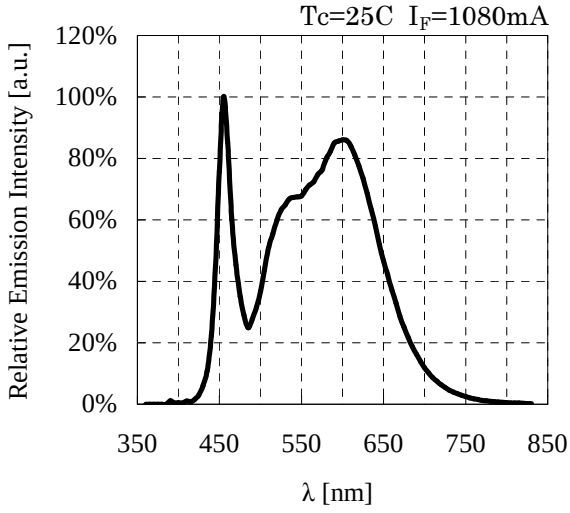

Case Temperature vs. Relative Luminous Flux



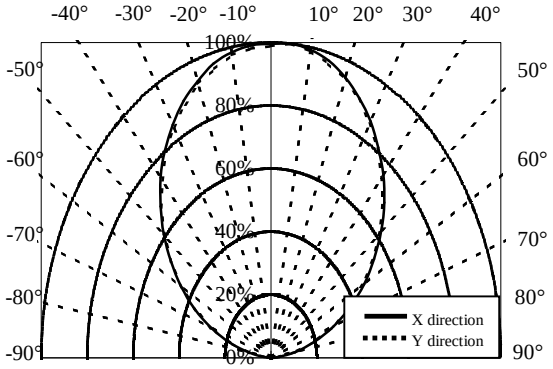

Case Temperature vs. Allowable Forward Current

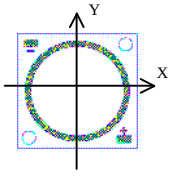



Spectrum




Directive Characteristic




| Symbol | CITILED |
|---|---|
| Name | CLL040-1818A1-403M1A2 |
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6. Reliability

(1) Datails of the tests

| Test Item | Test Condition |
|---|---|
| Continuous Operation Test | Ta=25 C, $I_F$=1080mA× 1000 hours(with Al-fin) |
| | $I_{Fmax}$=2160 mA Tjmax=150C× 1000 hours(with Al-fin) |
| Low Temperature Storage Test | -40 C × 1000 hours |
| High Temperature Storage Test | 100 C × 1000 hours |
| Moisture-proof Test | 85 C, 85 %RH for 500 hours |
| Thermal Shock Test | -40 C × 30 minutes – 100 C × 30 minutes, 100 cycle |

(2)Judgement Criteria of Failure for Reliability Test

(Ta=25C)

| Measuring Item | Symbol | Measuring Condition | Judgement Criteria for Failure |
|---|---|---|---|
| Forward Voltage | VF | $I_F$=1080mA | >U X 1.1 |
| Total Luminous Flux | φv | $I_F$=1080mA | <S X 0.85 |

U defines the upper limit of the specified characteristics. S defines the initial value.

Note : Measurement shall be taken between 2 hours and 24 hours, and the test pieces should be return to the normal ambient conditions after the completion of each test.

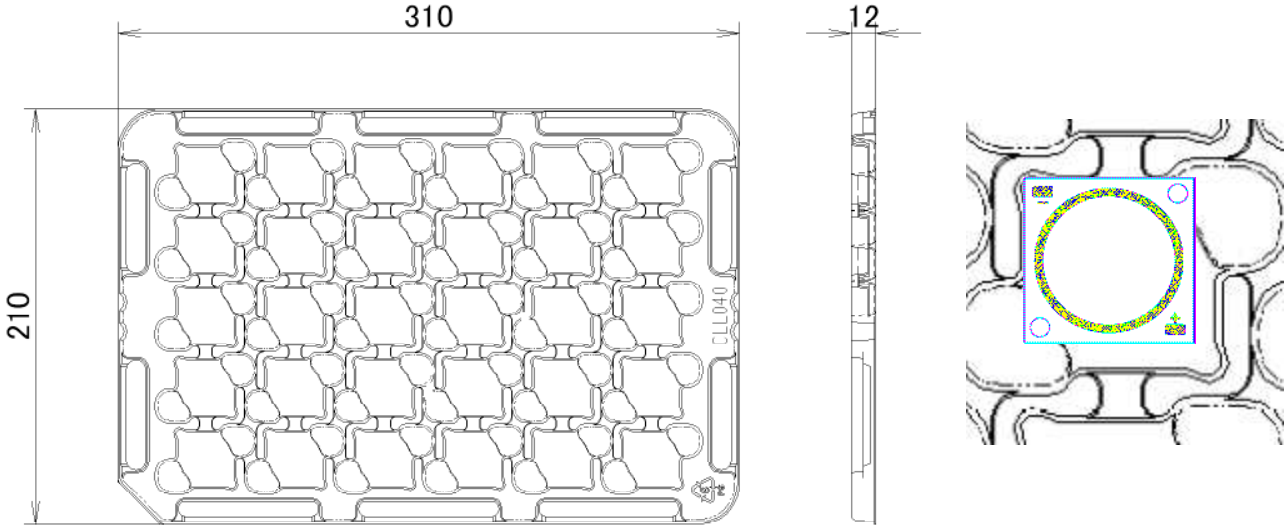
## 7. Packing Specifications

### (1) Packing

An empty tray is placed on top of a six-tier tray which contain 30 pieces each. The set of seven trays is banded together with two rubber bands.
(Smallest packing unit: 180 pieces)
A label with product name, quantity, lot number is placed on the upper empty tray.

Tray (Dimensions: 310 × 210 × 12 mm / Materials: Electrically conductive PS)

< Packing figure >




Product 30 pcs/tray

< Example of indication label >

CUSTOMER
TYPE : CLL040-******-*******-(1)
P. NO : ******  ---(2)
Lot No: *******  ---(3)
Q'ty : ***  ---(4)
PASS
CITIZEN ELECTRONICS

1. TYPE e.g. CLL040-1818A1-403M1A2
2. P.No. (Cutomer's P/N) e.g. 50008-010-1203303M1
3. Lot No.
   - First and second letter: Last digit of the year e.g. 11 : year 2011
   - Third letter: Production month e.g. 8 : August
     Note: October, November and December are designated
   - Forth letter: CE's control number e.g. 5035
4. Quantity

| Symbol | CITILED |
|---|---|
| Name | CLL040-1818A1-403M1A2 |
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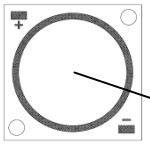
## 8. Precautions

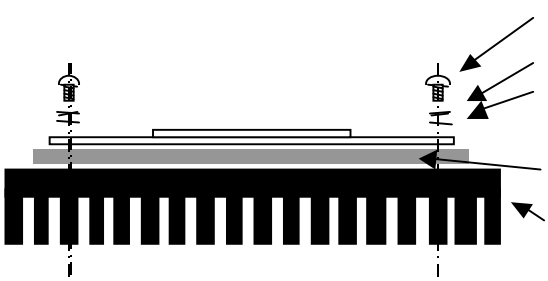
1. Avoid the application of any stress to the resin portion.
2. Avoid any contact by a sharp metal nail or other materials with the resin portion.

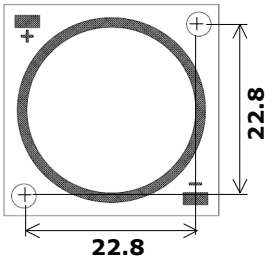



3. Precautions for product assembly

-When the LED package is attached to the heat sink by M3 screws, please be careful not to apply too much stress to the LED package. For example, fix the screws firmly after temporarily fixing them.

-Attachment to heat sink conditions such as tightening torque for screws should be optimized in accordance with the specifications for heat sinks. In addition, asperity or burrs harms the thermal connection between the LED package and heat sink. So please ensure correct contact to keep both thermal and mechanical connection.



Recommended installation screw pitch

4. Insulation of the thermal section from the heat sink section of the LED has been confirmed up to 500V. However, for voltages higher than 500V, the customer should confirm the level of insulation themselves or contact Citizen Electronics. With regard to insulation after this product has been assembled in an apparatus, preventive action should be carried out by the customer.
5. For fixing this product to the outer heat sink, heat grease should be applied to the whole rear deformation when conducting the clamping operation with heat grease in sheet form.
6. Handling of static electricity
   - These products are sensitive to static electricity charge.
     Please take measures to prevent any static electricity being produced such as the wearing of a wristband or anti-static gloves when handling this product.
   - All devices, equipment and machinery must be properly grounded. It is recommended that precautions be taken against surge voltage to the equipment that mounts the LEDs.
   - ESD sensitivity of this product is 1000V (HBM, based on JEITA ED-4701/304).
   - When inspecting the final products in which LEDs were assembled, it is recommended to check whether the assembled LEDs are damaged by static electricity or not.
   - It is easy to find static-damaged LEDs by a light-on test.

## 8. Precautions (continued)

7. Lighting at a low current
A minimum current value of lighting of all dice is 90mA.
When a minimum current is applied, LED dice may look different in their brightness due to the individual difference of the LED element, and it is not a failed product.

8. Please be aware that this product should not come into contact with any other parts in assembled status.

9. Drive circuit
- A constant current circuit is recommended as a drive circuit.
  And when two or more LED packages are connected, the series connection between each package is recommended.
- Please design a circuit that prevents any reverse voltage (excess current) from being applied to this product instantaneously when the circuit is ON or OFF.

10. Heat generation
- As this product is designed with consideration of the heat release property of module, a heat release design is required to use this product efficiently.
  Please ensure that heat generation is not in excess of the absolute maximum rating.
  (Refer to 4-1 Performance)
- Factors responsible for an increase in temperature include heat generation attributed to ambient temperature conditions or power dissipation. Thus, drive conditions should be taken into consideration, depending on ambient temperature (Ta).

11. Recommended soldering condition (This product is not adaptable to reflow process)
- Manual soldering
  - Soldering shall be implemented using a soldering bit of 40W or less with a temperature 350°C or less within 3.5 seconds for one land.
    (Recommended condition in a case of lead-free solder condition)
  - No external force shall be applied to resin part during soldering.
  - Next process of soldering should be carried out after the product has returned to ambient temperature.
- For soldering correction
  - Regarding soldering correction, above conditions shall be used.
  - Contacts number of soldering bit should be within twice for each terminal as a correction.

* Citizen Electronics cannot guarantee if usage exceeds this recommended conditions.
Please use it after sufficient verification is carried out on your own risk if necessary.

## 8. Precautions (continued)

12. Eye Safety

- The International Electrical Commission (IEC) published in 2006 IEC 62471 *"2006 Photobiological safety oflamps and lamp systems"* which includes LEDs within its scope. When sorting single LEDs according to IEC 62471, most white LEDs can be classified as belonging to either Exempt Group or Risk Group 1.
- However, Optical characteristics of LEDs such as radiant flux, spectrum and light distribution are factors that affect the risk group determination of the LED, and especially a high-power LED, that emits light containing blue wavelengths, may have properties equivalent to those of Risk Group 2.
- Great care should be taken when directly viewing an LED that is driven at high current, has multiple uses as a module or when focusing the light with optical instruments, as these actions may greatly increase the hazard to your eyes.
- It is recommended to regard the evaluation of stand-alone LED packages as a reference and to evaluate the customer's final product.

13. The use of Class 2 power supply is assumed for this product.

14. If the product might to be used under the following conditions, the customer must evaluate its approproateness them. This product is not designed for use under the following conditions. in places where the product might:
    - get wet due to rain
    - suffer from damage caused by salt.
    - be exposed to corrosive gas such as Cl, H2S, NH3, SO2, Nox and so on.
    - be exposed to dust, fluid or oil.

## 9. Precautions with regard to product use

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