




PRODUCT SPECIFICATION

Model No : CSST-NLASWGA95-M4X

| Descriptions: | |
|------------------|---|
| • LED Type | : White SMD LED : PLCC2 3.5x2.8 x0.8mm |
| • Emitting Color | : Standard White |
| • Encapsulation | : Silicone Resin |



| CUSTOMER APPROVED SIGNATURES | APPROVED BY | CHECKED BY | PREPARED BY |
|------------------------------|---|--|---|
| |  |  |  |

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■ Features –

1. High luminous intensity using InGaN dice Technology
2. High reliability package due to silicone encapsulation
3. Wide viewing angle at 120 °
4. RoHS Compliant
5. Compatible Lead-Free Reflow Soldering process
6. JEDEC MSL 2a

■ Applications –

1. General lighting
2. Architecture and entertainment lighting
3. Electronic signs and signals
4. Interior automotive lighting

■ Absolute Maximum Rating Polarity–

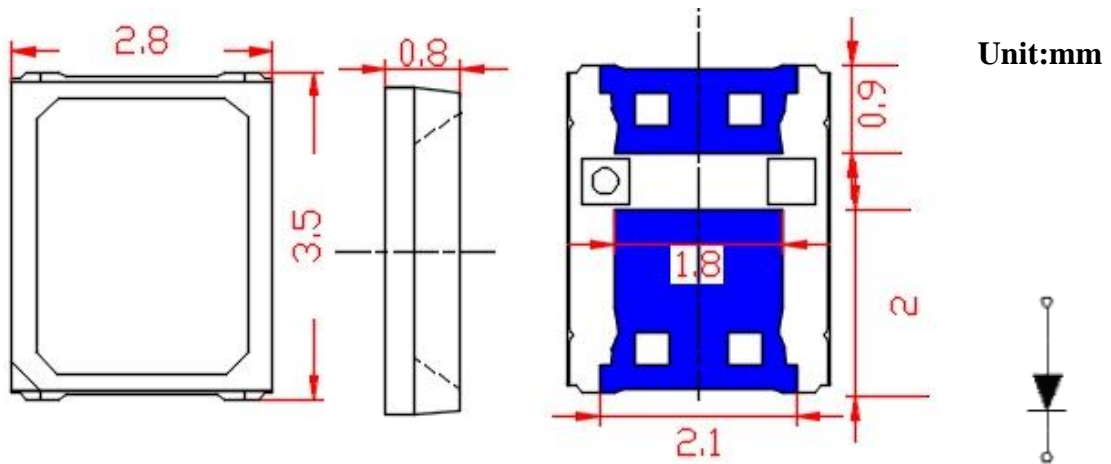
(Ta=25°C)

| Parameter | Symbol | Rating | Unit |
|---------------------------|------------------|---|------|
| Power Dissipation | Pd | 280 | mW |
| Forward Current | I _F | 90 | mA |
| Peak Forward Current* | I _{FP} | 120 | mA |
| Reverse Voltage* | V _R | 5 | V |
| LED Junction Temperature* | T _j | 110 | °C |
| Operating Temp. | T _{opr} | -40~ +85 | °C |
| Storage Temp. | T _{stg} | -40 ~ +100 | °C |
| Soldering Temp. | T _{sol} | Reflow Soldering : 260°C for 10 sec Hand Soldering : 350°C for 3 sec | |

Notes:

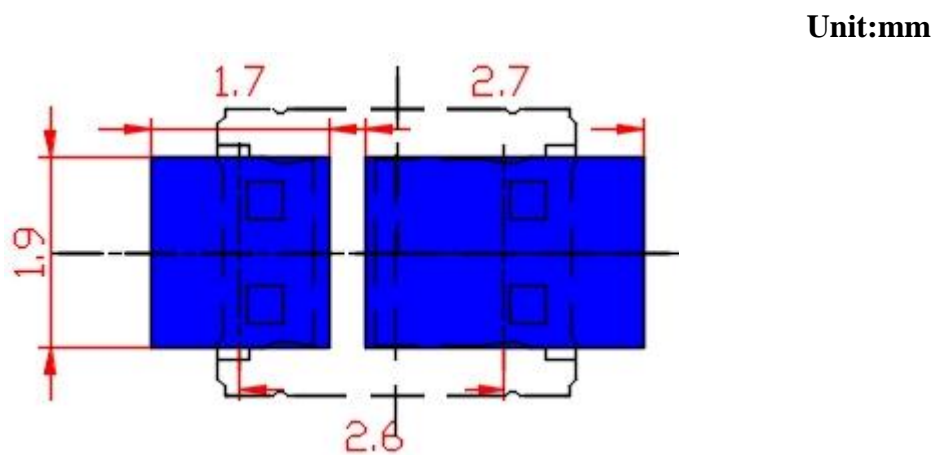
1. Pulse width \leq 0.1 msec, duty \leq 1/10
2. Proper current rating must be observed to maintain junction temperature below the maximum at all the time.
3. The device can not operated under continuous reverse voltage

■ Package Outline Dimensions –



Notice: Tolerance of measurement of Dimension: $\pm 0.2\text{mm}$

■ Recommended Soldering Pad Pattern



■ Electrical / Optical Characteristics –

($T_a=25^\circ\text{C}$)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Condition |
|-----------------------|-----------------|------|------|------|---------------|-------------------|
| Forward Voltage | V_F | | 3.1 | | V | $I_F=60\text{mA}$ |
| Luminous Flux | Φ_V | | 25 | | lm | |
| Viewing Angle | $2\theta_{1/2}$ | | 120 | | deg | |
| Color Rendering Index | R_a | 90 | 95 | | | |
| Reverse Current | I_R | | | 10 | μA | $V_R=5\text{V}$ |

■ Luminous Flux Rank Limits ($I_F = 60\text{mA}$)

unit : lm

| Luminous Flux Part No. | P173 | P190 | P230 | P253 | P280 |
|------------------------|-----------|-----------|-----------|---------|-----------|
| CSST-NLASWGA95-M4X | 17.3-19.0 | 19.0-23.0 | 23.0-25.3 | 25.3-28 | 28.0-31.0 |

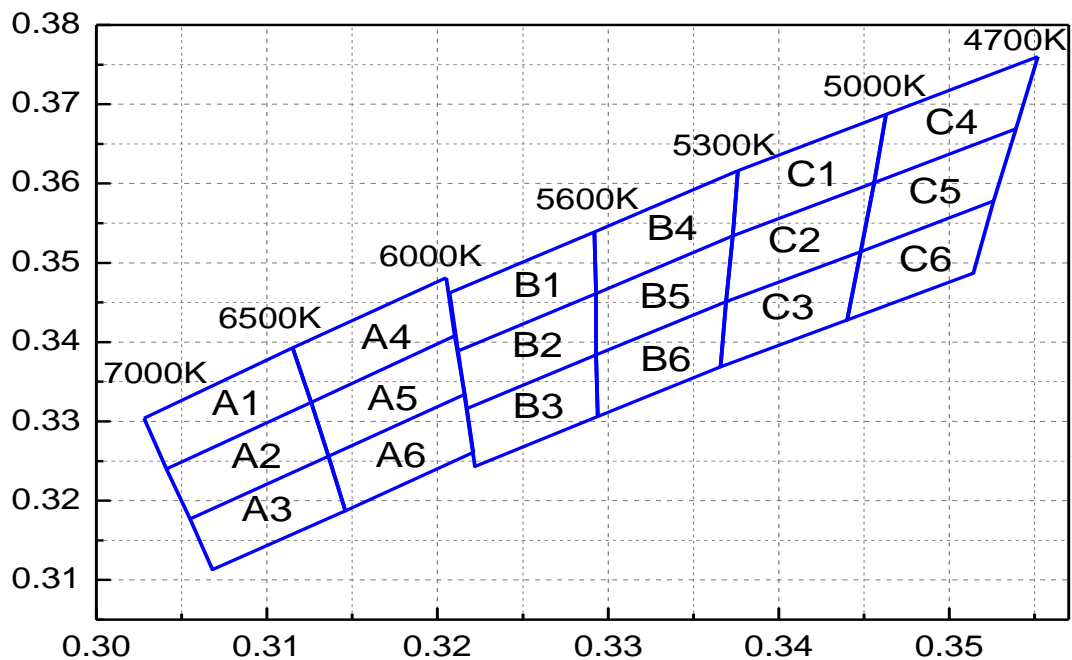
Notice: Tolerance of measurement of Luminous Flux : $\pm 7\%$

■ Forward Voltage Rank Limits –

| V_F Rank | Min | Max | Unit | Condition |
|------------|-----|-----|------|---------------------|
| V28 | 2.8 | 2.9 | V | $I_F = 60\text{mA}$ |
| V29 | 2.9 | 3.0 | | |
| V30 | 3.0 | 3.1 | | |
| V31 | 3.1 | 3.2 | | |
| V32 | 3.2 | 3.3 | | |
| V33 | 3.3 | 3.4 | | |

Notice: Tolerance of measurement of Forward Voltage: $\pm 0.1\text{V}$

■ Color Rank Limits ($I_F = 60\text{mA}$)



| Rank A Color Temperature:6500~7000K | | | | | |
|-------------------------------------|--------|--------|--------|--------|--------|
| A1 | | A2 | | A3 | |
| CIE X | CIE Y | CIE X | CIE Y | CIE X | CIE Y |
| 0.3028 | 0.3304 | 0.3041 | 0.324 | 0.3055 | 0.3177 |
| 0.3041 | 0.3240 | 0.3055 | 0.3177 | 0.3068 | 0.3113 |
| 0.3126 | 0.3324 | 0.3136 | 0.3256 | 0.3146 | 0.3187 |
| 0.3115 | 0.3393 | 0.3126 | 0.3324 | 0.3136 | 0.3256 |

| Rank A Color Temperature:6000~6500K | | | | | |
|-------------------------------------|--------|--------|--------|--------|--------|
| A4 | | A5 | | A6 | |
| CIE X | CIE Y | CIE X | CIE Y | CIE X | CIE Y |
| 0.3115 | 0.3393 | 0.3126 | 0.3324 | 0.3136 | 0.3256 |
| 0.3126 | 0.3324 | 0.3136 | 0.3256 | 0.3146 | 0.3187 |
| 0.3210 | 0.3408 | 0.3216 | 0.3334 | 0.3221 | 0.3261 |
| 0.3205 | 0.3481 | 0.3210 | 0.3408 | 0.3216 | 0.3334 |

| Rank B Color Temperature:5600~6000K | | | | | |
|-------------------------------------|--------|--------|--------|--------|--------|
| B1 | | B2 | | B3 | |
| CIE X | CIE Y | CIE X | CIE Y | CIE X | CIE Y |
| 0.3207 | 0.3462 | 0.3212 | 0.3389 | 0.3217 | 0.3316 |
| 0.3212 | 0.3389 | 0.3217 | 0.3316 | 0.3222 | 0.3243 |
| 0.3293 | 0.3461 | 0.3293 | 0.3384 | 0.3294 | 0.3306 |
| 0.3292 | 0.3539 | 0.3293 | 0.3461 | 0.3293 | 0.3384 |

| Rank B Color Temperature:5300~5600K | | | | | |
|-------------------------------------|--------|--------|--------|--------|--------|
| B4 | | B5 | | B6 | |
| CIE X | CIE Y | CIE X | CIE Y | CIE X | CIE Y |
| 0.3292 | 0.3539 | 0.3293 | 0.3461 | 0.3293 | 0.3384 |
| 0.3293 | 0.3461 | 0.3293 | 0.3384 | 0.3294 | 0.3306 |
| 0.3373 | 0.3534 | 0.3369 | 0.3451 | 0.3366 | 0.3369 |
| 0.3376 | 0.3616 | 0.3373 | 0.3534 | 0.3369 | 0.3451 |

| Rank C Color Temperature:5000~5300K | | | | | |
|-------------------------------------|--------|--------|--------|--------|--------|
| C1 | | C2 | | C3 | |
| CIE X | CIE Y | CIE X | CIE Y | CIE X | CIE Y |
| 0.3376 | 0.3616 | 0.3373 | 0.3534 | 0.3369 | 0.3451 |
| 0.3373 | 0.3534 | 0.3369 | 0.3451 | 0.3366 | 0.3369 |
| 0.3456 | 0.3601 | 0.3448 | 0.3514 | 0.3440 | 0.3428 |
| 0.3463 | 0.3687 | 0.3456 | 0.3601 | 0.3448 | 0.3514 |
| Rank C Color Temperature:4700~5000K | | | | | |
| C4 | | C5 | | C6 | |
| CIE X | CIE Y | CIE X | CIE Y | CIE X | CIE Y |
| 0.3463 | 0.3687 | 0.3456 | 0.3601 | 0.3448 | 0.3514 |
| 0.3456 | 0.3601 | 0.3448 | 0.3514 | 0.3440 | 0.3428 |
| 0.3539 | 0.3669 | 0.3526 | 0.3578 | 0.3514 | 0.3487 |
| 0.3552 | 0.3760 | 0.3539 | 0.3669 | 0.3526 | 0.3578 |

Notice : Tolerance of measurement of Color Coordinates : ± 0.01

**■ Typical Electrical / Optical Characteristics Curves –
(Ta = 25°C Unless Otherwise Noted)**

Figure1 Forward Current VS Ambient Temperature

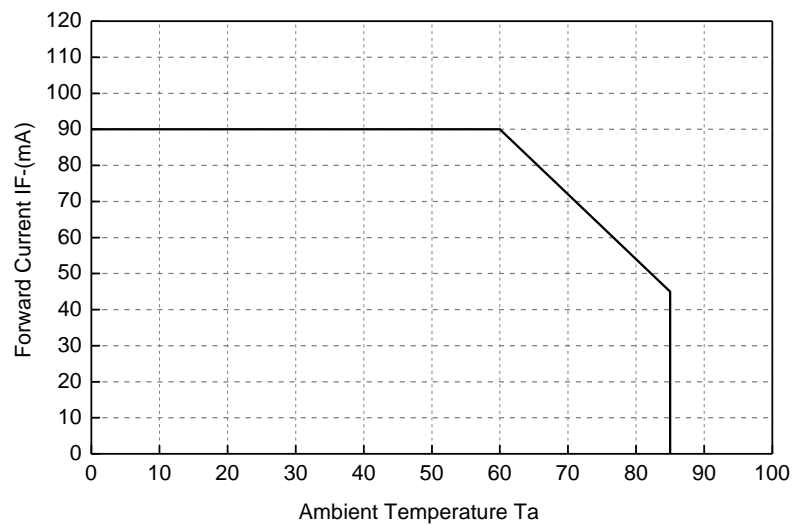


Figure2. Forward Current VS. Forward Voltage

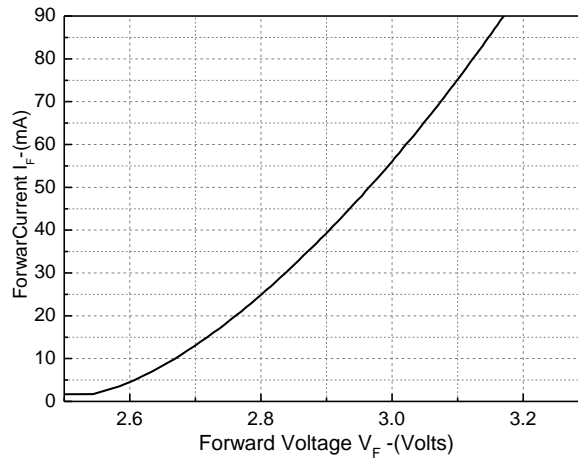


Figure3. Relative Luminous Flux VS. Forward Current

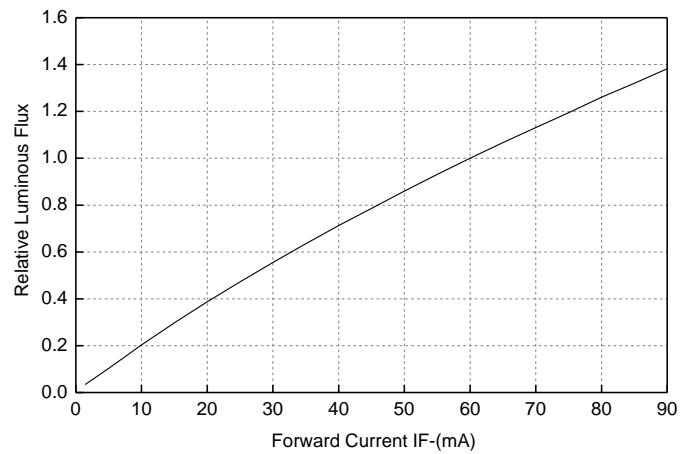


Figure4. CIE X VS. Forward Current

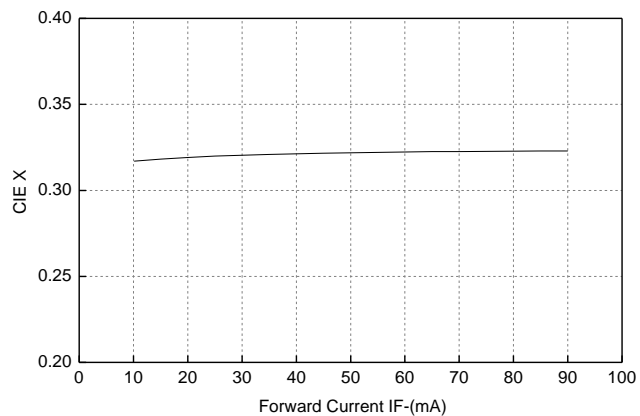


Figure5. CIE Y VS. Forward Current

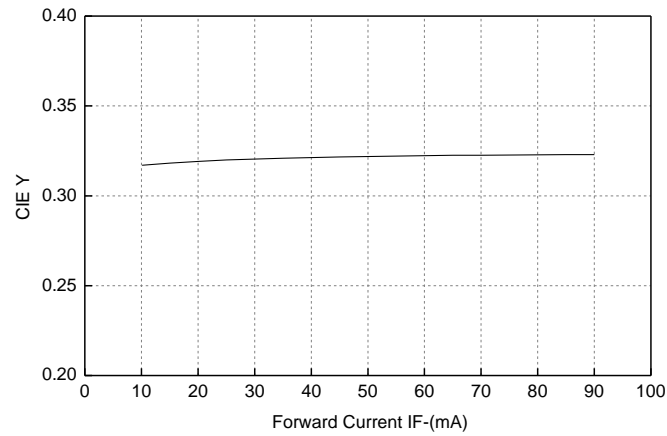


Figure6. Relative Luminosity VS. Radiation Angle

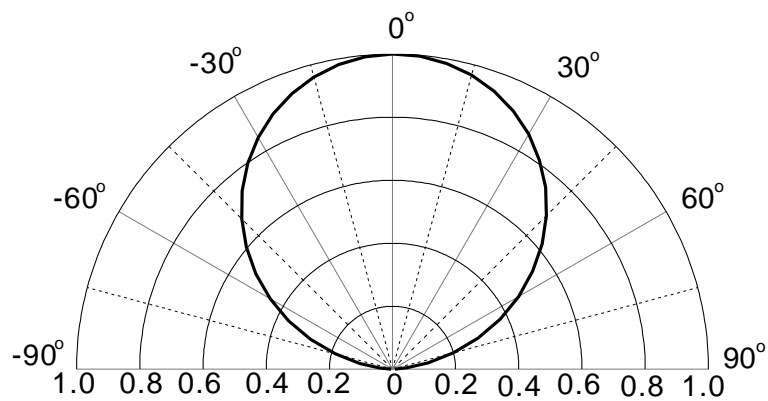
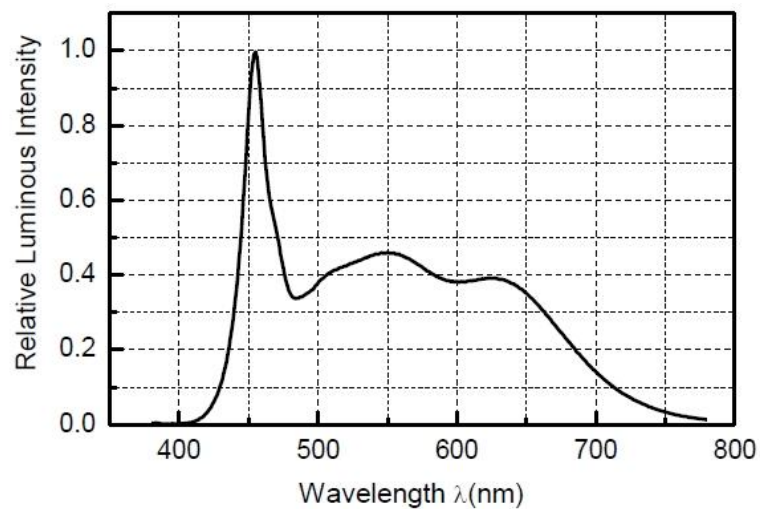
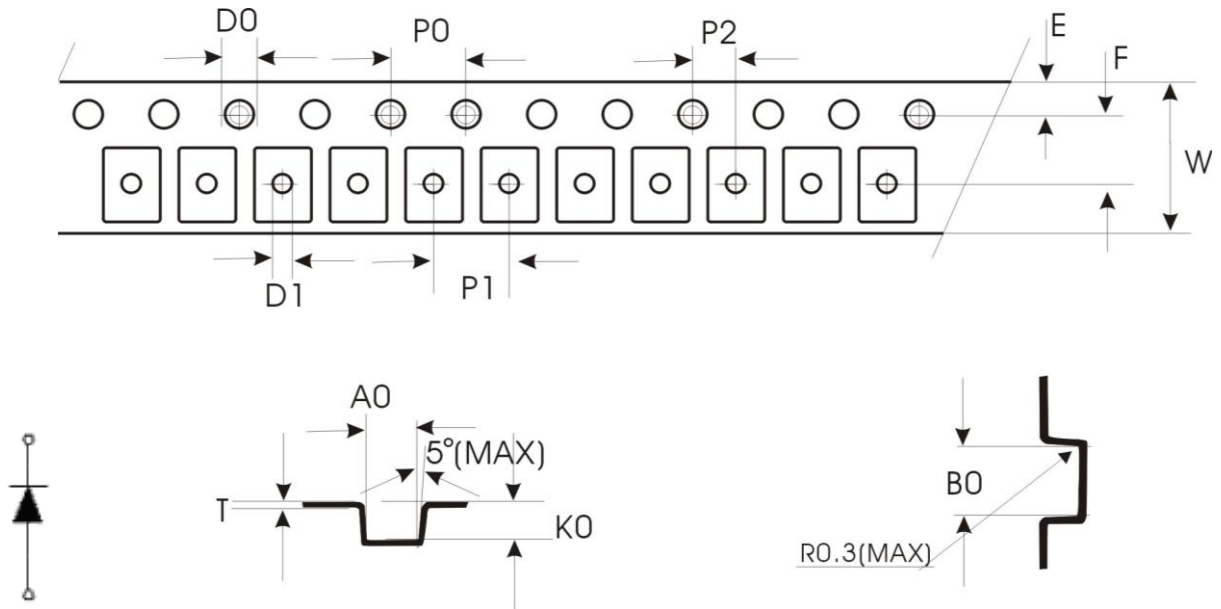


Figure7. Relative Spectral Power Distribution VS. Wavelength



■ Package –

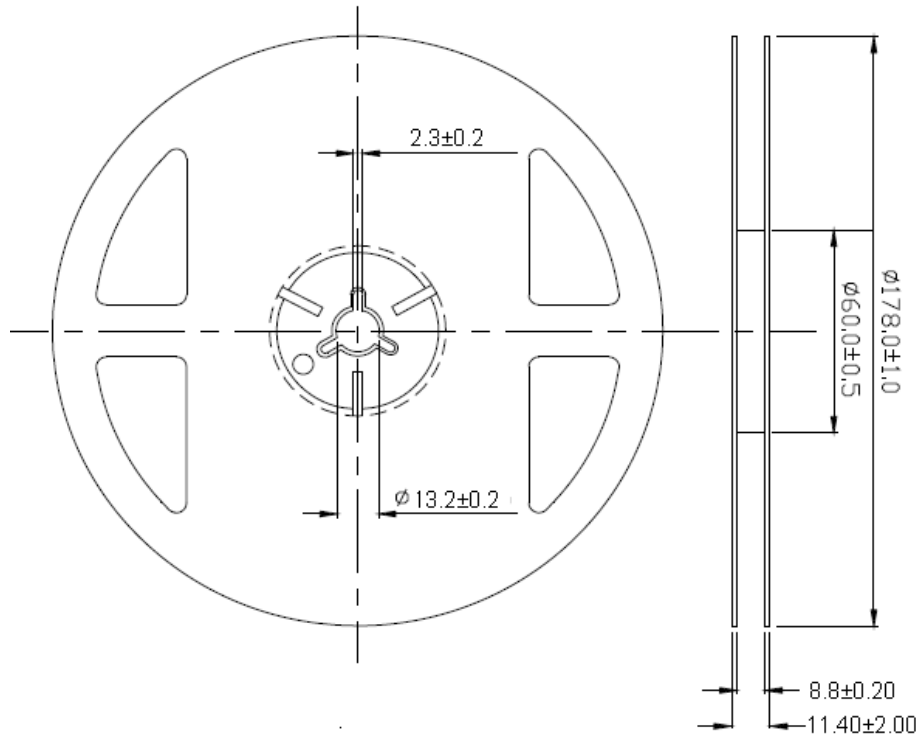
1. Tape Dimension



Unit: mm

| | | | | | | | |
|--------|-----------|-----------|---------|---------|---------|----------|-----------|
| Symbol | A0 | B0 | K0 | P0 | P1 | P2 | T |
| Spec | 3.0±0.1 | 3.8±0.1 | 1.0±0.1 | 4.0±0.1 | 4.0±0.1 | 2.00±0.1 | 0.22±0.05 |
| Symbol | E | F | D0 | D1 | W | P0 | |
| Spec | 1.75±0.10 | 3.50±0.05 | 1.5±0.1 | 1.0±0.1 | 8.0±0.1 | 40.0±0.2 | |

2. Reel Dimension

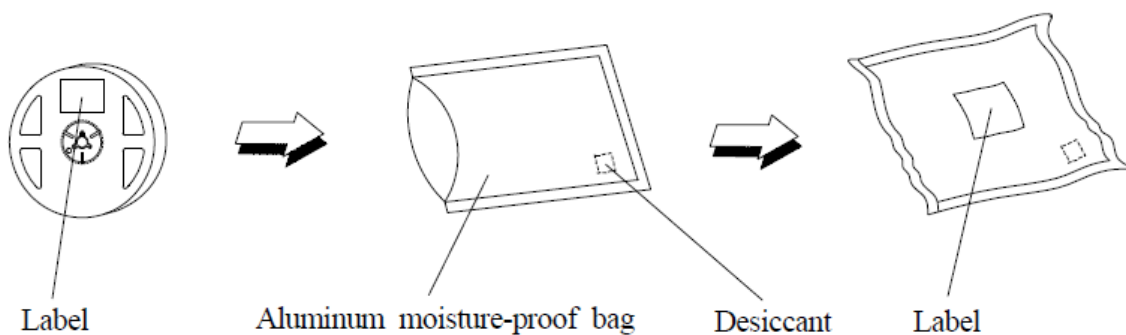


Unit: mm

Notice: (1) Quantity: 4000PCS/Reel

(2) Tolerance unless mentioned is ± 0.2 mm

3. Packing Model



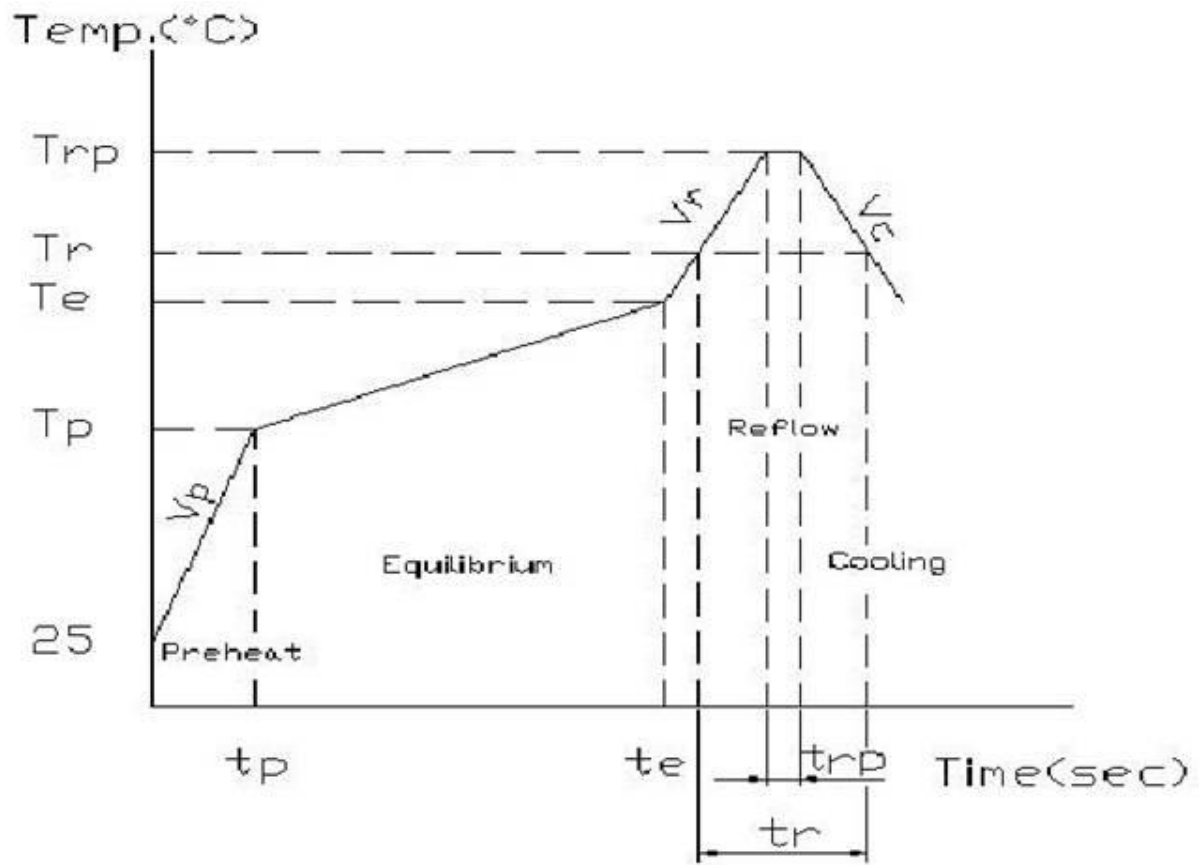
■ Packing Amount

| Package Name | Package Dimension | | Distribution of the layer or box | | Total Mount | | Note |
|--------------|-------------------|------|----------------------------------|-----------|-------------|------|------|
| | Size | Unit | Amount | Unit | Amount | Unit | |
| Reel | Φ178X11.4 | mm | 1 | Reel | 4000 | Pcs | |
| Inner Box | 265X235X78 | mm | 5 | Reel | 20000 | Pcs | |
| Outer Box | 540x260x170 | mm | 4 | Inner Box | 80000 | Pcs | |

■ Soldering Characteristics

IR-reflow Condition (Pb free)

| Area | Title | Symbol | Min | Max | Unit |
|----------------|------------------|--------|-----|-----|--------|
| (1)Preheat | Ramp-up rate | Vp | 1 | 5 | °C/sec |
| | temperature | Tp | 150 | - | °C |
| | time | tp | - | - | sec |
| (2)Equilibrium | Ramp-up rate | Ve | - | - | °C/sec |
| | temperature | Te | 150 | 200 | °C |
| | Time | te | 60 | 120 | sec |
| (3)Reflow | Ramp-up rate | Vr | 1 | 5 | °C/sec |
| | temperature | Tr | 220 | - | °C |
| | Time | tr | - | 60 | sec |
| | Peak temperature | Trp | - | 260 | °C |
| | Peak time | trp | - | 10 | sec |
| (4)Cooling | Ramp-down rate | Vc | 3 | 6 | °C/sec |



Hand Soldering (Iron Condition)

Soldering Iron: 30W Max

Temperature 350°C Max (iron tip 260° C Max)

Soldering Time: 3 Seconds Max (Once)

■ Reliability Test Program/ Reliability Test Item

| NO. | Test Item | Standard | Test Conditions | Test | Failure | Units |
|-----|-------------------------------------|---------------------------|--|---------------|----------|---------------|
| | | Test Method | | Duration | Criteria | Failed/Tested |
| 1 | Resistance to Soldering Heat | JEITA ED-4701 300 301 | Tsld=260°C, 10sec,reflows Pretreatment30°C,70%,168hrs | | #1 | 0/20 |
| 2 | Solderability (Reflow Soldering) | JEITA ED-4701 300 303A | Tsld=245±5°C,5sec. Lead-free Solder(Sn-3.0Ag-0.5Cu) | | #3 | 0/20 |
| 3 | Thermal Shock | JEITA ED-4701 300 307 | -40°C~110°C 10min dwell, 10sec transfer, | 100cycle s | #1 | 0/20 |
| 4 | Temperature Cycle | JEITA ED-4701 100 105 | -40°C (30min) ~25°C (5min) ~ 110°C (30min) ~25°C (5min) | 100cycle s | #1 | 0/20 |
| 5 | High Temperature Storage | JEITA ED-4701 200 201 | Ta=110°C | 1000hrs. | #1 | 0/20 |
| 6 | Temperature Humidity | JEITA ED-4701 100 103 | Ta=60°C, RH=90% | 1000hrs. | #1 | 0/20 |
| 7 | Low Temperature Storage | JEITA ED-4701 200 202 | Ta=-40°C | 1000hrs. | #1 | 0/20 |
| 8 | Room Temperature Operating life | | Ta=25°C, IF=60mA | 1000 hrs. | #2 | 0/20 |
| 9 | Low Temperature Operating life | | Ta=-40°C, IF=60mA | 1000hrs. | #2 | 0/20 |

Failure Criteria

| Criteria # | Items | Conditions | Failure Criteria |
|------------|------------------------|------------|-------------------------------|
| #1 | Forward Voltage(VF) | IF=60mA | >U.S.L.X1.1 |
| | Luminous Intensity(IV) | IF=60mA | <L.S.L.X0.7 |
| #2 | Forward Voltage(VF) | IF=60mA | >U.S.L.X1.1 |
| | Luminous Intensity(IV) | IF=60mA | <L.S.L.X0.5 |
| #3 | Solderability | | Less than 95% solder coverage |

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

■ Handling of Silicone Resin LEDs-

● Handling Indications

- i. When handling the product, do not touch it directly with bare hands as it may contaminate the surface and affect on optical characteristics. In the worst cases, excessive force to the product might result in catastrophic failure due to package damage and/or wire breakage.



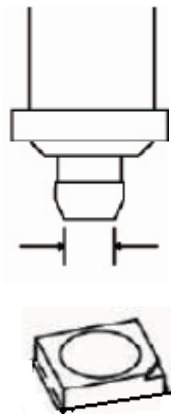
- ii. When handling the product with tweezers, LEDs should only be handled from the side and make sure that excessive force is not applied to the resin portion of the product. Failure to comply can cause the resin portion of the product to be cut, chipped, delaminated and/or deformed, and wire to be broken, and thus resulting in catastrophic failure.



- **Pick and place**

Recommended conditions: Outer nozzle $> \Phi 2.5\text{mm}$

Avoid direct contact to the encapsulant with picking up nozzle. Failure to comply might result in pick and place processes or damage to encapsulant. In the worst cases, catastrophic failure of the LEDs due to wire deformation and/or breakage.



- **Storage –**

- Storage Conditions

A. Before opening the package:

The LEDs should be kept at $\leq 40^\circ\text{C}$ and $\leq 90\%\text{RH}$. The LEDs should be used within a year. When storing the LEDs, moisture proof packaging with absorbent material (silica gel) is recommended.

B. After opening the package:

The LEDs should be kept at $\leq 30^\circ\text{C}$ and $\leq 60\%\text{RH}$. The LEDs should be soldered within 672 hours (4 weeks) after opening the package. If unused LEDs remain, they should be stored in moisture proof packages, such as sealed containers with packages of moisture absorbent material (silica gel). It is also recommended to return the LEDs to the original moisture proof bag and to reseal the moisture proof bag again.

- If the moisture absorbent material (silica gel) has faded away or the LEDs have exceeded the storage time, baking treatment should be performed using the following conditions.

Baking treatment: more than 24 hours at $60 \pm 5^\circ\text{C}$

- This product has silver plated metal parts that are inside and/or outside the package body. The silver plating becomes tarnished when being exposed to an environment which contains corrosive gases. Any LED with tarnished leads may lead to poor

solderability and deterioration of optical characteristics. Please do not expose the LEDs to corrosive atmosphere during storage.

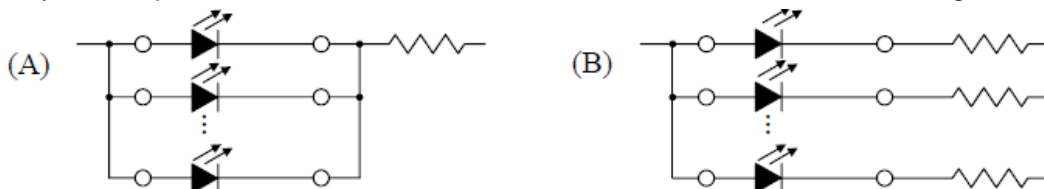
- After assembly and during use, silver plating can be affected by the corrosive gases emitted by components and materials in close proximity of the LEDs within an end product, and the gases entering into the product from the external atmosphere. The above should be taken into consideration when designing.

■ Moisture Proof Package –

- When moisture is absorbed into the SMT package it may vaporize and expand during soldering. There is a possibility that this can cause exfoliation of the contacts and damage to the optical characteristics of the LEDs. For this reason, the moisture proof package is used to keep moisture to a minimum in the package.
- The moisture proof package is made of an aluminum moisture proof bag. A package of a moisture absorbent material (silica gel) is inserted into the aluminum moisture proof bag. The silica gel changes its color from blue to red as it absorbs moisture.
- Please avoid rapid transitions in ambient temperature, especially in high humidity environments where condensation can occur.

■ Recommended circuit –

- In designing a circuit, the current through each LED must not exceed the absolute maximum rating specified for each LED. It is recommended to use Circuit B which regulates the current flowing through each LED. In the meanwhile, when driving LEDs with a constant voltage in Circuit A, the current through the LEDs may vary due to the variation in forward voltage (VF) of the LEDs. In the worst case, some LED may be subjected to stresses in excess of the absolute maximum rating.



- This product should be operated in forward bias. A driving circuit must be designed so that the product is not subjected to either forward or reverse voltage while it is off. In particular, if a reverse voltage is continuously applied to the product, such operation can cause migration resulting in LED damage.

■ Heat Generation –

- Thermal design of the end product is of paramount importance. Please consider the

heat generation of the LED when making the system design. The coefficient of temperature increase per input electric power is affected by the thermal resistance of the circuit board and density of LED placement on the board, as well as other components. It is necessary to avoid intense heat generation and operate within the maximum ratings given in this specification.

- The operating current should be decided after considering the ambient maximum temperature of LEDs.

■ Static Electricity –

- Static electricity or surge voltage damages the LEDs. It is recommended that a wrist band or an anti-electrostatic glove be used when handling the LEDs.
- 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.
- 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 or a VF test at a lower current (below 1mA is recommended).
- Damaged LEDs will show some unusual characteristics such as the leak current remarkably increases, the forward voltage becomes lower, or the LEDs do not light at the low current.

Criteria: (VF > 2.0V at IF=0.5mA)

■ Cleaning –

- It is recommended that isopropyl alcohol be used as a solvent for cleaning the LEDs. When using other solvents, it should be confirmed beforehand whether the solvents will dissolve the package and the resin or not. Freon solvents should not be used to clean the LEDs because of worldwide regulations.
- Do not clean the LEDs by the ultrasonic. When it is absolutely necessary, the influence of ultrasonic cleaning on the LEDs depends on factors such as ultrasonic power and the assembled condition. Before cleaning, a pre-test should be done to confirm whether any damage to the LEDs will occur.

■ Change story

| REV. | Date | Change Description |
|------|------------|---|
| A | 2015.08.17 | Original Version |
| B | 2016.10.07 | 1、 Change Package Outline Dimensions 2、 Change Recommended Soldering Pad Pattern |
| C | 2018.11.15 | 1. Change Electrical / Optical Characteristics 2. Change Luminous Flux Rank Limits |
| D | 2019.12.21 | Change Absolute Maximum Rating Polarity Notes |
| F | 2023.03.16 | Change address |