

$\Phi_V = 23.0 \text{ lm}$, $V_F = 5.47 \text{ V}$
High Color Rendering Index, Surface Mount LED
SEP2AQ1L92



Preliminary

Data Sheet

Description

The SEP2AQ1L92 is a surface mount LED with a color temperature of white (5000K), which has high color rendering index and high luminous efficacy. Its high color rendering characteristics allow your application to reproduce the true colors of an object faithfully.

Suitable applications include wellness lighting based on the colors rendered by near-natural light, and lighting for color evaluation.

Features

- Color----- White (5000K)
- Luminous Flux, Φ_V ----- 23.0 lm (typ.) ($I_F = 30 \text{ mA}$)
- Forward Voltage, V_F ----- 5.47 V (typ.) ($I_F = 30 \text{ mA}$)
- Chromaticity (x, y)----- (0.3457, 0.3585)
- Average Color Rendering Index, R_a ----- 95 (typ.)
- Special Color Rendering Index, R_i ----- 90 (typ.)
- Viewing Angle, $2\theta_{1/2}$ ----- 105 deg
- MSL 3
- RoHS Compliant
- Pb-free, Reflow Soldering
- High Reliability

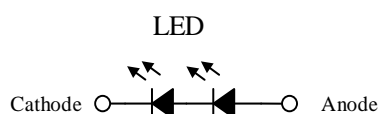
Applications

LED lighting for industrial equipment, houses, and facilities, such as:

- Light Source for Color Evaluation
- Wellness Lighting
- Spotlight
- LED Tube
- Ceiling Light
- Downlight

Package

Dimensions (L × W × H): 2.8 × 3.5 × 0.7 mm



Not to scale

This product uses technology licensed from the National Institute for Materials Science (NIMS).
This technology is protected by worldwide patents, including Japan Patent No. 3931239 owned by NIMS.

Absolute Maximum Ratings

Unless specifically noted, $T_A = 25\text{ }^{\circ}\text{C}$.

Parameter	Symbol	Conditions	Rating	Unit
Power Dissipation	P_D		420	mW
Forward Current	I_F		75	mA
Reverse Voltage	V_R		3	V
Operating Temperature ⁽¹⁾	T_{OP}	⁽²⁾	-40 to 85	$^{\circ}\text{C}$
Storage Temperature ⁽¹⁾	T_{STG}	⁽²⁾	-40 to 100	$^{\circ}\text{C}$
Junction Temperature	T_J		115	$^{\circ}\text{C}$

Electrical / Optical Characteristics

Unless specifically noted, $T_A = 25\text{ }^{\circ}\text{C}$.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	V_F	$I_F = 30\text{ mA}$	5.0	5.47	5.6	V
Reverse Current	I_R	$V_R = 3\text{ V}$	—	—	10	μA
Luminous Flux	Φ_V	$I_F = 30\text{ mA}$	19.7	23.0	26.3	lm
Chromaticity	x	$I_F = 30\text{ mA}$	—	0.3457	—	—
	y		—	0.3585	—	—
Average Color Rendering Index ⁽³⁾	Ra	$I_F = 30\text{ mA}$	—	95	—	—
Special Color Rendering Index ⁽³⁾	Ri	$I_F = 30\text{ mA}$	—	90	—	—
Viewing Angle	$2\theta_{1/2}$	$I_F = 30\text{ mA}$	—	105	—	deg
Junction-to-Solder Point Thermal Resistance	$\theta_{(J-S)}$	⁽²⁾	—	25	—	$^{\circ}\text{C/W}$

Mechanical Characteristics

Parameter	Conditions	Min.	Typ.	Max.	Unit
Package Weight		—	0.0214	—	g

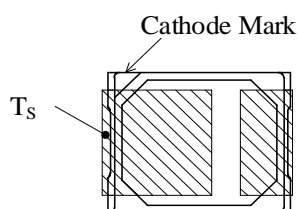


Figure 1. T_s Measurement Point

⁽¹⁾ Determined by the solder point temperature, T_s .

⁽²⁾ Solder point temperature, T_s , is defined by land pattern of cathode side (see Figure 1).

⁽³⁾ Allows a measurement tolerance of ± 2 .

Luminous Flux Bins

The values have a tolerance of $\pm 10\%$.

Bin Number	Luminous Flux Range	Unit
1	19.7 to 21.7	lm
2	21.7 to 23.9	lm
3	23.9 to 26.3	lm

V_F Bins

The values have a tolerance of $\pm 3\%$.

Bin Number	V _F Range	Unit
1	5.0 to 5.2	V
2	5.2 to 5.4	V
3	5.4 to 5.6	V

Chromaticity Bins

Figure 2 is the chromaticity diagram plotting chromaticity bins, with a tolerance of ± 0.01 .

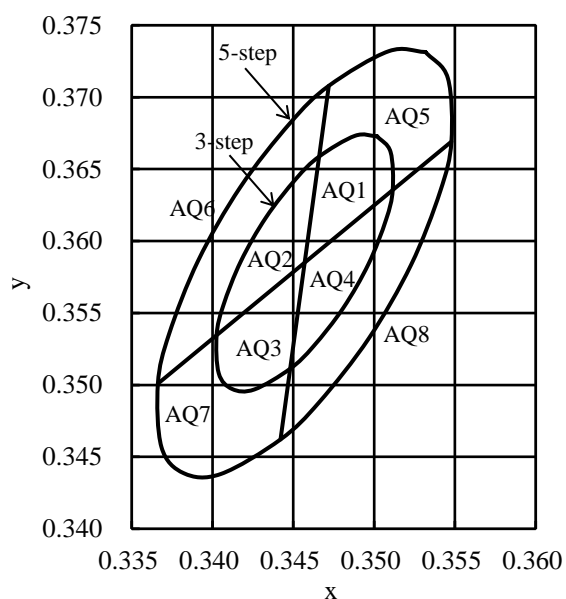


Table 1. Chromaticity Diagram: Region and Coordinates

Parameter	MacAdam Ellipse	
	3-step	5-step
Chromaticity Center Coordinate, x	0.3457	
Chromaticity Center Coordinate, y	0.3585	
Ellipse Major Axis	0.003550	0.006000
Ellipse Minor Axis	0.009700	0.016400
Rotation Angle, θ	63°	

Figure 2. Chromaticity Diagram

Derating Curves

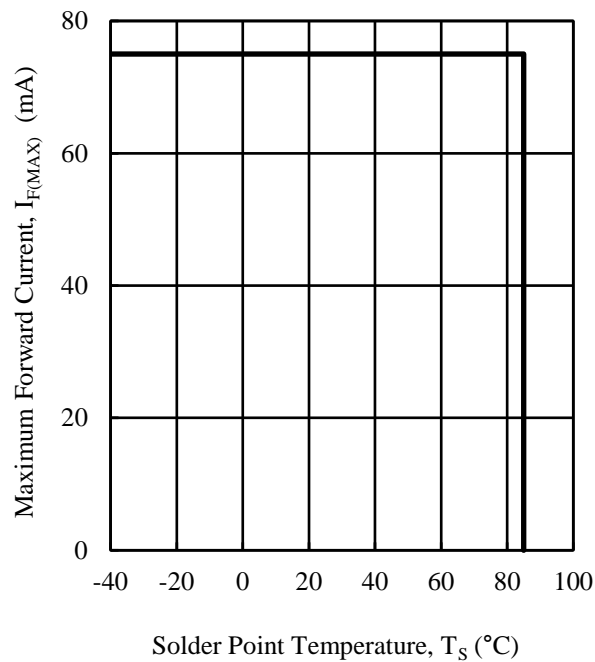


Figure 3. $I_{F(MAX)}$ vs. T_S

Characteristic Curves

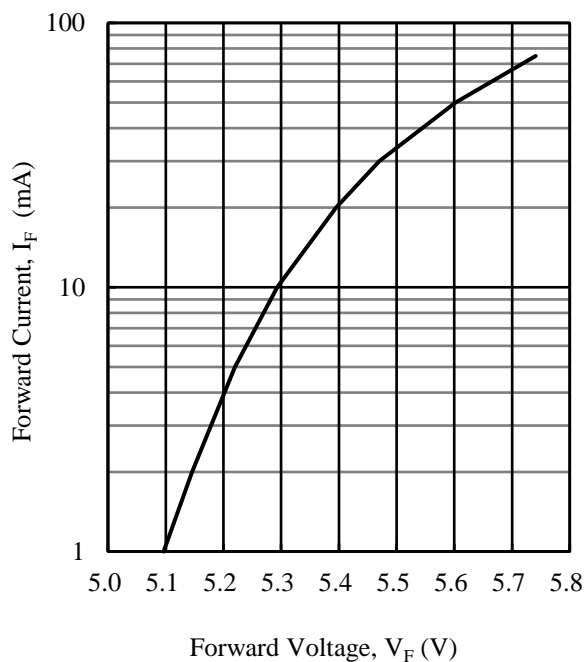


Figure 4. I_F vs. V_F ($T_A = 25\text{ °C}$)

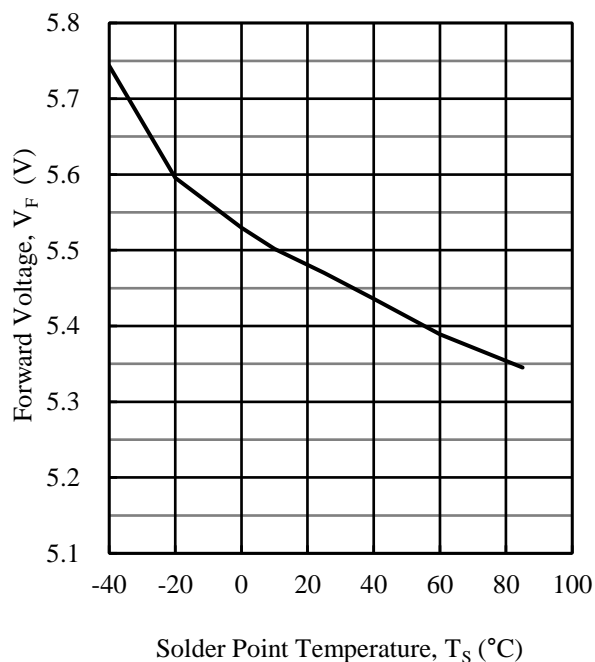


Figure 5. V_F vs. T_S ($I_F = 30\text{ mA}$)

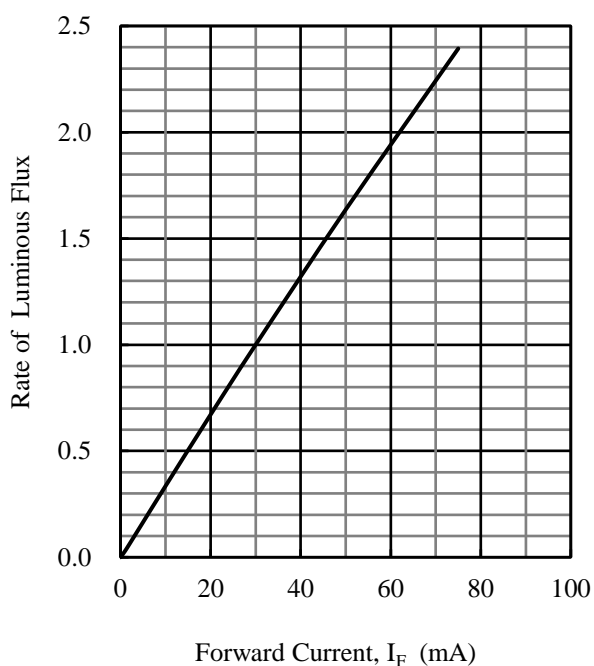


Figure 6. Rate of Luminous Flux vs. I_F ($T_A = 25\text{ °C}$)

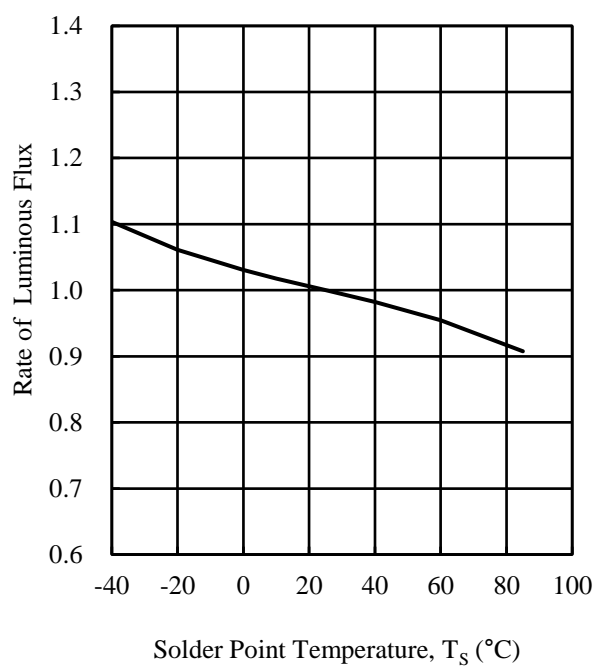


Figure 7. Rate of Luminous Flux vs. T_S ($I_F = 30\text{ mA}$)

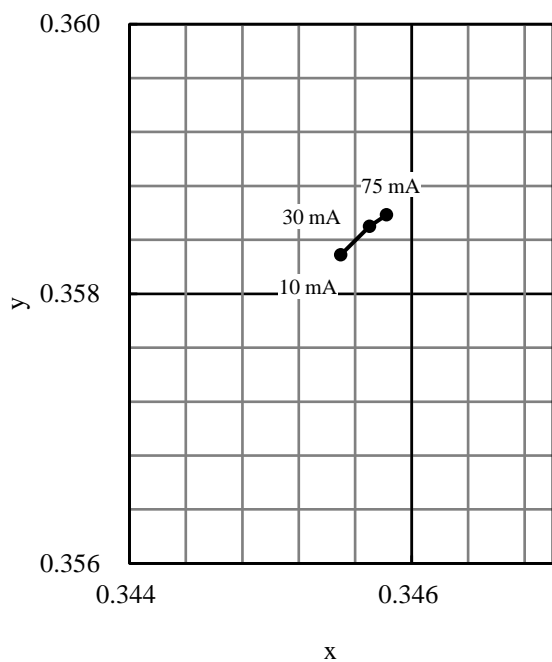


Figure 8. I_F vs. Chromaticity ($T_A = 25\text{ }^{\circ}\text{C}$)

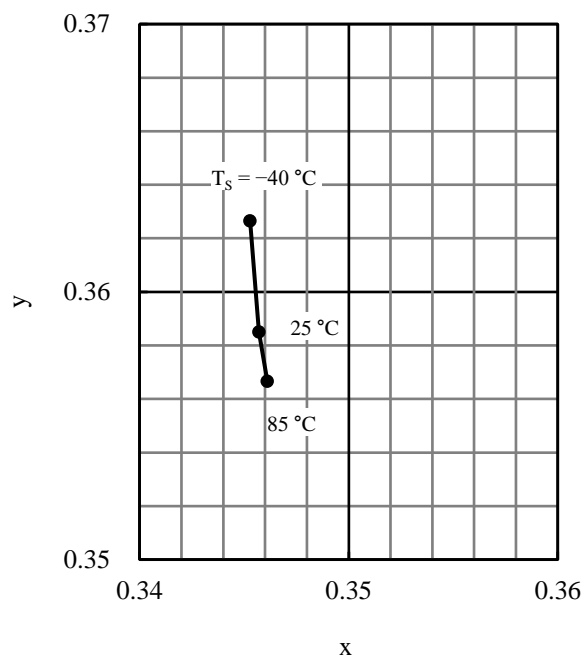


Figure 9. T_S vs. Chromaticity ($I_F = 30\text{ mA}$)

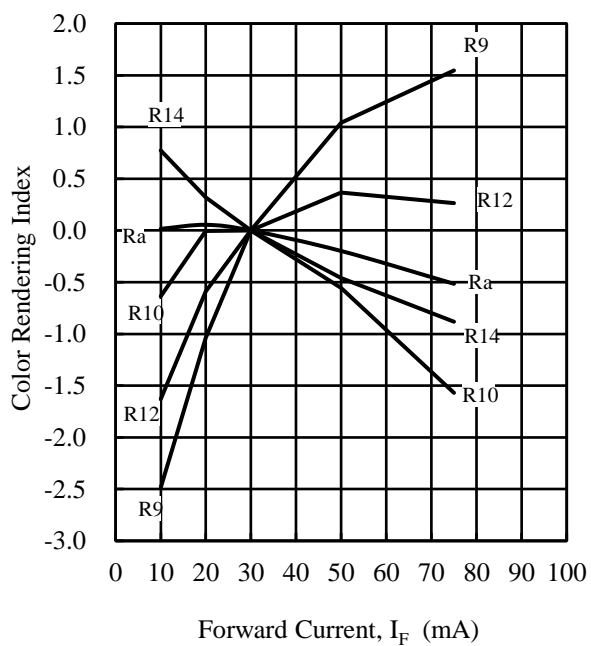


Figure 10. Color Rendering Index vs. I_F

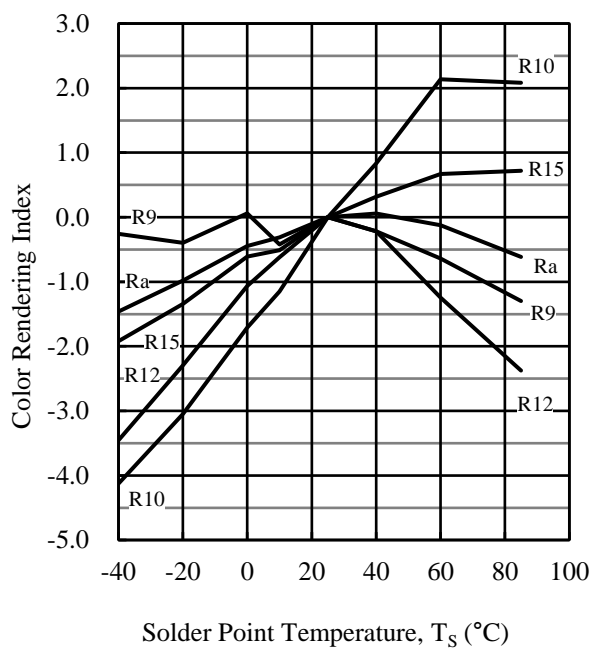


Figure 11. Color Rendering Index vs. T_S ($I_F = 30\text{ mA}$)

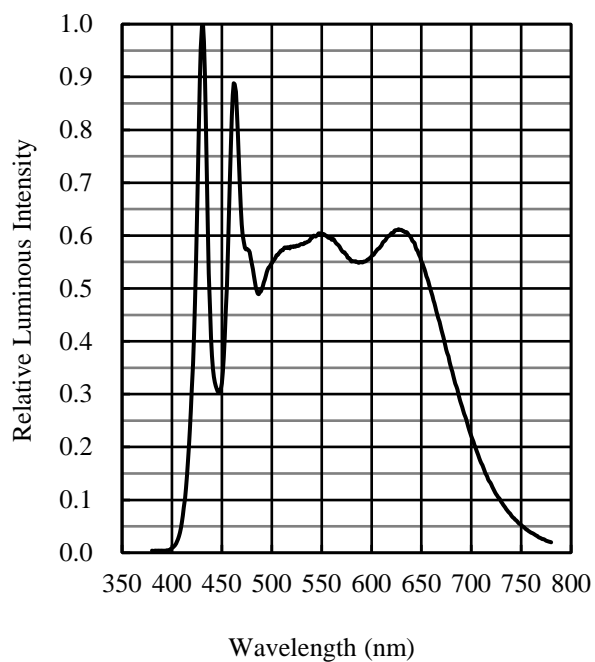


Figure 12. Spectrum ($T_A = 25\text{ }^{\circ}\text{C}$, $I_F = 30\text{ mA}$)

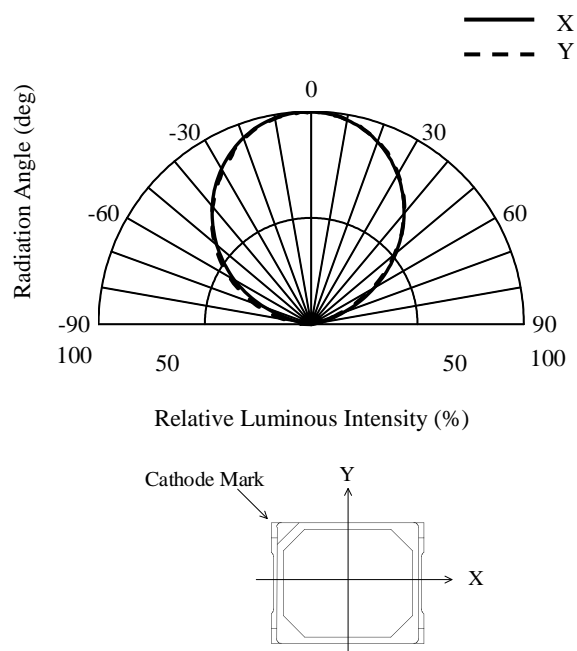
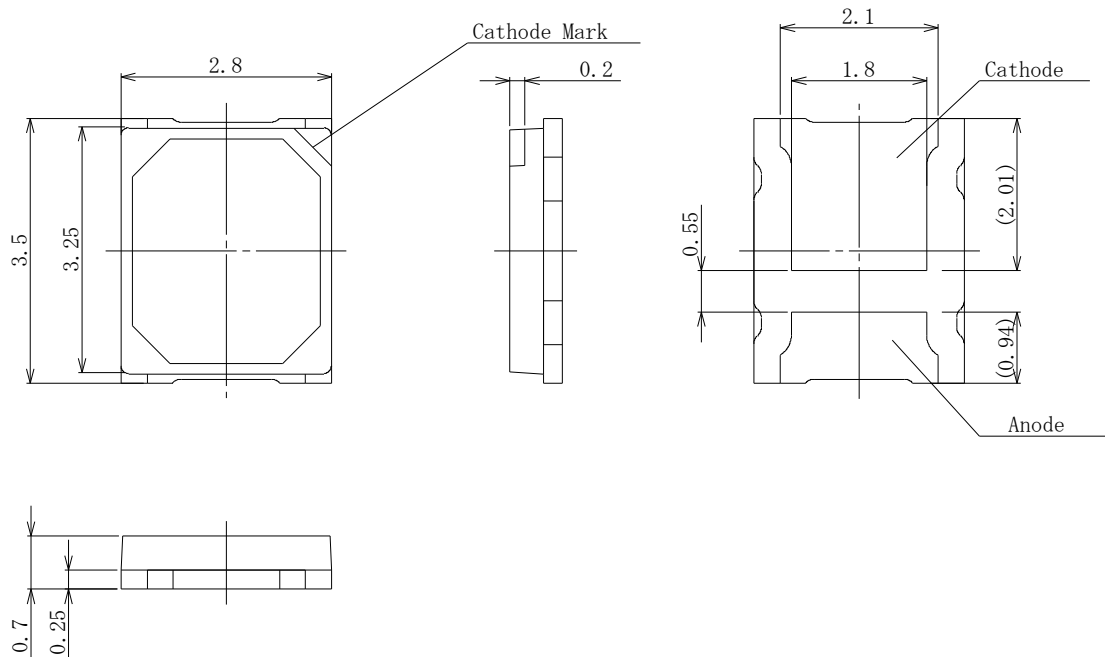


Figure 13. Directivity ($T_A = 25\text{ }^{\circ}\text{C}$, $I_F = 30\text{ mA}$)

Physical Dimensions

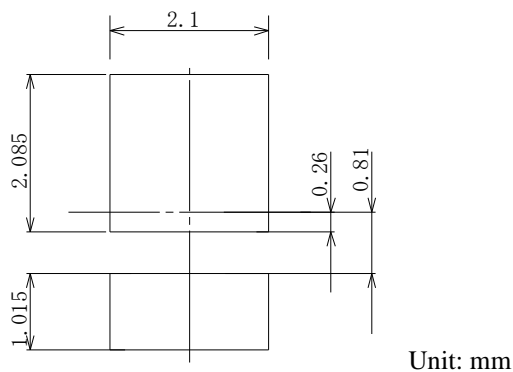
• Surface Mount ($2.8 \times 3.5 \times 0.7$ mm)



NOTES:

- Dimensions in millimeters
- Tolerance: ± 0.2 mm
- All the values in parentheses are reference dimensions.
- Pb-free (RoHS compliant)
- MSL 3 (Moisture Sensitivity Level 3)

• Land Pattern Example

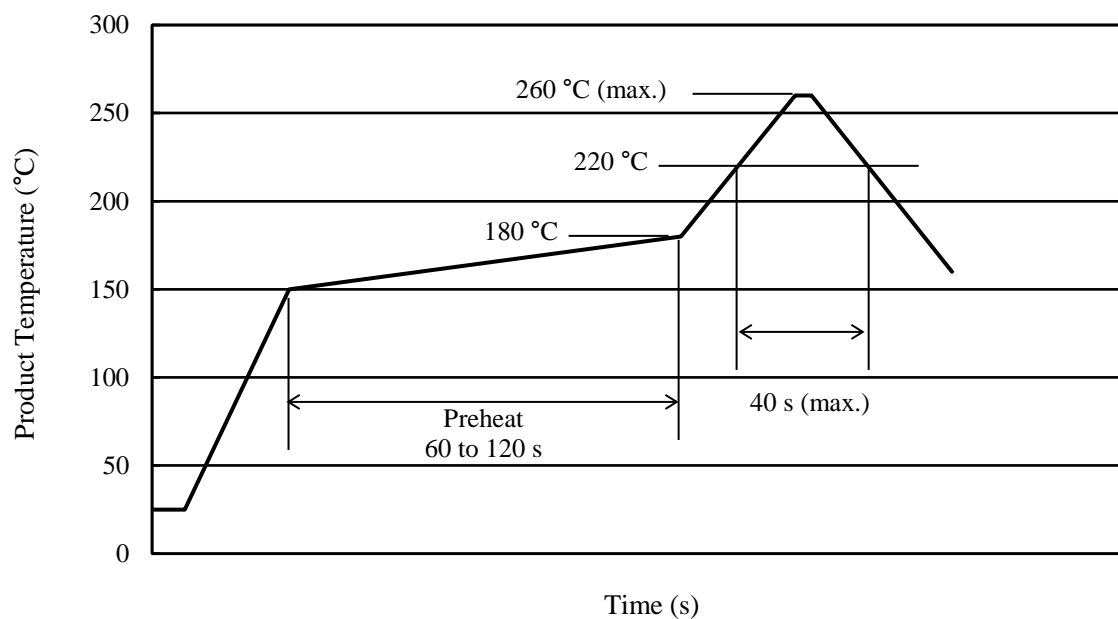


Soldering Conditions

When soldering the products, it is required to minimize the working time within the following limits:

- Reflow:
 - Preheat: 150 to 180 °C / 60 to 120 s
 - Solder heating: 220 °C / 40 s (260 °C peak, 2 times)
- Soldering iron: 350 ±10 °C, 3 s, 1 time

● Reference Reflow Profile



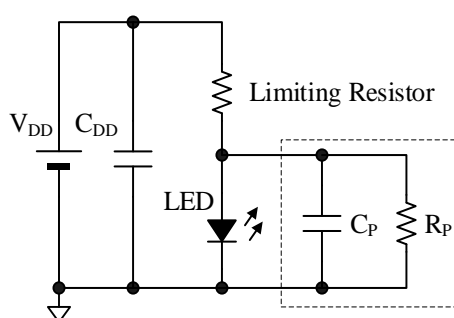
Precautions for Use

• Measures for Electrostatic Discharge (ESD)

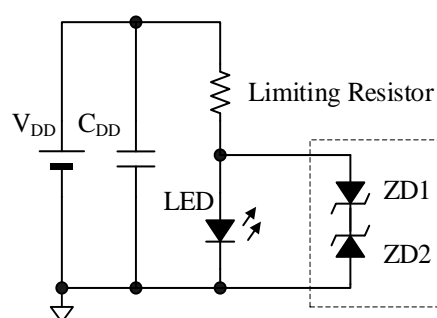
Because this product is sensitive to ESD, it is necessary to take adequate measures against ESD and surge for safe and proper handling. In particular, note that when a voltage that exceeds the absolute maximum rating is applied, the product may be damaged.

• Reference Protection Circuits for Electrostatic Discharge and Surge

The following figures show reference protection circuits that prevent the product from any damage due to ESD or surge. Note that these circuits are only examples; therefore, be sure to check the ESD and surge levels in your actual system and to take appropriate measures (e.g., adding a part) as needed.



Example of Adding Filter
($C_P \geq 0.01 \mu\text{F}$, $R_P = 10 \text{ k}\Omega$)



Example of Adding Zener Diodes
(ZD1, ZD2: $V_Z = 7 \text{ V}$ to 8 V)

• Other

- After soldering the product, care should be taken not to apply mechanical stress or excessive vibration until it cools to room temperature.
- Do not cool the product rapidly.
- When mounting the product on a board, mounting position and orientation should be taken into account so that any stress due to board warpage is not applied to the product.
- Do not touch the encapsulating resin of the product with sharp objects such as a tweezer or fingernails. Also, do not use the product again after removal.
- Do not touch the product after mounting it on a board.
- The product emits a high-power light. Therefore, care should be taken not to look at the light emission directly for a long time because it may hurt your eyes.
- Use the product at rated current (sorting current) as much as possible. When the product is used at a current lower than the rated current (sorting current), a variation in forward voltage or luminous intensity may increase. Therefore, care should be taken for such variation when you use the product at low current.
- When the product comes into contact with material containing sulfide or is exposed to an atmosphere containing sulfide gas, the following may be caused: discoloration in the silver plating of the metal parts inside and outside the package; change in the brightness and tint of the original luminescent color.
- When the product is used in applications where high-and-low current regulations are repeated for a long time, its luminous intensity lifetime may be shortened in low-current settings. Therefore, thorough verifications are required beforehand.
- When using the product, care should be taken not to apply a voltage in the opposite direction of the LED.

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