

High Power LED Series

# LH502D General



High efficacy and lumen makes

The LH502D suitable for Streetlight and High-bay applications

### Features & Benefits

- Operates at a maximum current of up to 1000mA
- Uniform light distribution under any beam angle
- Strengthened Anti sulfurization
- Color binning @ 85°C



### Outdoor 5050 LED Robustness

Im maintenance > 97%  
Vf maintenance < 101%



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## 1. Characteristics

### a) Absolute Maximum Rating

Item	Symbol	Rating	Unit	Condition
Operating Temperature	$T_{opr}$	-40 ~ +105	°C	
Storage Temperature	$T_{stg}$	-40 ~ +100	°C	-
LED Junction Temperature	$T_j$	125	°C	-
Forward Current	$I_F$	1000	mA	-
Peak Pulse Forward Current	$I_{FP}$	1250	mA	Duty cycle ≤ 1/10, pulse width 10ms
Soldering Temperature		260 <10	°C	-
Electrostatic Discharge Withstand Voltage(HBM)	ESD(HBM)	±8 (Class 3B)	kV	-

### b) Electro-optical Characteristics ( $I_F = 640 \text{ mA}$ , $T_j = 25^\circ\text{C}$ )

Item	Unit	Rank	Min.	Typ.	Max.
Forward Voltage ( $V_F$ )	V	YE	5.9	-	6.3
		3	70 / -50	-	-
		4	75 / -50		
		5	80 / 0		
Color Rendering Index ( $R_a$ ) / R9	-	7	90 / 50		
Thermal Resistance (junction to chip point)	°C/W		-	3	-
Beam Angle	°			120	

#### Notes:

Samsung maintains measurement tolerance of: luminous flux =  $\pm 7\%$ , forward voltage =  $\pm 0.1 \text{ V}$ , CRI =  $\pm 3$ , R9 =  $\pm 6.5$

## 2. Product Code Information

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
S	P	H	W	H	2	L	5	N	6	0	3	Y	E	T	5	A	3

Digit	PKG Information	Code	Specification		
1 2 3	Samsung Package High Power	SPH	High Power PKG		
4 5	Color	WH	White		
6	Product Version	2	2nd Version		
7 8	Form Factor	L5	5050 size		
9	Lens Type	N	No lens		
10	Model	6	5050 Series		
11	Internal Code	0			
12	CRI	3	Min. 70		
		4	Min. 75		
		5	Min. 80		
		7	Min. 90		
13 14	Forward Voltage (V)	YE	Bin code	A0	5.9 – 6.1
				A1	6.1 – 6.3
15	CCT (K)	Y	2200K		
		W	2700K		
		V	3000K		
		U	3500K		
		T	4000K		
		R	5000K		
		Q	5700K		
		P	6500K		
16	MacAdam Step	3	MacAdam 3-Step		
		5	MacAdam 5-Step		
17 18	Luminous Flux (lm)	A3			

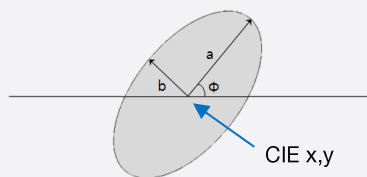
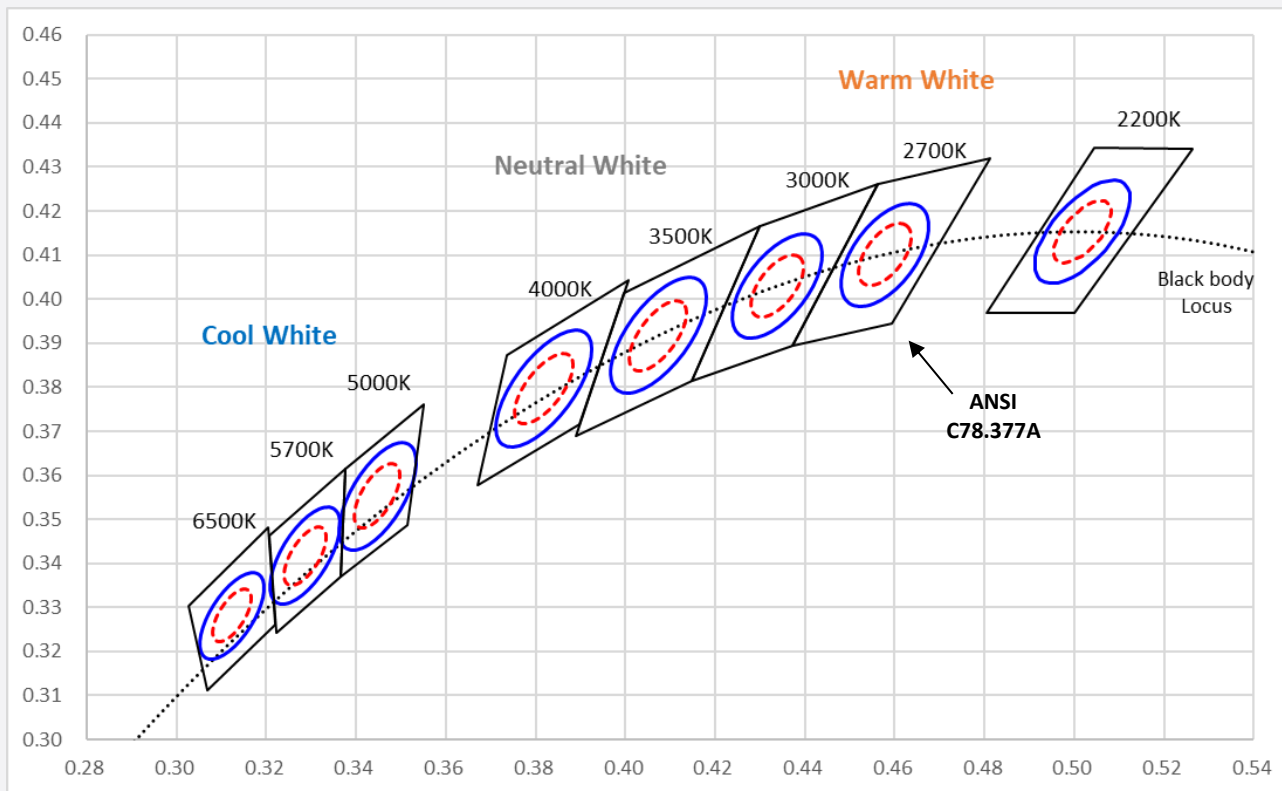
a) Luminous flux Rank ( I<sub>f</sub> = 640 mA, T<sub>j</sub> = 25°C )

CRI (R <sub>a</sub> ) Min.	Nominal CCT(K)	Product Code	VF Rank	Chrom Rank (Bins)	Flux		Flux Range (Φ <sub>v</sub> , lm)					
					Rank	Bins						
70	2200	SPHWH2L5N603YEY3A3	YE	Y3, Y5	A3		58	580-620				
		SPHWH2L5N603YEW5A3					62	620-660				
	2700	SPHWH2L5N603YEW3A3		W3, W5			64	640-680				
		SPHWH2L5N603YEW5A3					68	680-720				
	3000	SPHWH2L5N603YEV3A3		V3, V5			66	660-700				
		SPHWH2L5N603YEV5A3					70	700-740				
	3500	SPHWH2L5N603YEU3A3		U3, U5			67	670-710				
		SPHWH2L5N603YEU5A3					71	710-750				
	4000	SPHWH2L5N603YET3A3		T3, T5			69	690-730				
		SPHWH2L5N603YET5A3					73	730-770				
	5000	SPHWH2L5N603YER3A3		R3, R5			68	680-720				
		SPHWH2L5N603YER5A3					72	720-760				
	5700	SPHWH2L5N603YEQ3A3		Q3, Q5			67	670-710				
		SPHWH2L5N603YEQ5A3					71	710-750				
	6500	SPHWH2L5N603YEP3A3		P3, P5			66	660-700				
		SPHWH2L5N603YEP5A3					70	700-740				
75	2700	SPHWH2L5N604YEW3A3	YE	W3, W5	A3		59	590-630				
		SPHWH2L5N604YEW5A3					63	630-670				
	3000	SPHWH2L5N604YEV3A3		V3, V5			62	620-660				
		SPHWH2L5N604YEV5A3					66	660-700				
	3500	SPHWH2L5N604YEU3A3		U3, U5			64	640-680				
		SPHWH2L5N604YEU5A3					68	680-720				
	4000	SPHWH2L5N604YET3A3		T3, T5			65	650-690				
		SPHWH2L5N604YET5A3					69	690-730				
	5000	SPHWH2L5N604YER3A3		R3, R5			65	650-690				
		SPHWH2L5N604YER5A3					69	690-730				
	5700	SPHWH2L5N604YEQ3A3		Q3, Q5			64	640-680				
		SPHWH2L5N604YEQ5A3					68	680-720				
	6500	SPHWH2L5N604YEP3A3		P3, P5			64	640-680				
		SPHWH2L5N604YEP5A3					68	680-720				
	80	2200		SPHWH2L5N605YEW3A3			YE	Y3, Y5	A3		47	470-510
				SPHWH2L5N605YEW5A3							51	510-550
2700		SPHWH2L5N605YEW3A3	W3, W5	55	550-590							
		SPHWH2L5N605YEW5A3		59	590-630							
3000		SPHWH2L5N605YEV3A3	V3, V5	58	580-620							
		SPHWH2L5N605YEV5A3		62	620-660							
3500		SPHWH2L5N605YEU3A3	U3, U5	60	600-640							
		SPHWH2L5N605YEU5A3		64	640-680							
4000		SPHWH2L5N605YET3A3	T3, T5	62	620-660							
		SPHWH2L5N605YET5A3		66	660-700							
5000		SPHWH2L5N605YER3A3	R3, R5	62	620-660							
		SPHWH2L5N605YER5A3		66	660-700							
5700		SPHWH2L5N605YEQ3A3	Q3, Q5	61	610-650							
		SPHWH2L5N605YEQ5A3		65	650-690							
6500		SPHWH2L5N605YEP3A3	P3, P5	61	610-650							
		SPHWH2L5N605YEP5A3		65	650-690							
90	2200	SPHWH2L5N607YEW3A3	YE	Y3, Y5	A3		41	410-450				
		SPHWH2L5N607YEW5A3					45	450-490				
	2700	SPHWH2L5N607YEW3A3		W3, W5			46	460-500				
		SPHWH2L5N607YEW5A3					50	500-540				
	3000	SPHWH2L5N607YEV3A3		V3, V5			48	480-520				
		SPHWH2L5N607YEV5A3					52	520-560				
	3500	SPHWH2L5N607YEU3A3		U3, U5			49	490-530				
		SPHWH2L5N607YEU5A3					53	530-570				
	4000	SPHWH2L5N607YET3A3		T3, T5			52	520-560				
		SPHWH2L5N607YET5A3					56	560-600				
	5000	SPHWH2L5N607YER3A3		R3, R5			52	520-560				
		SPHWH2L5N607YER5A3					56	560-600				
	5700	SPHWH2L5N607YEQ3A3		Q3, Q5			52	520-560				
		SPHWH2L5N607YEQ5A3					56	560-600				

**b) Voltage Bins** (  $I_f = 640 \text{ mA}$ ,  $T_j = 25^\circ\text{C}$  )

Nominal CCT (K)	CRI (R <sub>a</sub> ) Min.	Product Code	Voltage Rank	Voltage Bin	Voltage Range (V)
-	-	-	YE	A0	5.9 - 6.1
				A1	6.1 - 6.3

c) Chromaticity Region & Coordinates (  $I_F = 640 \text{ mA}$ ,  $T_j = 85^\circ\text{C}$  )



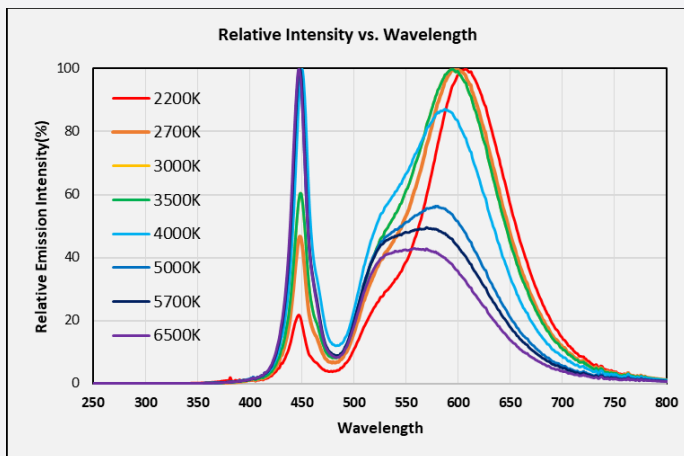
CRI	CCT	Rank	CIE x	CIE y	Φ	A	b
70	2200K	Y3	0.5019	0.4153	49.3	0.0086	0.0040
		Y5				0.0144	0.0066
	2700K	W3	0.4578	0.4101	53.7	0.0081	0.0042
		W5				0.0135	0.0070
	3000K	V3	0.4338	0.4030	53.2	0.0083	0.0041
		V5				0.0138	0.0068
	3500K	U3	0.4073	0.3917	54.0	0.0093	0.0041
		U5				0.0155	0.0069
	4000K	T3	0.3818	0.3797	53.7	0.0094	0.0040
		T5				0.0157	0.0067
	5000K	R3	0.3447	0.3553	59.6	0.0082	0.0035
		R5				0.0137	0.0058
	5700K	Q3	0.3287	0.3417	59.1	0.0075	0.0032
		Q5				0.0125	0.0053
	6500K	P3	0.3123	0.3282	58.6	0.0067	0.0029
		P5				0.0112	0.0048

Note : Samsung maintains measurement tolerance of:  $C_x, C_y = \pm 0.005$

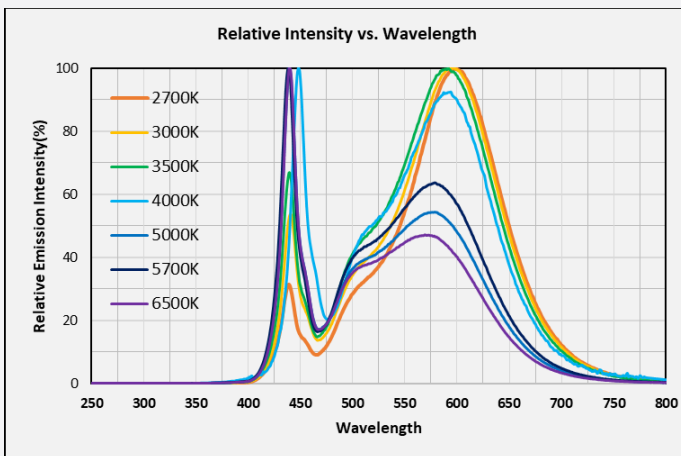
### 3. Typical Characteristic Graphs

a) Spectral Distribution ( $I_F = 640 \text{ mA}$ ,  $T_j = 25^\circ\text{C}$ )

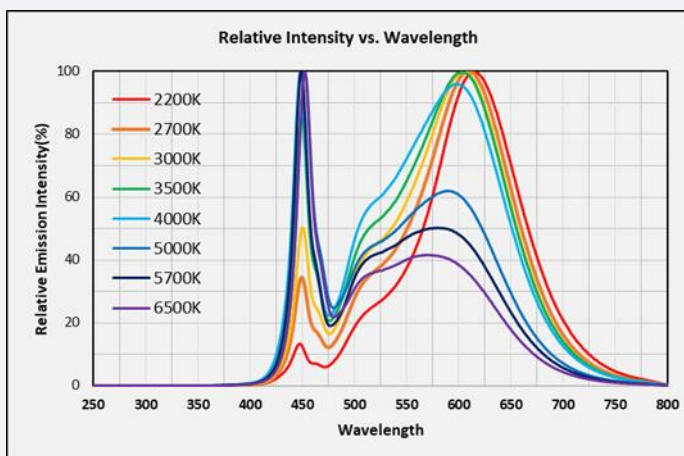
CRI70+



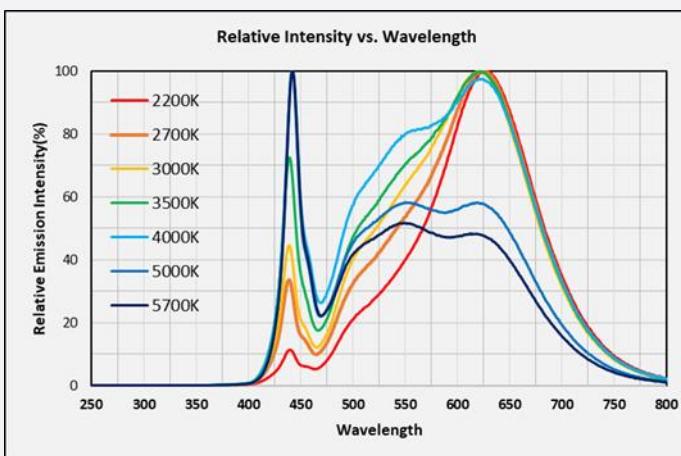
CRI75+



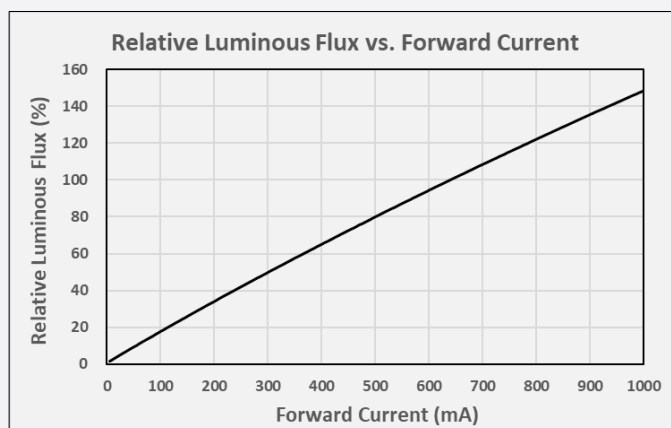
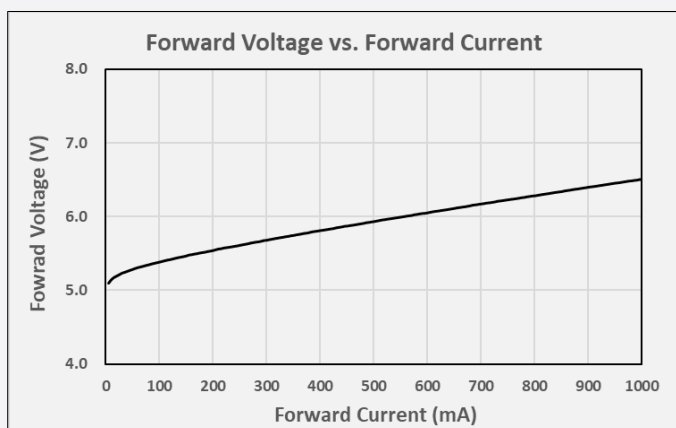
CRI80+



CRI90+

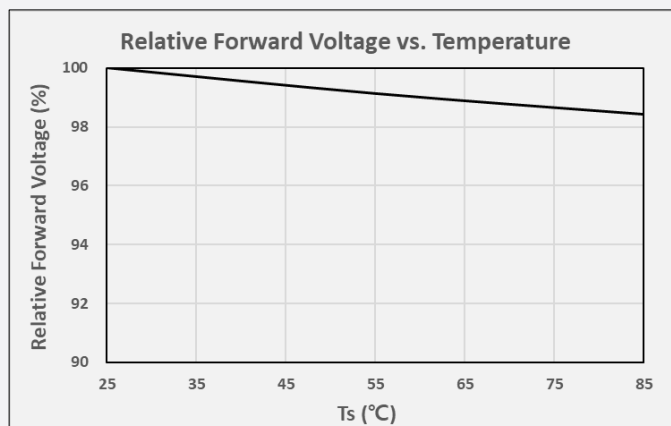
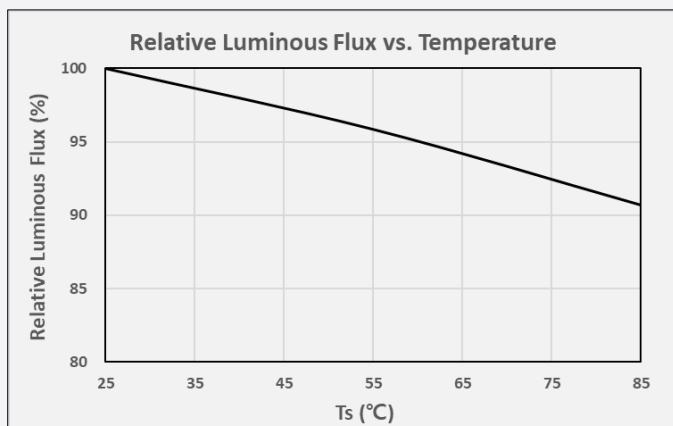


b) Forward Current Characteristics ( $T_j = 25^\circ\text{C}$ )

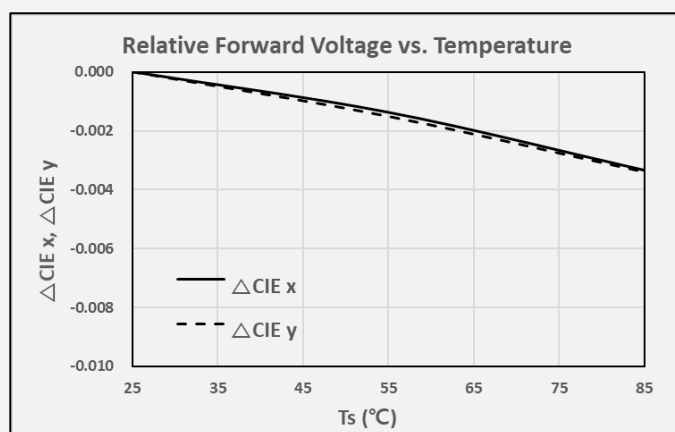
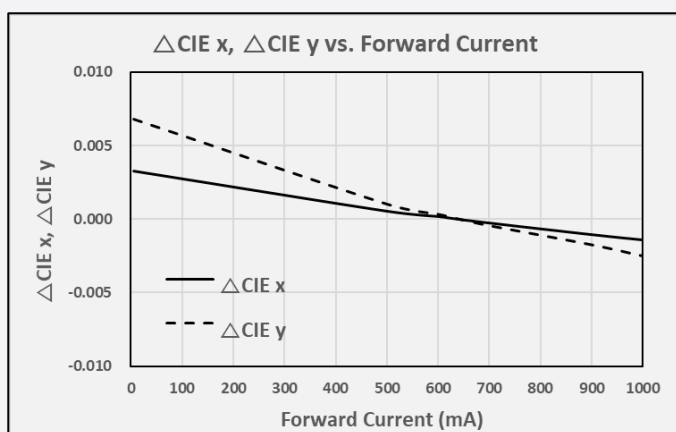




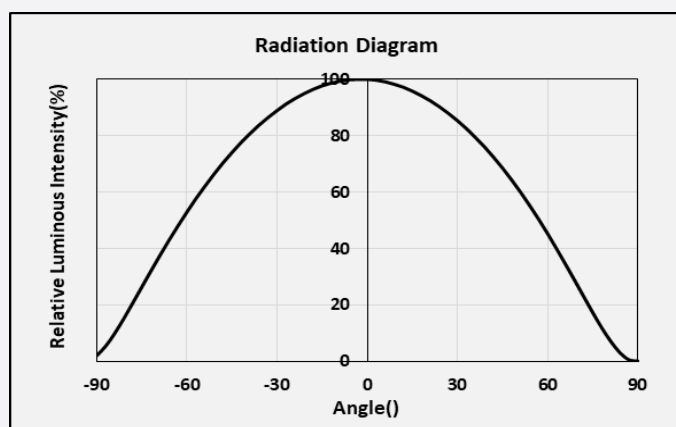
### c) Temperature Characteristics ( $I_F = 640 \text{ mA}$ )



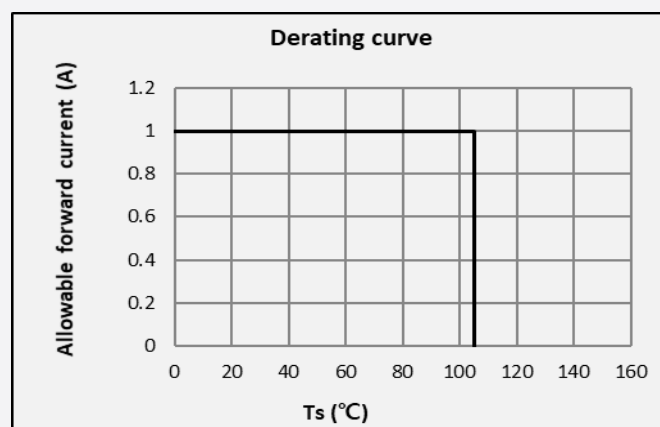
### d) Color Shift Characteristics ( $I_F = 640 \text{ mA}$ , $T_j = 25^\circ\text{C}$ )



### e) Beam Angle Characteristics ( $I_F = 640 \text{ mA}$ , $T_j = 25^\circ\text{C}$ )



### f) Derating Curve



g) Luminous Flux Characteristics<sup>1)</sup> (CRI = 70, CCT = 4000K)

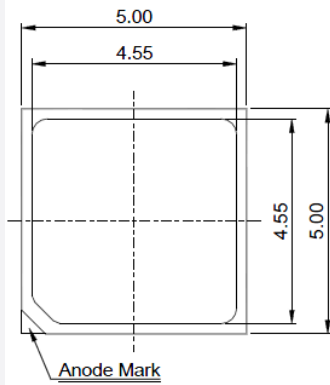
CRI (Ra) Min.	Nominal CCT (K)	I <sub>F</sub>	Typ. @ T <sub>J</sub> = 25 °C		
			V <sub>F</sub> Forward voltage	Im Flux	lm/W Luminous efficacy
70	4000K	180mA	5.49 V	217 lm	219 lm/W
		360mA	5.74 V	421 lm	204 lm/W
		600mA	6.03 V	679 lm	188 lm/W
		640mA	6.08 V	720 lm	185 lm/W
		800mA	6.26 V	881 lm	176 lm/W
		1000mA	6.48 V	1073 lm	166 lm/W

**Notes:**

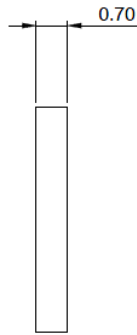
- 1) Reference Only

## 4. Outline Drawing & Dimension

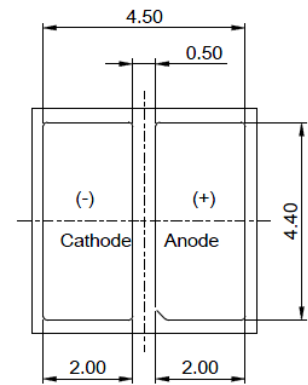
### a) Mechanical Dimensions



[Top View]



[Side View]

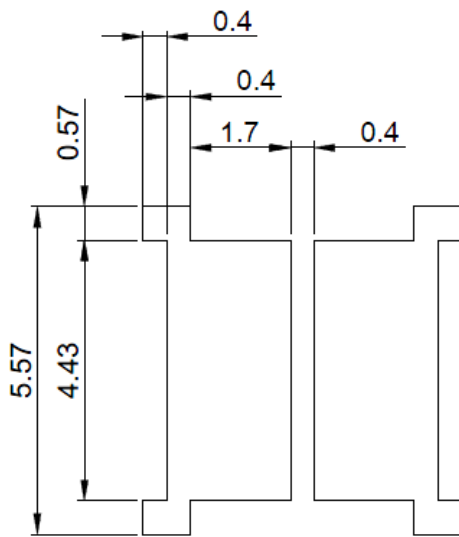


[Bottom View]

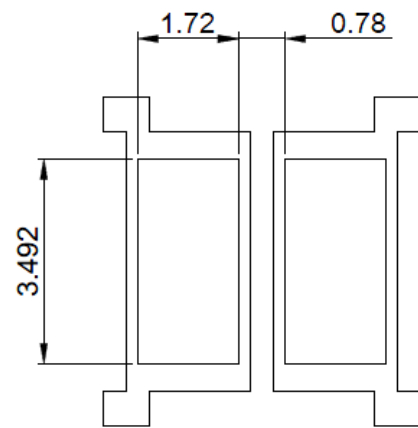
#### Notes:

- 1) Mark for the Anode
- 2) Unit : mm
- 3) Tolerance :  $\pm 0.1\text{mm}$

### b) Recommended Solder Pad



Recommended Solder Pad



Recommended Stencil Opening

## 5. Reliability Test Items & Conditions

### a) Test Items

Test Item	Test Condition	Test Hour / Cycle
High Temperature Operating Life Test	85°C, 640mA	1000 h
Wet High Temperature Operating Life Test	85°C, 85 % RH, DC 640mA	1000 h
Temperature Cycling	-45°C / 15min ~ 125°C / 15min Temperature change within 5min	500 cycles
ESD (HBM)	R1: 10 MΩ R2: 1.5 kΩ C: 100 pF V: ±8 kV	5 times
Vibration Test	20~ 80 Hz (displacement: 0.06 inch, max. 20 g) 80 ~ 2 kHz (max. 20 g) min. frequency ↔ max. frequency 4 min transfer	4 times
Mechanical Shock Test	1500g, 0.5 ms each of the 6 surfaces (3 axis x 2 sides)	5 times

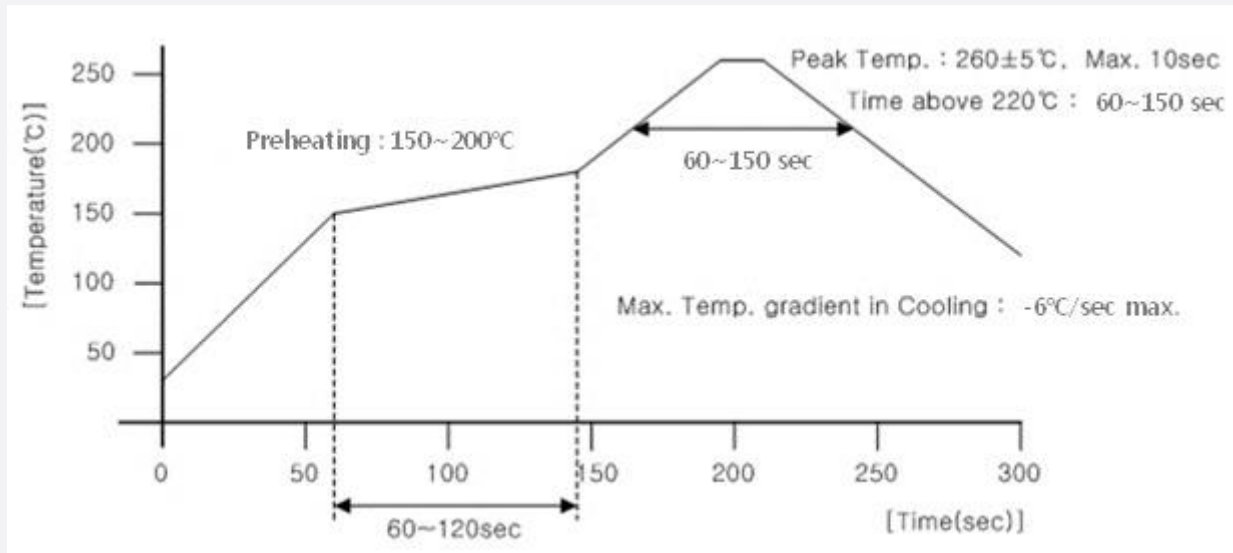
### b) Criteria for Judging the Damage

Item	Symbol	Test Condition (T <sub>c</sub> = 25°C)	Limit	
			Min.	Max.
Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = Sorting Current	L.S.L. * 0.9	U.S.L. * 1.1
Luminous Flux	Φ <sub>v</sub>	I <sub>F</sub> = Sorting Current	L.S.L. * 0.7	U.S.L. * 1.3

## 6. Soldering Conditions

### a) Reflow Conditions (Pb free)

Reflow frequency: 2 times max.



### b) Manual Soldering Conditions

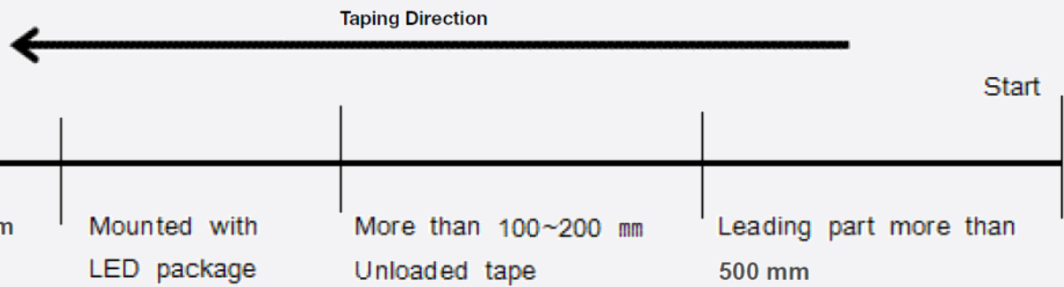
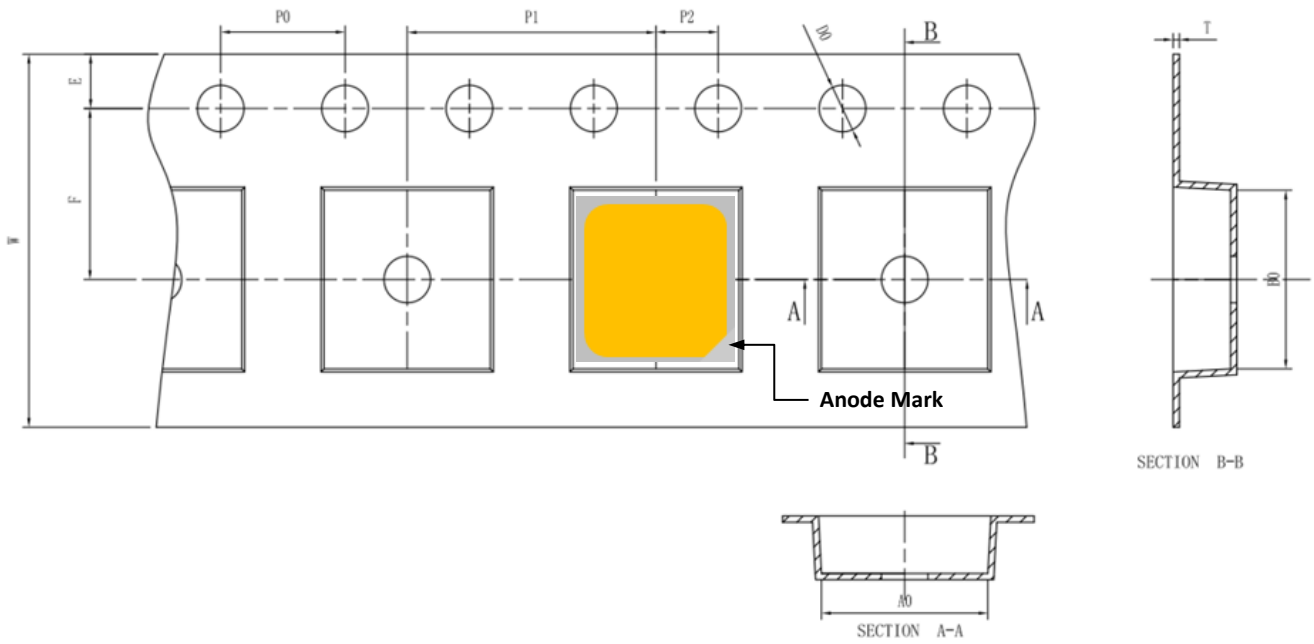
Not more than 5 seconds @ max. 300°C, under soldering iron.

## 7. Tape & Reel

### a) Taping Dimension

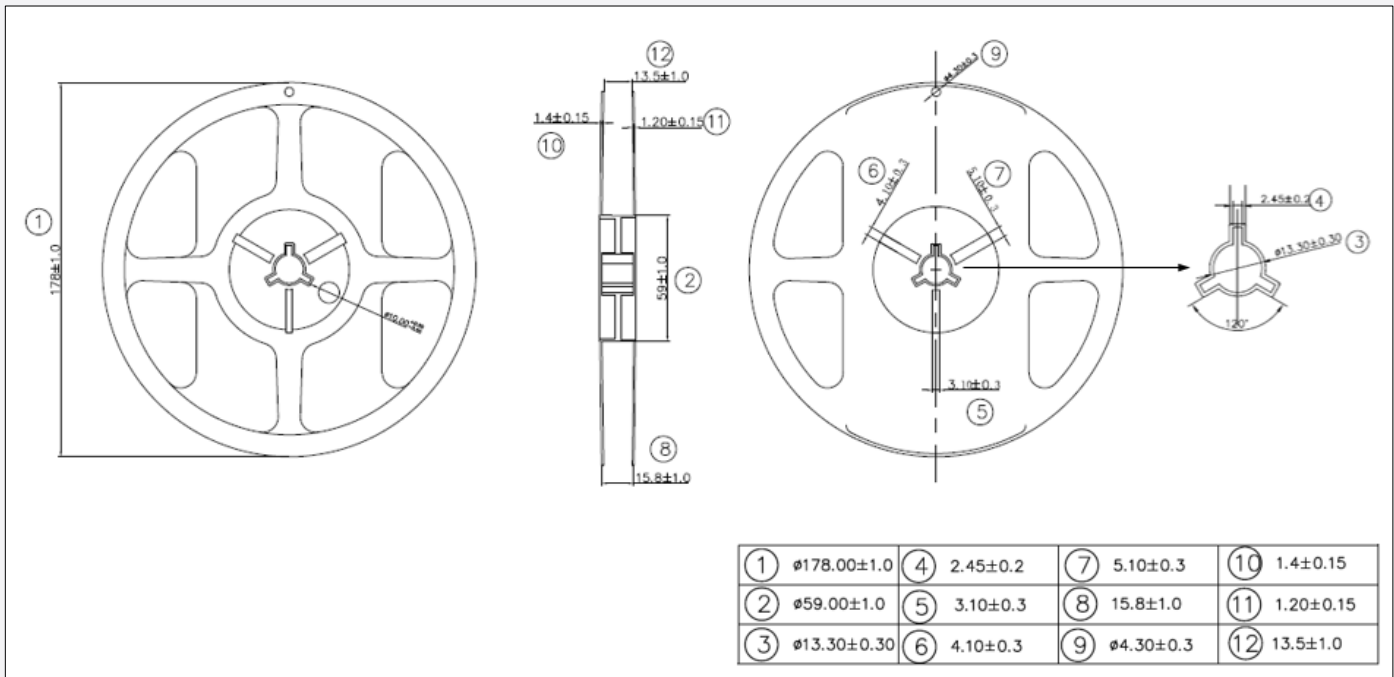
(unit: mm)

ITEM	W	A0	B0	K0	E	F	D0	D1	P0	P1	P2	T	LENGTH	PCS/REEL
5.35	12.00	5.40	5.20	0.95	1.75	5.50	1.50	1.50	4.00	8.00	2.00	0.20	m	PCS



## b) Reel Dimension (max 2,000 pcs)

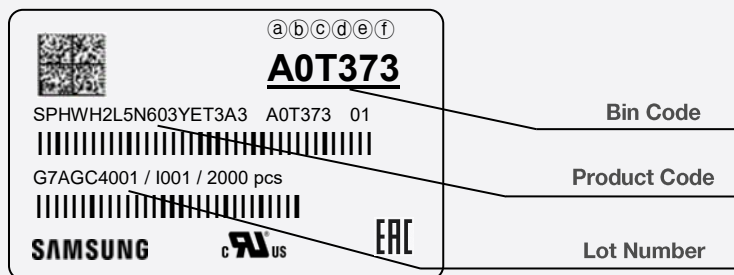
(unit: mm)

**Notes:**

- 1) Quantity: The quantity/reel is 2000 pcs
- 2) All dimensions are millimeters.
- 3) Packaging : P/N, Manufacturing data code no. and quantity are indicated on the aluminum packing bag.

## 8. Label Structure

### a) Label Structure



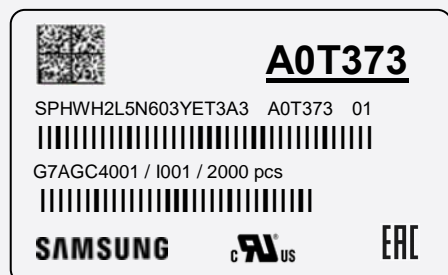
Note: Denoted bin code and product code above is only an example (see description on page 4)

Bin Code:

- ⒶⒷ: Forward Voltage bin (refer to page 6)
- ⒸⒹ: Chromaticity bin (refer to page 7)
- ⒺⒻ: Luminous Flux bin (refer to page 5)

### b) Lot Number

The lot number is composed of the following characters:



①②③④⑤⑥⑦⑧⑨ / IⒶⒷⒸ / xxxx pcs

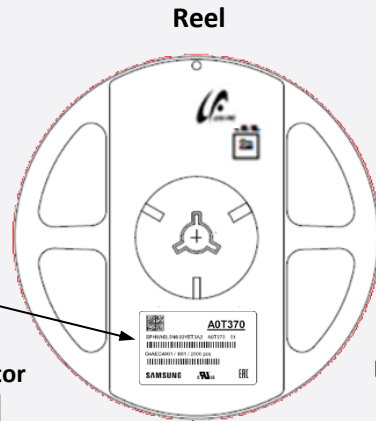
- ①② : Production site (G7 : Guangzhou ,China)
- ③ : Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
- ④ : Year (G:2022, H:2023 ... )
- ⑤ : Month (1-9, A, B, C)
- ⑥ : Day (1-9, A, B-V)
- ⑦⑧⑨ : Samsung Electronics Product serial number (001 - 999)
- ⒶⒷⒸ : Reel number(001 - 999)



## 9. Packing Structure

### a) Packing Process

#### Reel



Humidity indicator

Desiccant



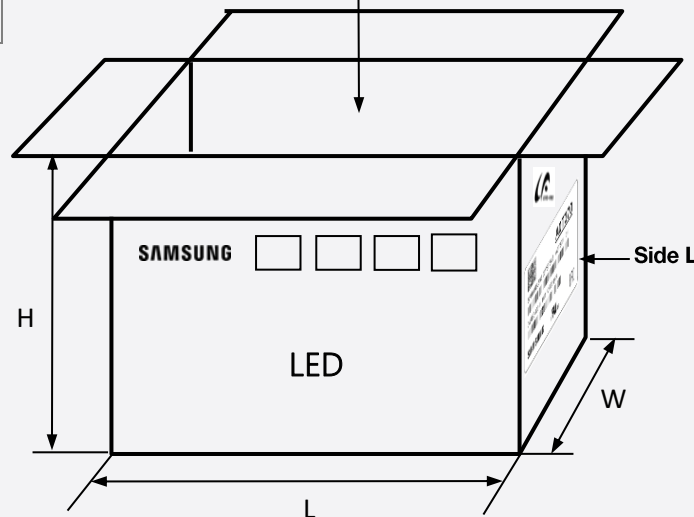
#### Aluminum Vinyl Packing Bag



#### Outer Box

Material: Paper (SW3B(B))

Type	Size (mm)			Note
	L	W	H	
7 inch S	245 ± 5	220 ± 5	86 ± 5	Up to 5 reels
7 inch L	245 ± 5	220 ± 5	182 ± 5	Up to 10 reels



Paper(SW3B(B))

#### Side Label



b) Aluminum Vinyl Packing Bag



**CAUTION**

This bag contains  
**MOISTURE SENSITIVE DEVICES**

**LEVEL**

**2a**



**A0T373**

SPHWH2L5N603YET3A3 A0T373 01

|||||

G7AGC4001 / I001 / 2000 pcs

|||||

**SAMSUNG**  

1. Shelf life in sealed bag: 12 months at < 40°C and < 90% relative humidity (RH)
2. Peak package body temperature: 240 °C
3. After this bag is opened, devices that will be subjected to reflow solder or other high temperature processes must be:
  - a. Mounted within 672 hours at factory conditions of equal to or less than 30°C / 60% RH, or
  - b. Stored at < 10% RH
4. Devices require bake, before mounting, if:
  - a. Humidity Indicator Card is > 60% when read at 23±5°C, or
  - b. 2a is not met.
5. If baking is required, devices must be baked for 10 ~ 24 hours at 60±5°C

Note: If device containers cannot be subjected to high temperature or shorter bake times are desired, reference IPC/JEDEC J-STD-033 for bake procedure.

Bag seal due date: \_\_\_\_\_  
(if blank, see code label)

Note: Level and body temperature by IPC/JEDEC J-STD-020






**주의 사항**

이 알루미늄 지퍼 백은 습기 및 정전기로부터 제품을 보호하기 위하여 제작되었습니다. 개봉 후에는 즉시 솔더 작업을 실시하는 것을 권장합니다.

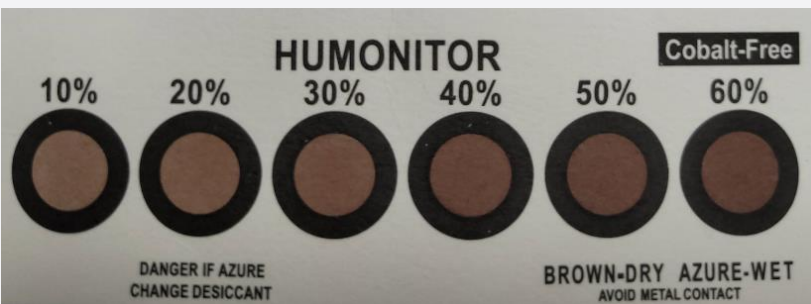
습기 및 정전기로부터 제품을 보호 하기 위해서 개봉 후 사용하지 않는 자재는 본 팩에 넣어 보관 하시기 바랍니다. 사용하지 않는 자재를 본 팩에 넣을 때는 반드시 동봉된 드라이 팩과 함께 넣고 지퍼부분을 완전하게 밀봉하여 주시기 바랍니다.

**Important**

This Al Zipper bag is designed to protect the enclosed products from moisture and ESD. Once opened, the products should be soldered onto the printed circuit board immediately. When not in use, please do not leave the products unprotected by the Al Zipper Bag. To repack unused products, please ensure the zip-lock is completely sealed with the dry pack left inside.

c) Silica Gel & Humidity Indicator Card inside Aluminum Vinyl Bag

(This image is for reference only. Silicagel and humidity indicator shapes may be different.)



## 10. Precautions in Handling & Use

- 1) For over-current protection, users are recommended to apply resistors connected in series with the LEDs to mitigate sudden change of the forward current caused by shift of forward voltage.
- 2) This device should not be used in any type of fluid such as water, oil, organic solvent, etc. When cleaning is required, IPA is recommended as the cleaning agent. Some solvent-based cleaning agent may damage the silicone resins used in the device.
- 3) When the device is in operation, the forward current should be carefully determined considering the maximum ambient temperature and corresponding junction temperature.
- 4) LEDs must be stored in a clean environment. Shelf life of sealed bags is 12 months at temperature 0~40°C, 0~90 % RH.
- 5) After storage bag is opened, device subjected to soldering, solder reflow, or other high temperature processes must be:
  - a. Mounted within 672 hours (28 days) at an assembly line with a condition of no more than 30°C / 60 % RH, or
  - b. Stored at <10 % RH
- 6) Repack unused devices with anti-moisture packing, fold to close any opening and then store in a dry place.
- 7) Devices require baking before mounting, if humidity card reading is >60 % at 23 ± 5°C
- 8) Devices must be baked for 1 hour at 60 ± 5°C, if baking is required.
- 9) The LEDs are sensitive to the static electricity and surge current. It is recommended to use a wrist band or anti-electrostatic glove when handling the LEDs. If voltage exceeding the absolute maximum rating is applied to LEDs, it may cause damage or even destruction to LED devices. Damaged LEDs may show some unusual characteristics such as increase in leakage current, lowered turn-on voltage, or abnormal lighting of LEDs at low current.
- 10) VOCs (Volatile Organic Compounds) can be generated from adhesives, flux, hardener or organic additives used in luminaires (fixtures). Transparent LED silicone encapsulant is permeable to those chemicals and they may lead to a discoloration of encapsulant when they exposed to heat or light. This phenomenon can cause a significant loss of light emitted (output) from the luminaires. In order to prevent these problems, we recommend users to know the physical properties of materials used in luminaires and they must be carefully selected.
- 11) Risk of sulfurization (or tarnishing)  
 The LED from Samsung Electronics Co., Ltd. uses a silver-plated lead frame and its surface color may change to black (or dark colored) when it is exposed to sulfur (S), chlorine (Cl) or other halogen compound. Sulfurization of lead frame may cause intensity degradation, change of chromaticity coordinates and, in extreme cases, open circuit. It requires caution. Due to possible sulfurization of lead frame, LED should not be used and stored together with oxidizing substances made of materials such as: rubber, plain paper, lead solder cream, etc.

# Legal and additional information.

## [About Samsung Electronics Co., Ltd.](#)

Samsung Electronics Co., Ltd. inspires the world and shapes the future with transformative ideas and technologies, redefining the worlds of TVs, smartphones, wearable devices, tablets, cameras, digital appliances, printers, medical equipment, network systems and semiconductors.

We are also leading in the Internet of Things space through, among others, our Digital Health and Smart Home initiatives. We employ 307,000 people across 84 countries. To discover more, please visit our official website at [www.samsung.com](http://www.samsung.com) and our official blog at [global.samsungtomorrow.com](http://global.samsungtomorrow.com).

"Samsung provides limited warranty for its LED products, the full text of which is available at <https://www.samsung.com/led/lighting/warranty>."

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