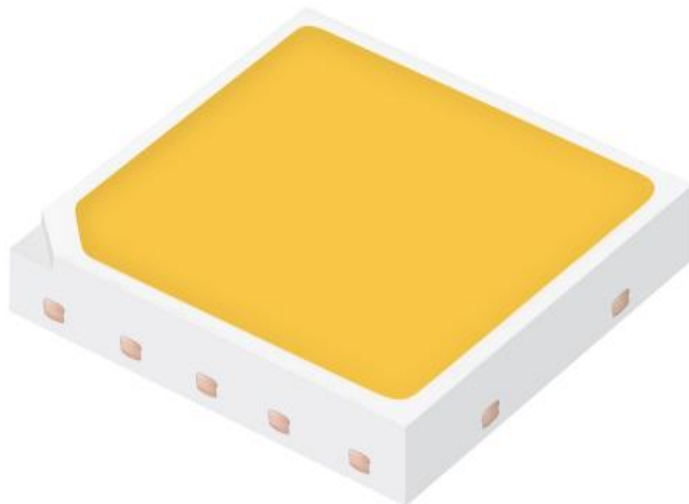


High Power LED Series

LH502C

General



High efficacy and lumen makes

The LH502C suitable for Streetlight and High-bay applications

Features & Benefits

- Operates at a maximum current of up to 880mA
- Uniform light distribution under any beam angle
- Strengthened Anti sulfurization
- Color binning @ 85°C



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1. Characteristics

a) Absolute Maximum Rating

Item	Symbol	Rating	Unit	Condition
Operating Temperature	T _{opr}	-40 ~ +85	°C	
Storage Temperature	T _{stg}	-40 ~ +100	°C	-
LED Junction Temperature	T _j	125	°C	-
Forward Current	I _F	880	mA	-
Peak Pulse Forward Current	I _{FP}	1000	mA	Duty cycle ≤ 1/10, pulse width 10ms
Soldering Temperature		260 <10	°C	-

b) Electro-optical Characteristics (I_F = 640 mA, T_j = 25°C)

Item	Unit	Rank	Min.	Typ.	Max.
Forward Voltage (V _F)	V	YE	5.9	6.1	6.3
		3	70	-	-
Color Rendering Index (R _a)	-	5	80		
		7	90	-	-
Thermal Resistance (junction to chip point)	°C/W		-	3	-
Beam Angle	°		-	120	-
ESD (HBM)	-			Class 3A	

Notes:

Samsung maintains measurement tolerance of: luminous flux = ±7 %, forward voltage = ±0.1 V

c) Luminous Flux Characteristics (I_F = 640 mA)

CRI (R _a) Min.	Nominal CCT (K)	Flux Rank	Flux @ T _J = 25 °C (lm)		
			Min.	Typ.	Max.
70	2200K	A2	510		
	2700K	A2	590		
	3000K	A2	620		
	3500K	A2	640		
	4000K	A2	660		
	5000K	A2	660		
	5700K	A2	640		
	6500K	A2	630		
80	2200K	A2	440		
	2700K	A2	530		
	3000K	A2	550		
	3500K	A2	580		
	4000K	A2	600		
	5000K	A2	600		
	5700K	A2	590		
	6500K	A2	590		
90	2200K	A2	400		
	2700K	A2	450		
	3000K	A2	470		
	3500K	A2	480		
	4000K	A2	490		
	5000K	A2	490		
	5700K	A2	490		

Notes:

- 1) Tested in pulsed operating condition at rated test current (10 ms pulse width) and rated temperature
- 2) Samsung maintains measurement tolerance of: Luminous flux = ±7 %, CRI = ±1

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 1 L 5 N 6 0 3 Y E T 5 A 2

Digit	PKG Information	Code	Specification		
1 2 3	Samsung Package High Power	SPH	High Power PKG		
4 5	Color	WH	White		
6	Product Version	1	1		
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		
		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 (CRI70/80)		
16	MacAdam Step	3	MacAdam 3-Step		
		5	MacAdam 5-Step		
17 18	Luminous Flux (lm)	A2			

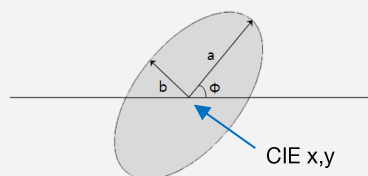
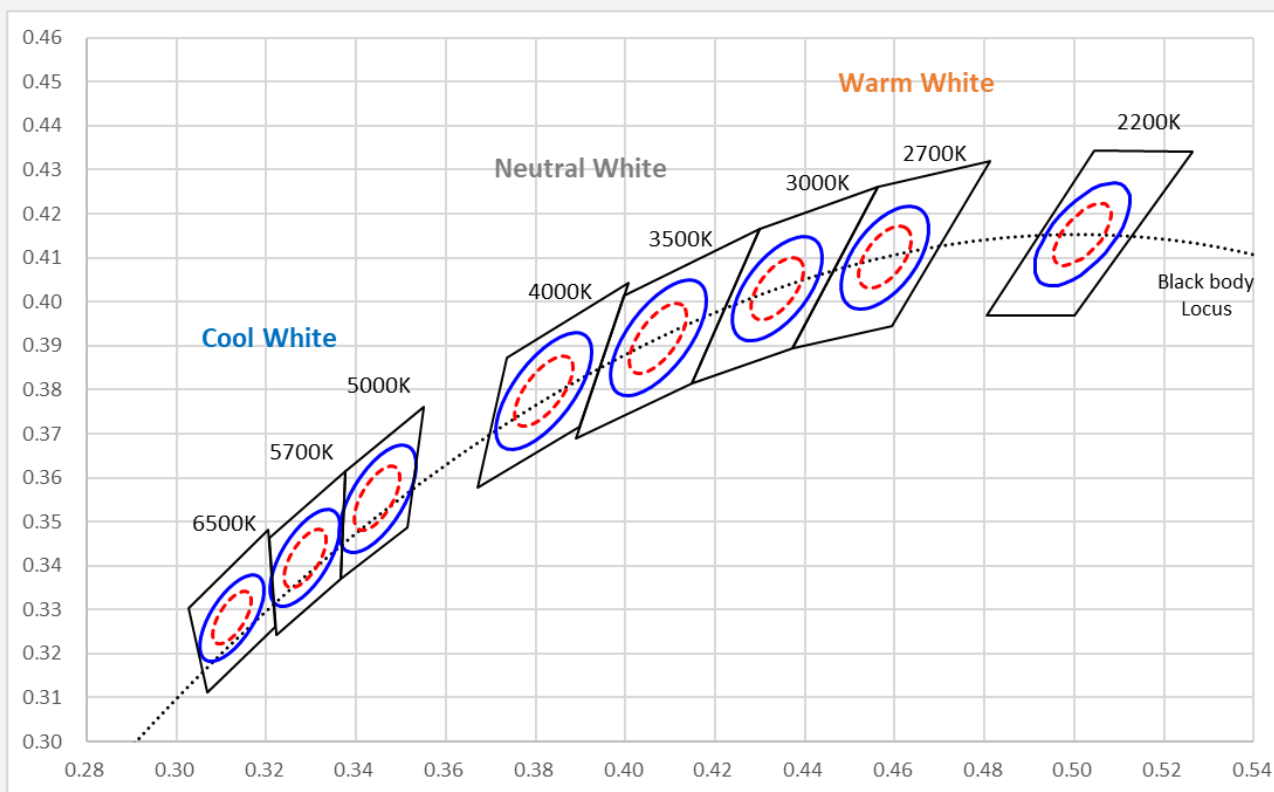
a) Luminous flux Rank (I_f = 640 mA, T_j = 25°C)

CRI (R _a) Min.	Nominal CCT(K)	Product Code	VF Rank	Chrom Rank (Bins)	Flux		Flux Range (Φ _v , lm)
					Rank	Bins	
70	2200	SPHWH1L5N603YEY3A2	YE	Y3, Y5	A2	51	510-550
		SPHWH1L5N603YEA5A2					550-590
	2700	SPHWH1L5N603YEW3A2		W3, W5		59	590-630
		SPHWH1L5N603YEW5A2					630-670
	3000	SPHWH1L5N603YEV3A2		V3, V5		62	620-660
		SPHWH1L5N603YEV5A2					660-700
	3500	SPHWH1L5N603YEU3A2		U3, U5		64	640-680
		SPHWH1L5N603YEU5A2					680-720
	4000	SPHWH1L5N603YET3A2		T3, T5		66	660-700
		SPHWH1L5N603YET5A2					700-740
	5000	SPHWH1L5N603YER3A2		R3, R5		66	660-700
		SPHWH1L5N603YER5A2					700-740
	5700	SPHWH1L5N603YEQ3A2		Q3, Q5		64	640-680
		SPHWH1L5N603YEQ5A2					680-720
	6500	SPHWH1L5N603YEP3A2		P3, P5		63	630-670
		SPHWH1L5N603YEP5A2					670-710
80	2200	SPHWH1L5N605YEY3A2	YE	Y3, Y5	A2	44	440-480
		SPHWH1L5N605YEA5A2					480-520
	2700	SPHWH1L5N605YEW3A2		W3, W5		53	530-570
		SPHWH1L5N605YEW5A2					570-610
	3000	SPHWH1L5N605YEV3A2		V3, V5		55	550-590
		SPHWH1L5N605YEV5A2					590-630
	3500	SPHWH1L5N605YEU3A2		U3, U5		58	580-620
		SPHWH1L5N605YEU5A2					620-660
	4000	SPHWH1L5N605YET3A2		T3, T5		60	600-640
		SPHWH1L5N605YET5A2					640-680
	5000	SPHWH1L5N605YER3A2		R3, R5		60	600-640
		SPHWH1L5N605YER5A2					640-680
	5700	SPHWH1L5N605YEQ3A2		Q3, Q5		59	590-630
		SPHWH1L5N605YEQ5A2					630-670
	6500	SPHWH1L5N605YEP3A2		P3, P5		59	590-630
		SPHWH1L5N605YEP5A2					630-670
90	2200	SPHWH1L5N607YEY3A2	YE	Y3, Y5	A2	40	400-440
		SPHWH1L5N607YEA5A2					440-480
	2700	SPHWH1L5N607YEW3A2		W3, W5		45	450-490
		SPHWH1L5N607YEW5A2					490-530
	3000	SPHWH1L5N607YEV3A2		V3, V5		47	470-510
		SPHWH1L5N607YEV5A2					510-550
	3500	SPHWH1L5N607YEU3A2		U3, U5		48	480-520
		SPHWH1L5N607YEU5A2					520-560
	4000	SPHWH1L5N607YET3A2		T3, T5		49	490-530
		SPHWH1L5N607YET5A2					530-570
	5000	SPHWH1L5N607YER3A2		R3, R5		49	490-530
		SPHWH1L5N607YER5A2					530-570
	5700	SPHWH1L5N607YEQ3A2		Q3, Q5		49	490-530
		SPHWH1L5N607YEQ5A2					530-570

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

Nominal CCT (K)	CRI (R _a) 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 ($I_F = 640 \text{ mA}$, $T_j = 85^\circ\text{C}$)



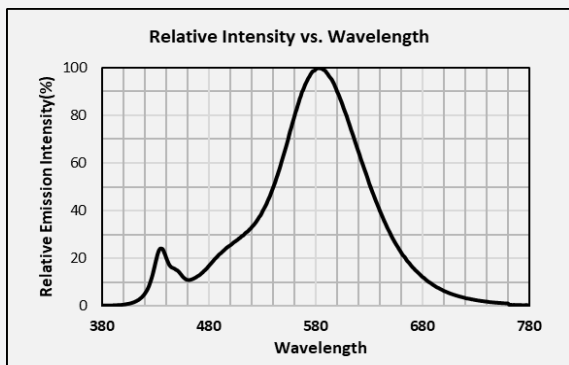
CRI	CCT	Rank	CIE x	CIE y	Φ	A	b
70 80 90	2200K	Y3	0.5019	0.4153	49.3	0.0086	0.0040
		Y5				0.0144	0.0066
	2700K	W3	0.4578	0.4101	53.7	0.0081	0.0042
		W5				0.0135	0.0070
	3000K	V3	0.4338	0.4030	53.2	0.0083	0.0041
		V5				0.0138	0.0068
	3500K	U3	0.4073	0.3917	54.0	0.0093	0.0041
		U5				0.0155	0.0069
	4000K	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: $C_x, C_y = \pm 0.005$

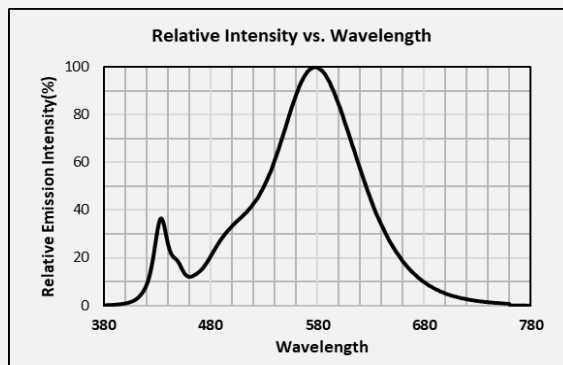
3. Typical Characteristic Graphs

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

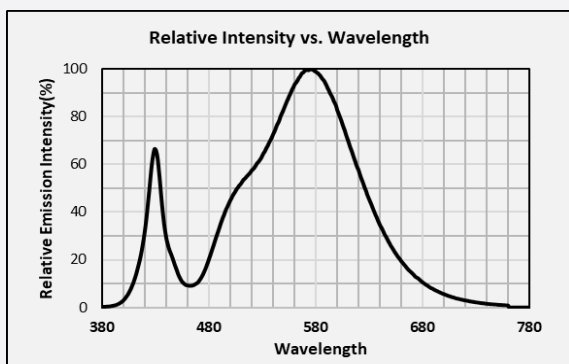
CCT : 2200K (CRI70)



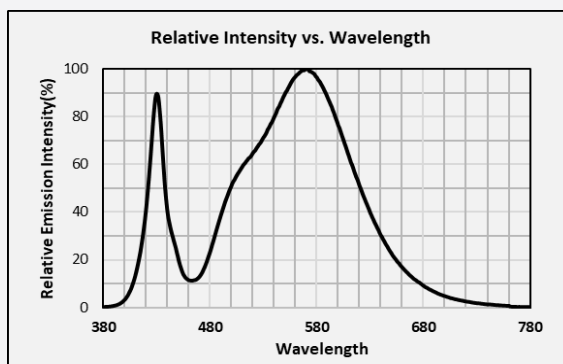
CCT : 2700K (CRI70)



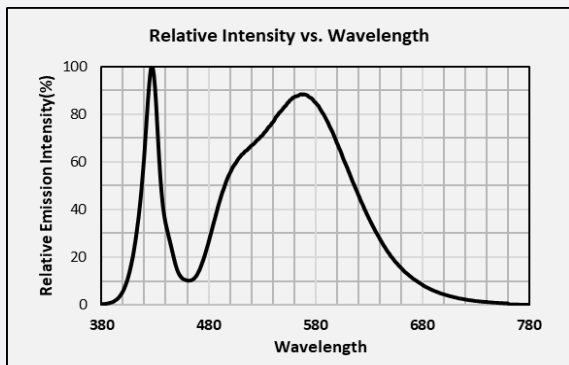
CCT : 3000K (CRI70)



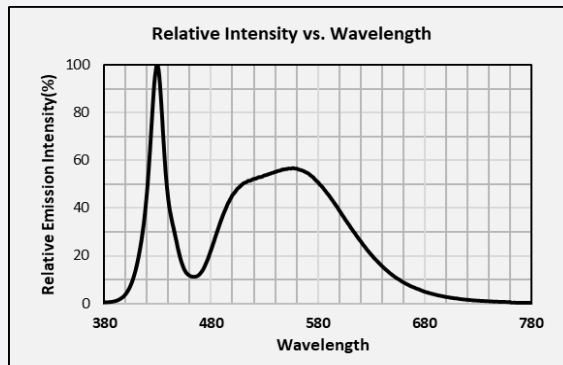
CCT : 3500K (CRI70)



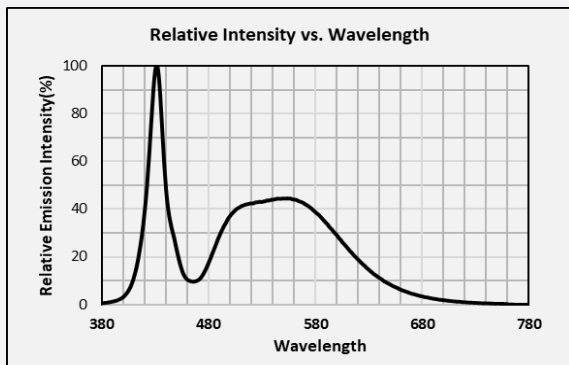
CCT : 4000K (CRI70)



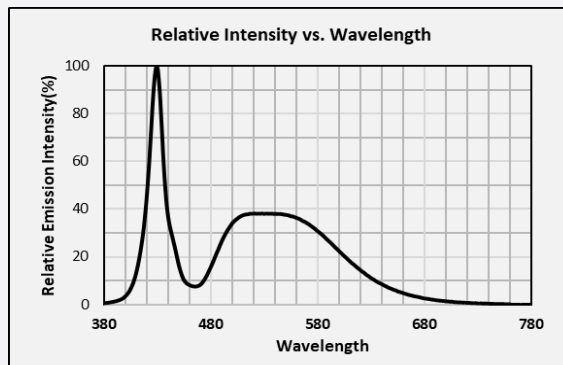
CCT : 5000K (CRI70)



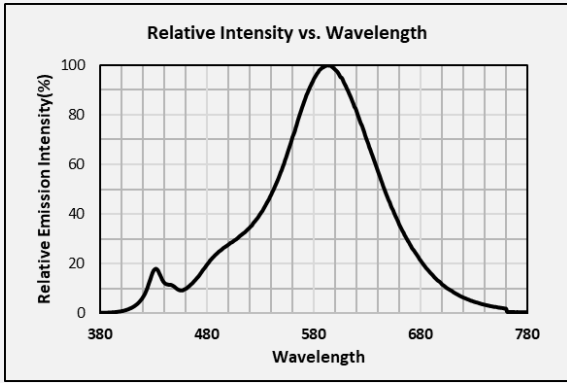
CCT : 5700K (CRI70)



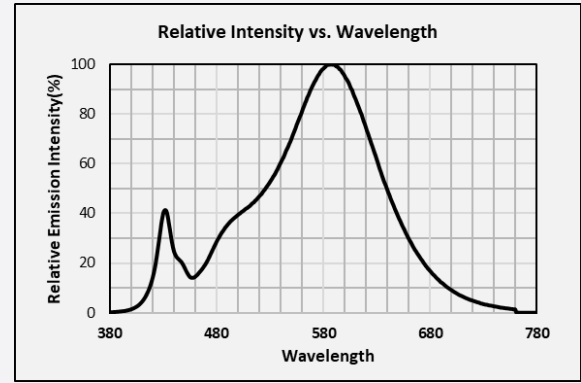
CCT : 6500K (CRI70)



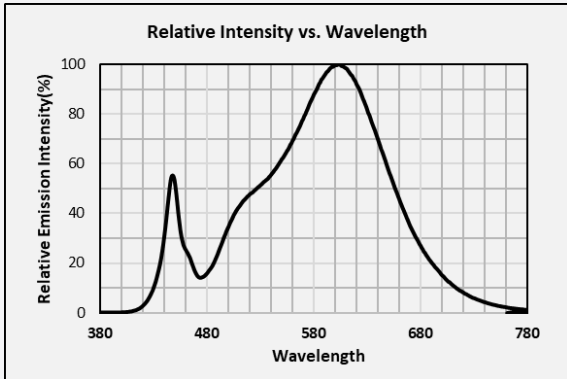
CCT : 2200K (CRI80)



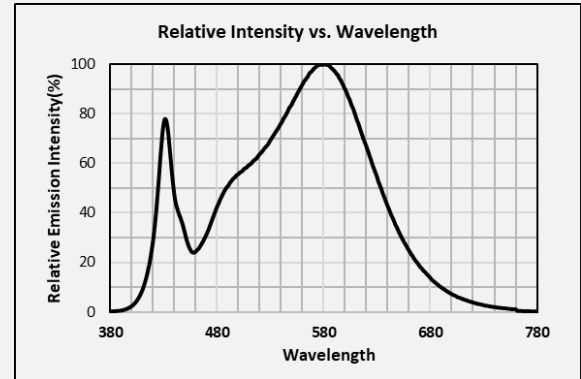
CCT : 2700K (CRI80)



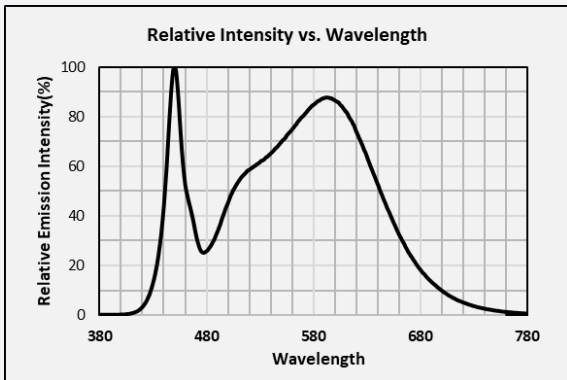
CCT : 3000K (CRI80)



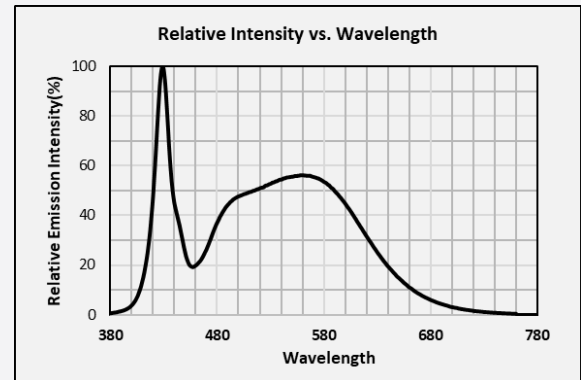
CCT : 3500K (CRI80)



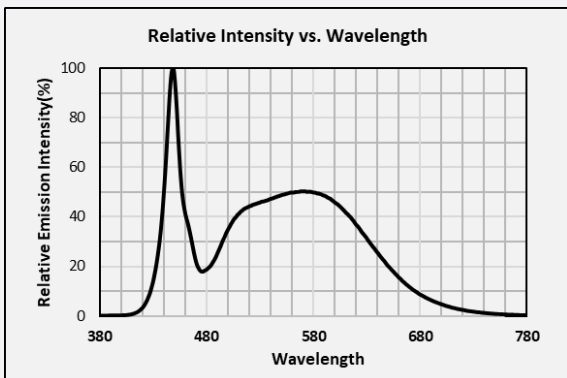
CCT : 4000K (CRI80)



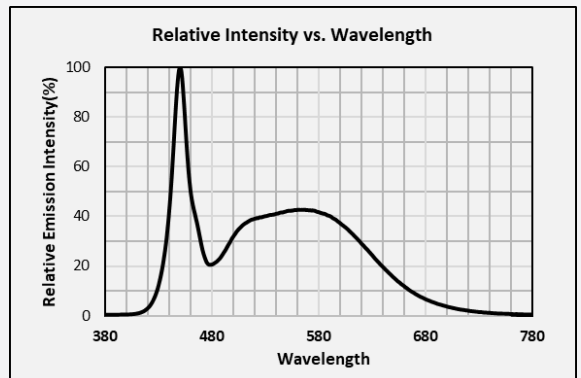
CCT : 5000K (CRI80)



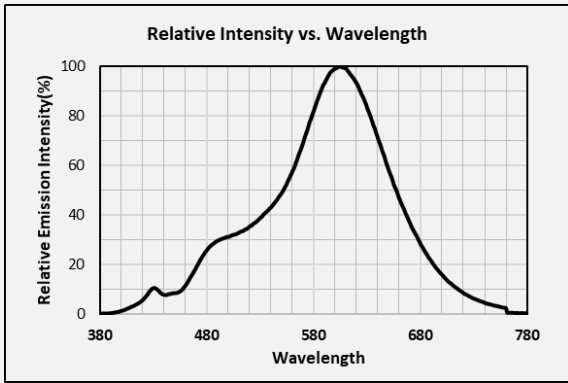
CCT : 5700K (CRI80)



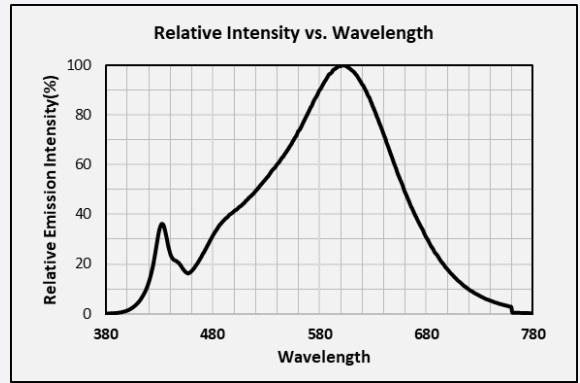
CCT : 6500K (CRI80)



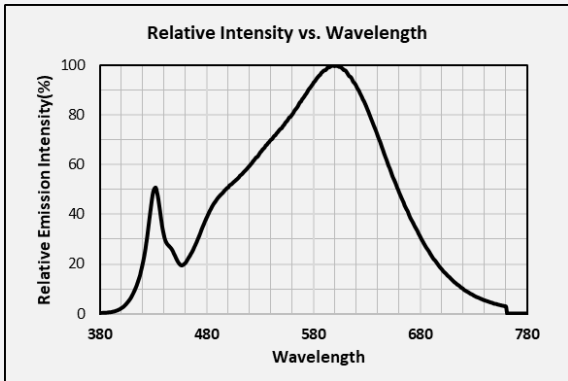
CCT : 2200K (CRI90)



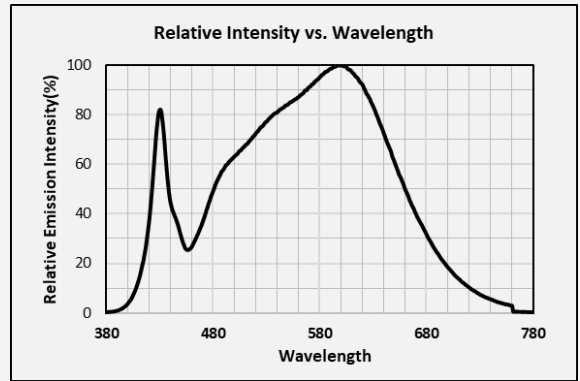
CCT : 2700K (CRI90)



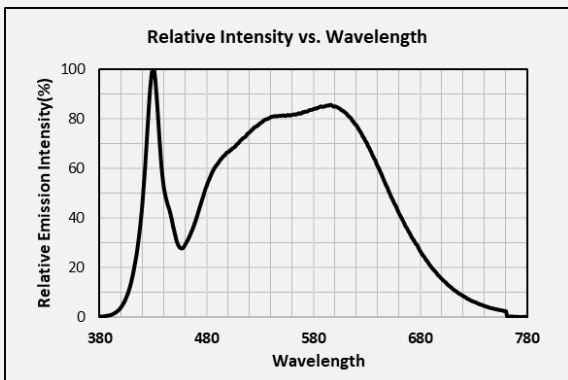
CCT : 3000K (CRI90)



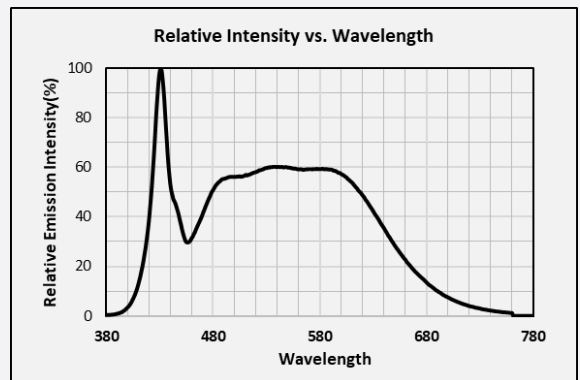
CCT : 3500K (CRI90)



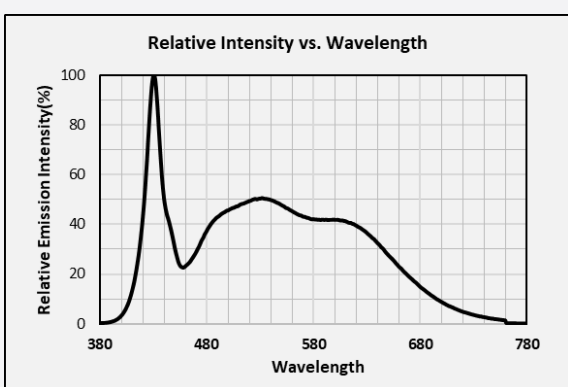
CCT : 4000K (CRI90)



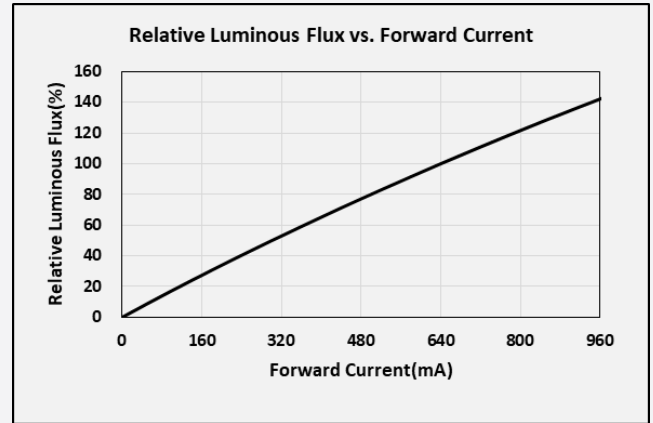
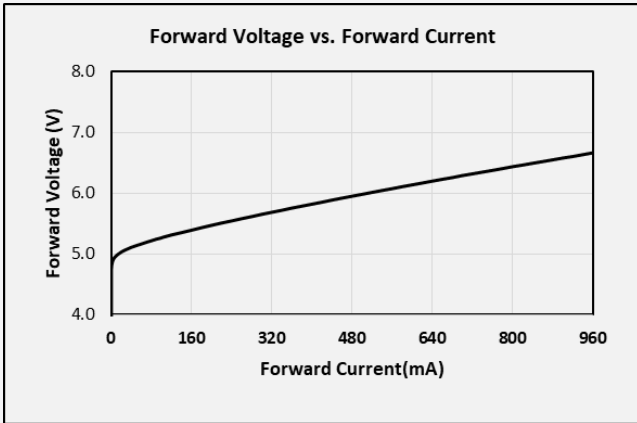
CCT : 5000K (CRI90)



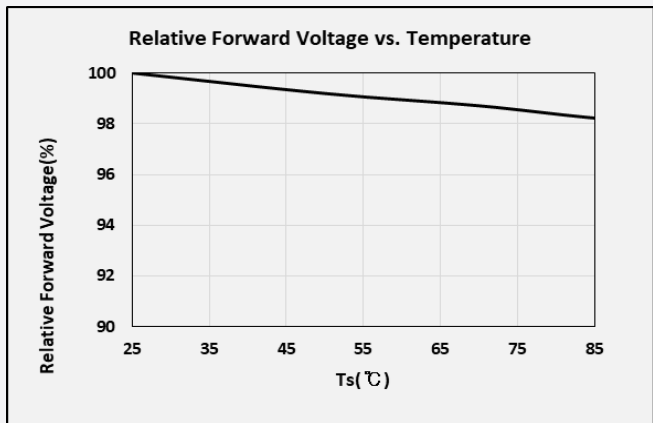
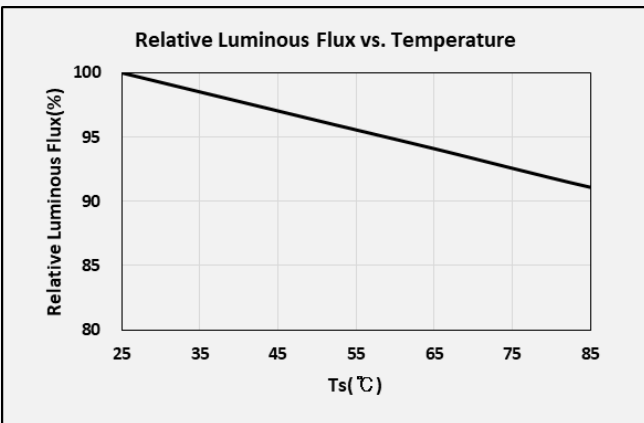
CCT : 5700K (CRI90)



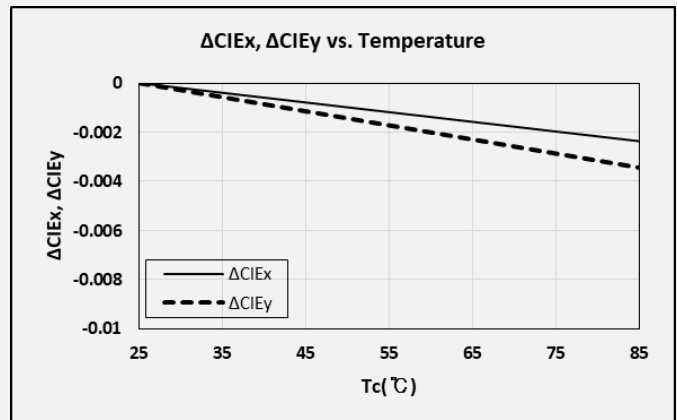
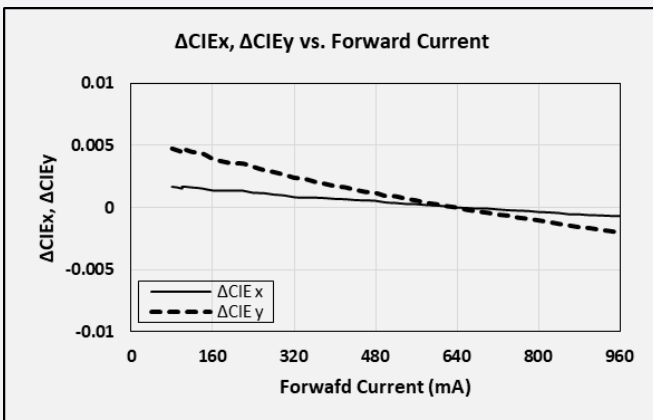
b) Forward Current Characteristics ($T_j = 25^\circ\text{C}$)



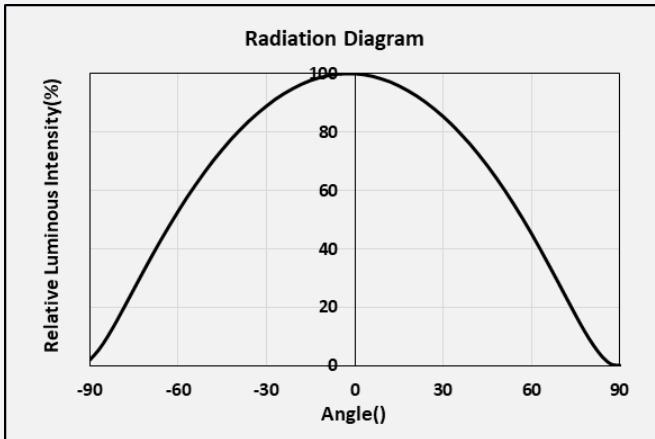
c) Temperature Characteristics ($I_f = 640\text{ mA}$)



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

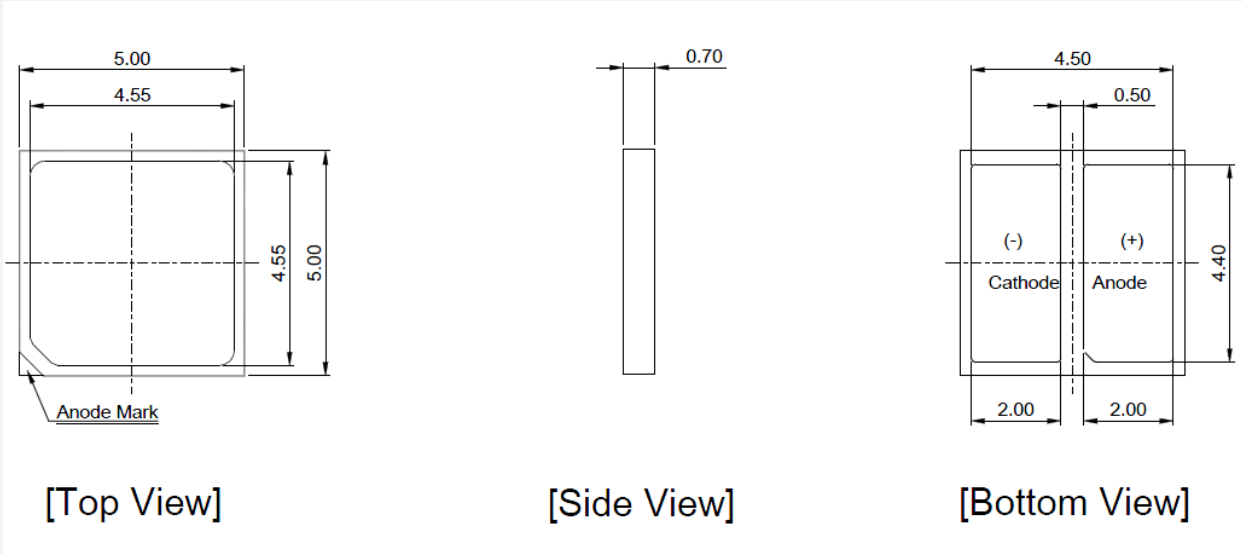


e) Beam Angle Characteristics ($I_f = 640 \text{ mA}$, $T_j = 25^\circ\text{C}$)



4. Outline Drawing & Dimension

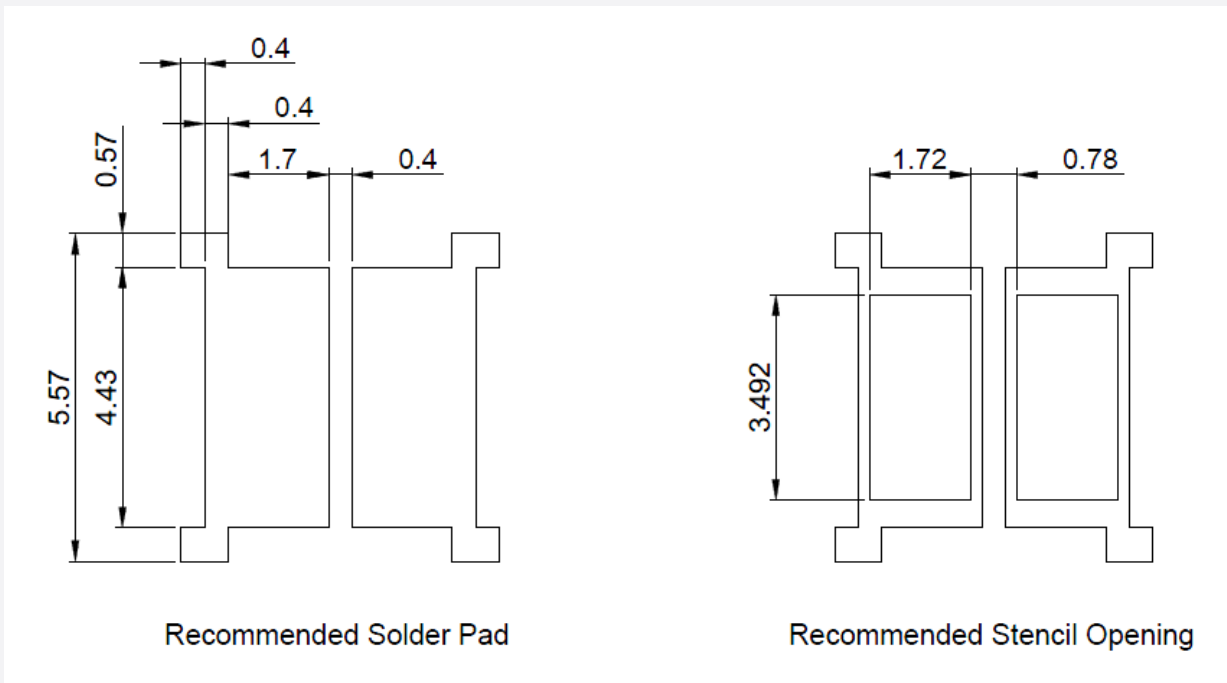
a) Mechanical Dimensions



Notes:

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

b) Recommended Solder Pad



5. Reliability Test Items & Conditions

a) Test Items

Test Item	Test Condition	Test Hour / Cycle
High Temperature Operating Life Test	85°C, 440mA	1000 h
Wet High Temperature Operating Life Test	85°C, 85 % RH, DC 440mA	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

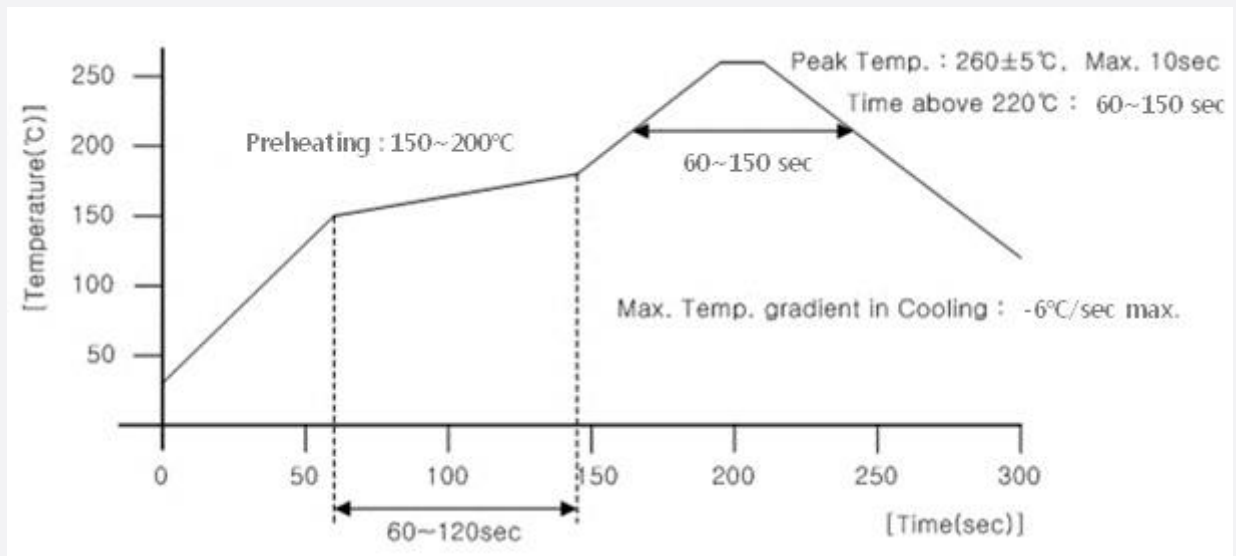
b) Criteria for Judging the Damage

Item	Symbol	Test Condition (T _c = 25°C)	Limit	
			Min.	Max.
Forward Voltage	V _F	I _F = Sorting Current	L.S.L. * 0.9	U.S.L. * 1.1
Luminous Flux	Φ _v	I _F = 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

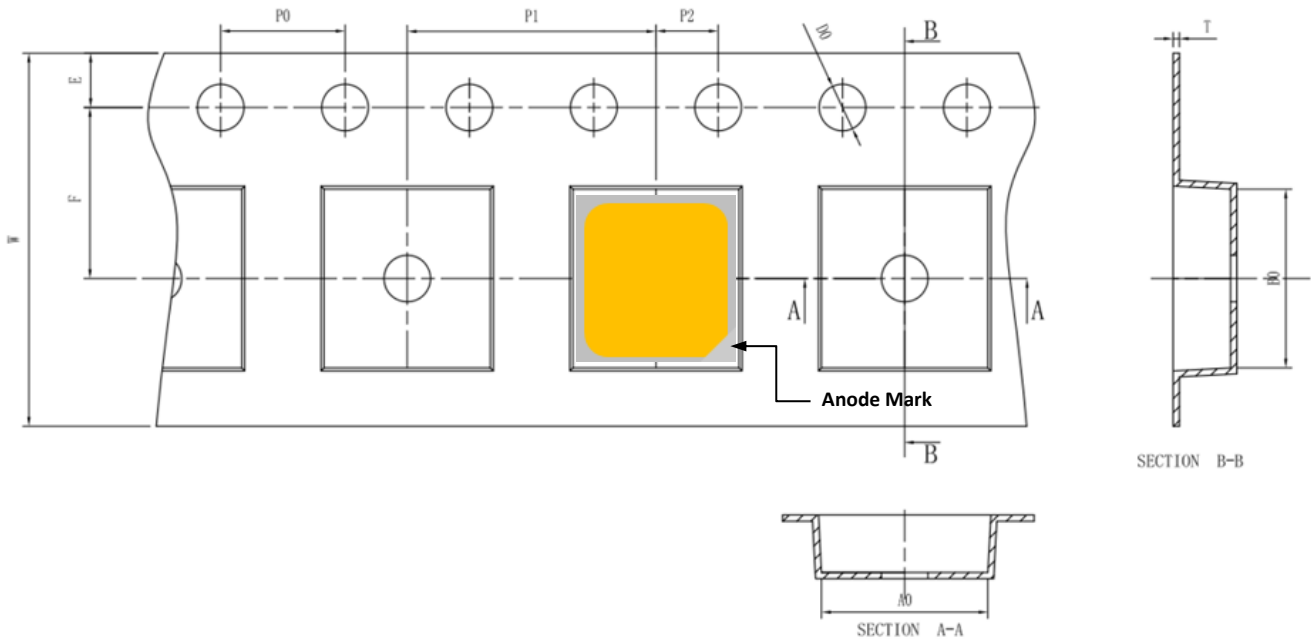
Not more than 5 seconds @ max. 300°C, under soldering iron.

7. Tape & Reel

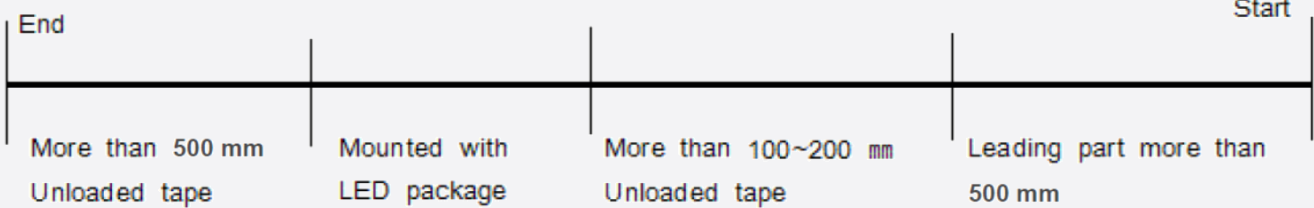
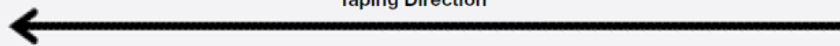
a) Taping Dimension

(unit: mm)

ITEM	W	A0	B0	K0	E	F	D0	D1	P0	P1	P2	T	LENGTH	PCS/REEL
5.35	+0.10 -0.10	+0.05 -0.05	+0.05 -0.05	+0.05 -0.05	+0.10 -0.10	+0.10 -0.10	+0.10 -0.00	+0.10 -0.00	+0.10 0.00	+0.10 -0.10	+0.10 -0.10	+0.05 -0.05	m	PCS

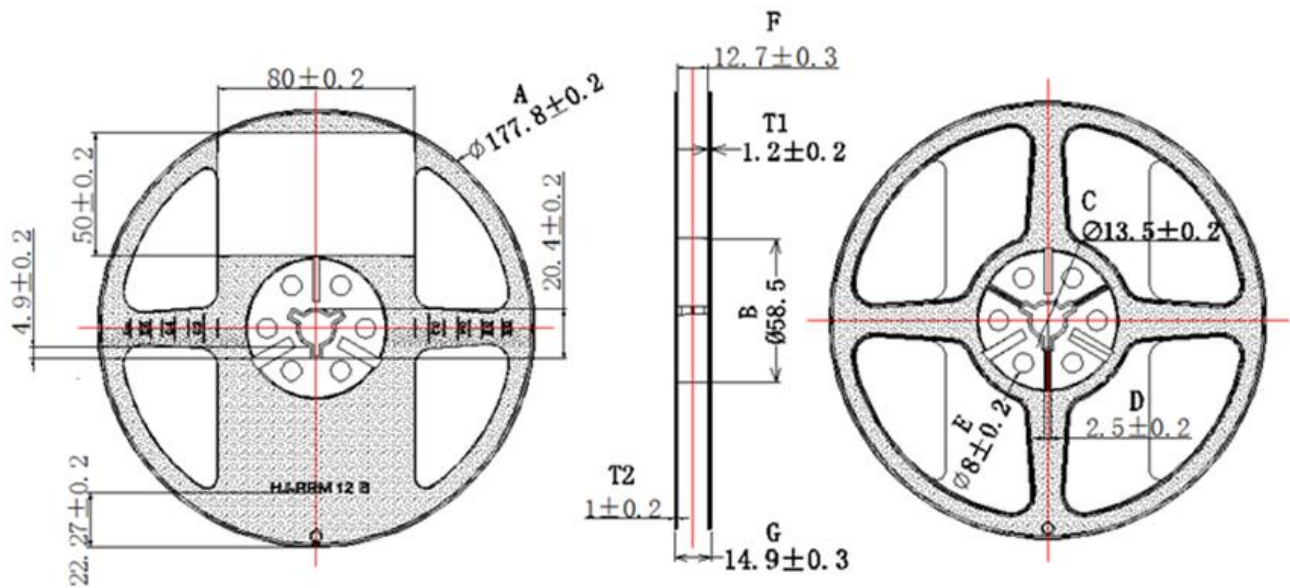


Taping Direction



b) Reel Dimension (max 2,000 pcs)

(unit: mm)



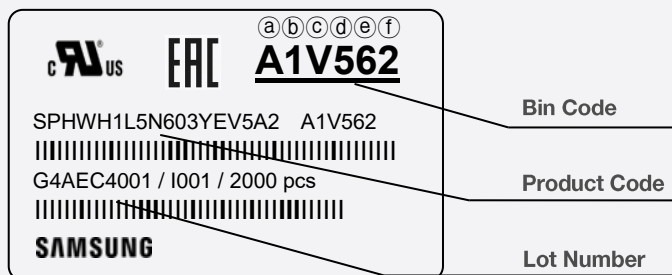
A±0.2	B±0.2	C±0.2	D±0.2	E±0.2	F±0.3	G±0.3	T1±0.2	T2±0.2
∅177.8	∅58.5	∅13.5	2.5	∅8	12.7	14.9	1.2	1

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



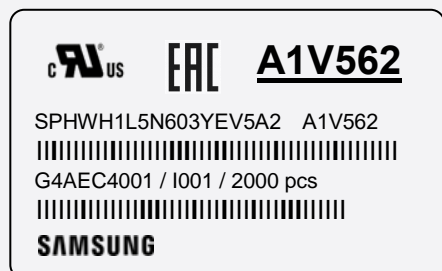
Note: Denoted bin code and product code above is only an example (see description on page 5)

Bin Code:

- ⒶⒷ: Forward Voltage bin (refer to page 7)
- ⒸⒹ: Chromaticity bin (refer to page 8)
- ⒺⒻ: Luminous Flux bin (refer to page 6)

b) Lot Number

The lot number is composed of the following characters:




①②③④⑤⑥⑦⑧⑨ / IⒶⒷⒸ / xxxx pcs

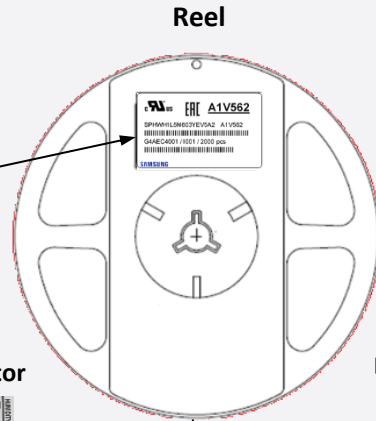
- ①② : Production site (G4 : Guangzhou ,China)
- ③ : Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
- ④ : Year (D:2019, E:2020, F:2021 ...)
- ⑤ : Month (1-9, A, B, C)
- ⑥ : Day (1-9, A, B-V)
- ⑦⑧⑨ : Samsung Electronics Product serial number (001 - 999)
- ⒶⒷⒸ : Reel number(001 - 999)

9. Packing Structure

a) Packing Process

Reel


ERC A1V562
 SPHWH1L5N603YEV5A2 A1V562
 G4AEC4001 / I001 / 2000 pcs
SAMSUNG




Humidity indicator



Desiccant



Aluminum Vinyl Packing Bag


ERC A1V562
 SPHWH1L5N603YEV5A2 A1V562
 G4AEC4001 / I001 / 2000 pcs
SAMSUNG




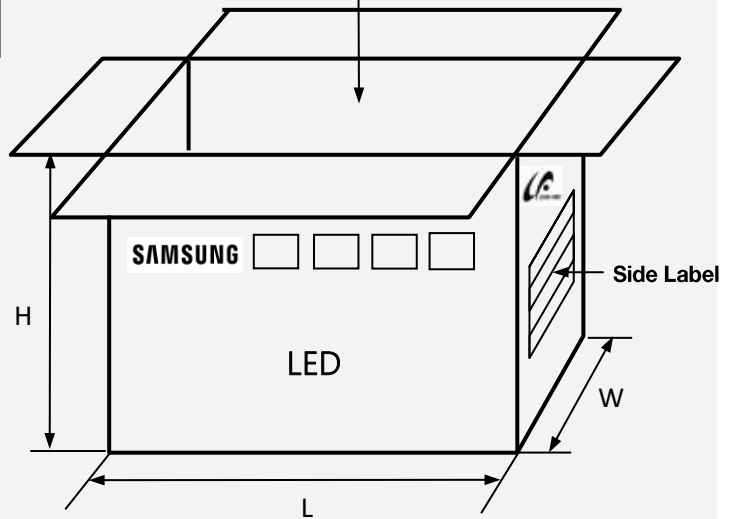
Outer Box

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

Side Label


ERC A1V562
 SPHWH1L5N603YEV5A2 A1V562
 G4AEC4001 / I001 / 2000 pcs
SAMSUNG



Paper(SW3B(B))

b) Aluminum Vinyl Packing Bag



CAUTION

This bag contains
MOISTURE SENSITIVE DEVICES

LEVEL
2a

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



SPHWH1L5N603YEV5A2 A1V562
 G4AEC4001 / I001 / 2000 pcs

SAMSUNG






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.)

SILICA
GEL
THROWAWAY
"DO NOT EAT"

DESICCANT
SILICA
GEL

Complies with IPC/JEDEC J-STD-033 & REACH Regulation **COBALT DICHLORIDE FREE**

10%



READ AT LAVENDER COLOR
CHANGE BETWEEN BLUE AND PINK

20%



30%



40%



Warning if pink
Change Desiccant

50%



60%



HUMIDITY INDICATOR

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.

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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 and our official blog at global.samsungtomorrow.com.

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