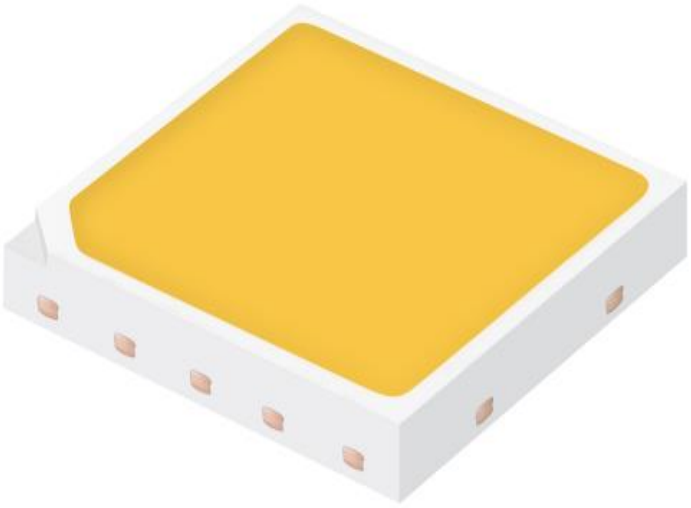
High Power LED Series

LH502C ECO General



High efficacy and lumen makes

The LH502C ECO 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
- Color binning @ 85℃

SAMSUNG

Table of Contents

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	-
Electrostatic Discharge Withstand Voltage(HBM)	ESD(HBM)	±2	kV	-

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

Item	Unit	Rank	Min.	Typ.	Max.
Forward Voltage (V_F)	V	YE	5.9	6.1	6.3
Color Rendering Index (R_a) / R9	-	3	70 / -50	-	-
		5	80 / 0	-	-
Thermal Resistance (junction to chip point)	°C/W		-	3	-
Beam Angle	°			120	

Notes:

Samsung maintains measurement tolerance of: luminous flux = ±7 %, forward voltage = ±0.1 V, CRI = ±1, R9 = ±6.5

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	A4	510		
	2700K	A4	590		
	3000K	A4	620		
	3500K	A4	640		
	4000K	A4	660		
	5000K	A4	660		
	5700K	A4	640		
	6500K	A4	630		
80	2200K	A4	470		
	2700K	A4	550		
	3000K	A4	560		
	3500K	A4	600		
	4000K	A4	610		
	5000K	A4	610		
	5700K	A4	600		
	6500K	A4	600		

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, R9 = ±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	1	L	5	N	6	0	3	Y	E	T	5	A	4

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		
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)	A4	**502C ECO lm Rank**		

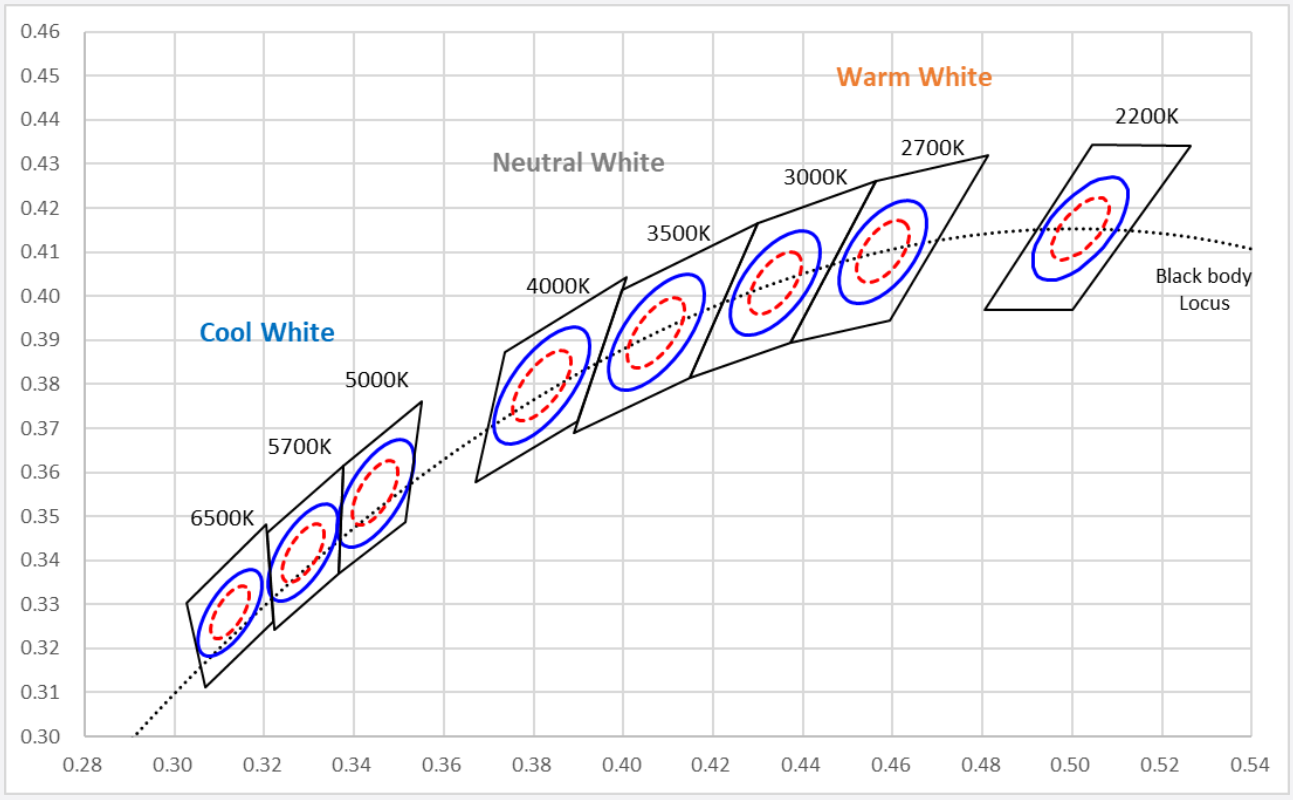
a) Luminous flux Rank (I_F = 640 mA, T_j = 25℃)

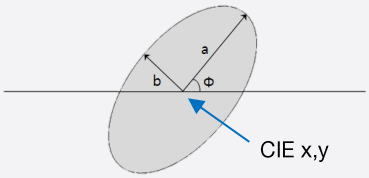
CRI (R_a) Min.	Nominal CCT(K)	Product Code	VF Rank	Chrom Rank (Bins)	Flux		Flux Range (Φv, lm)
					Rank	Bins	
70	2200	SPHWH1L5N603YEY3A4	YE	Y3, Y5	A4	51	510-550
		SPHWH1L5N603YEY5A4				55	550-590
	2700	SPHWH1L5N603YEW3A4		W3, W5		59	590-630
		SPHWH1L5N603YEW5A4				63	630-670
	3000	SPHWH1L5N603YEV3A4		V3, V5		62	620-660
		SPHWH1L5N603YEV5A4				66	660-700
	3500	SPHWH1L5N603YEU3A4		U3, U5		64	640-680
		SPHWH1L5N603YEU5A4				68	680-720
	4000	SPHWH1L5N603YET3A4		T3, T5		66	660-700
		SPHWH1L5N603YET5A4				70	700-740
	5000	SPHWH1L5N603YER3A4		R3, R5		66	660-700
		SPHWH1L5N603YER5A4				70	700-740
	5700	SPHWH1L5N603YEQ3A4		Q3, Q5		64	640-680
		SPHWH1L5N603YEQ5A4				68	680-720
	6500	SPHWH1L5N603YEP3A4		P3, P5		63	630-670
		SPHWH1L5N603YEP5A4				67	670-710
80	2200	SPHWH1L5N605YEY3A4	YE	Y3, Y5	A4	47	470-510
		SPHWH1L5N605YEY5A4				51	510-550
	2700	SPHWH1L5N605YEW3A4		W3, W5		55	550-590
		SPHWH1L5N605YEW5A4				59	590-630
	3000	SPHWH1L5N605YEV3A4		V3, V5		56	560-600
		SPHWH1L5N605YEV5A4				60	600-640
	3500	SPHWH1L5N605YEU3A4		U3, U5		60	600-640
		SPHWH1L5N605YEU5A4				64	640-680
	4000	SPHWH1L5N605YET3A4		T3, T5		61	610-650
		SPHWH1L5N605YET5A4				65	650-690
	5000	SPHWH1L5N605YER3A4		R3, R5		61	610-650
		SPHWH1L5N605YER5A4				65	650-690
	5700	SPHWH1L5N605YEQ3A4		Q3, Q5		60	600-640
		SPHWH1L5N605YEQ5A4				64	640-680
	6500	SPHWH1L5N605YEP3A4		P3, P5		60	600-640
		SPHWH1L5N605YEP5A4				64	640-680

b) Voltage Bins (I_F = 640 mA, T_j = 25℃)

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 mA, T_j = 85℃)





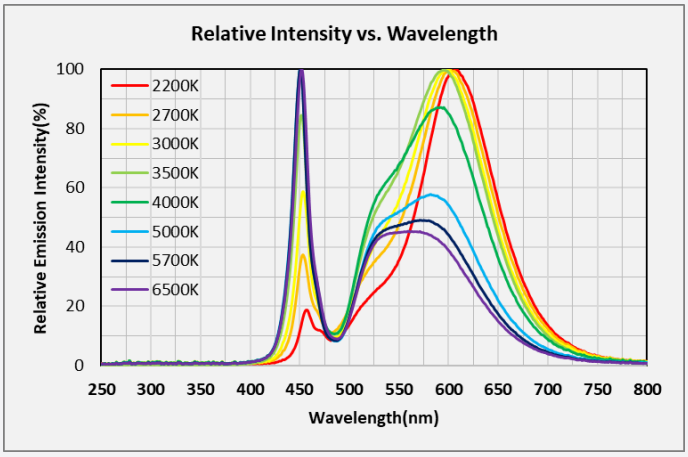
CRI	CCT	Rank	CIE x	CIE y	Φ	A	b
70 80 90	2200K	Y3	0.5019	0.4153	49.3	0.0086	0.0040
		Y5				0.0144	0.0066
	2700K	W3	0.4578	0.4101	53.7	0.0081	0.0042
		W5				0.0135	0.0070
	3000K	V3	0.4338	0.4030	53.2	0.0083	0.0041
		V5				0.0138	0.0068
	3500K	U3	0.4073	0.3917	54.0	0.0093	0.0041
		U5				0.0155	0.0069
	4000K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

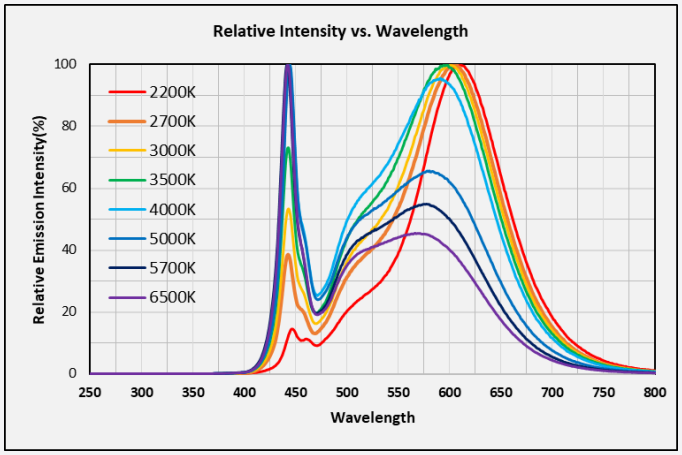
3. Typical Characteristic Graphs

a) Spectral Distribution (I_F = 640 mA, T_j = 25℃)

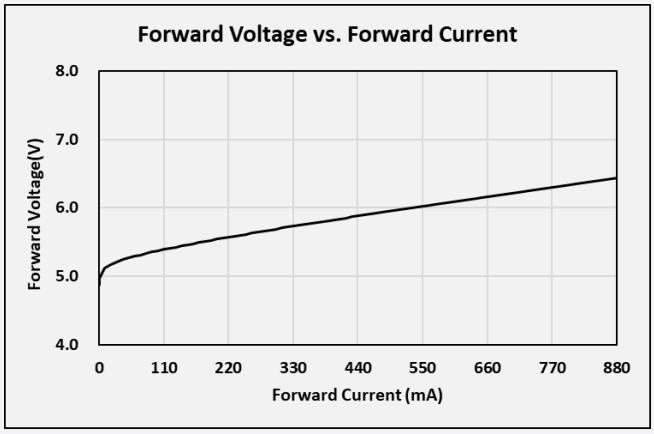
CRI70

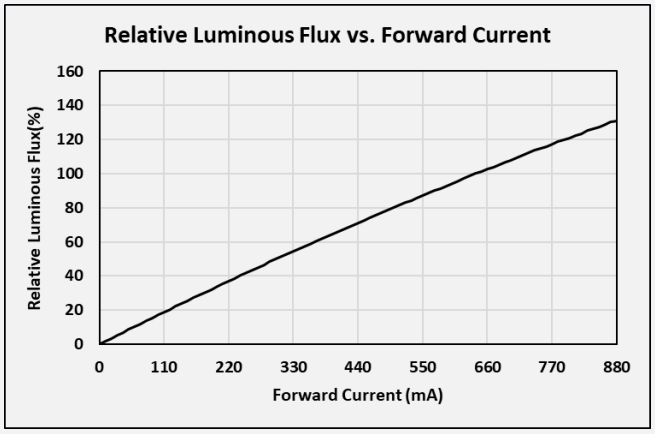


CRI80

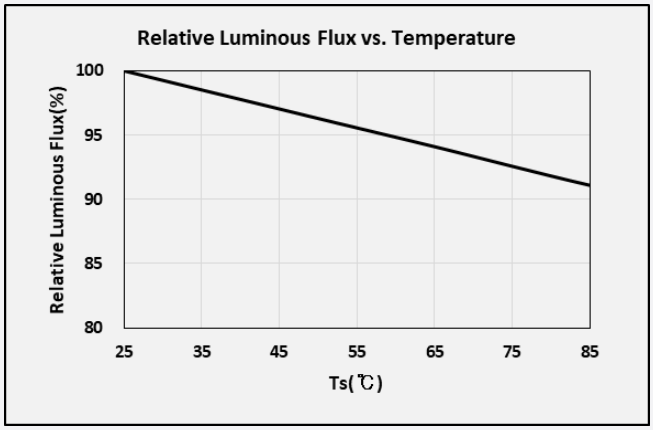


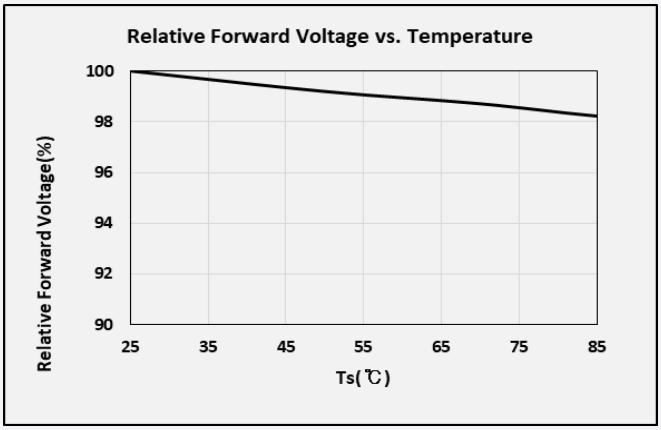
b) Forward Current Characteristics (T_j = 25℃)



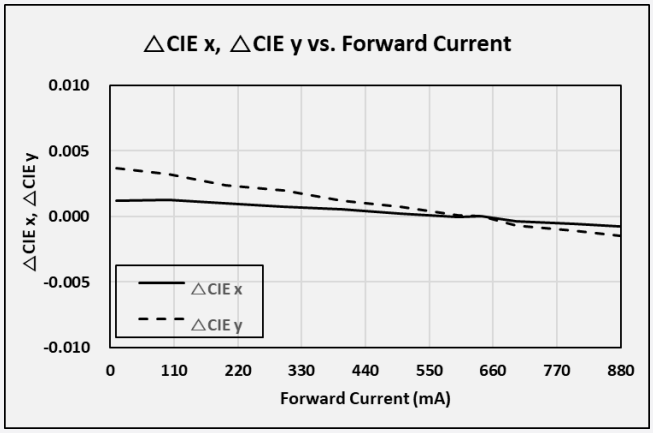


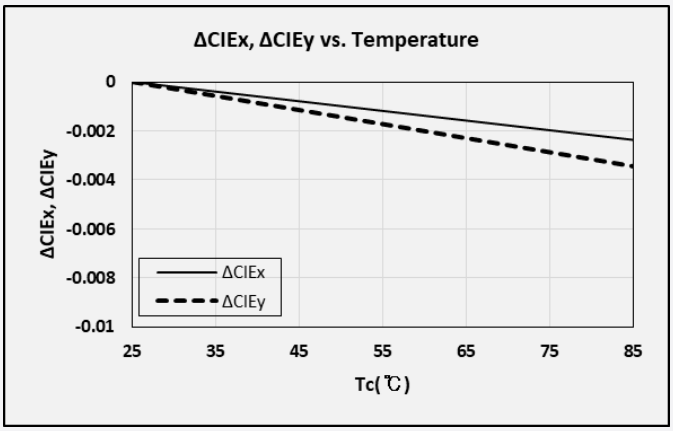
c) Temperature Characteristics (I_F = 640 mA)



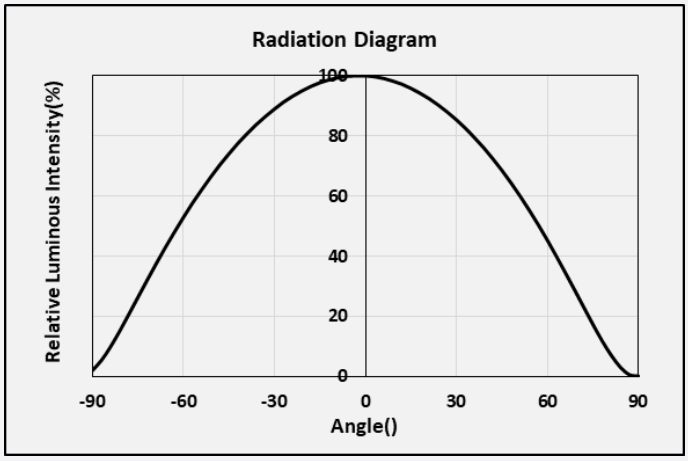


d) Color Shift Characteristics (I_F = 640 mA, T_j = 25℃)

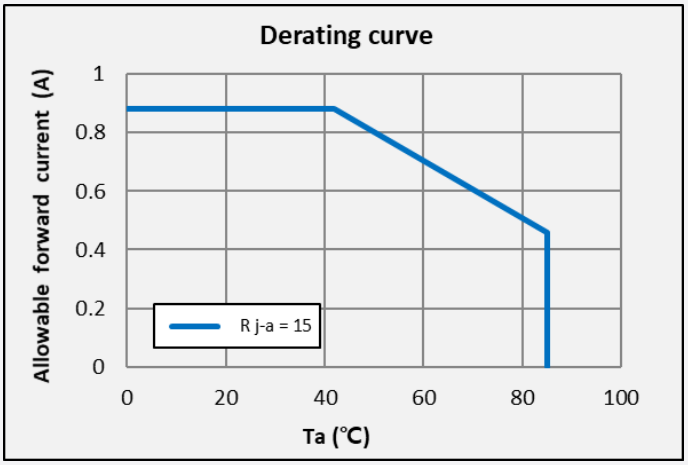




e) Beam Angle Characteristics (I_F = 640 mA, T_j = 25℃)



f) Derating Curve



g) Luminous Flux Characteristics[1)] (CRI = 70, CCT = 4000K)

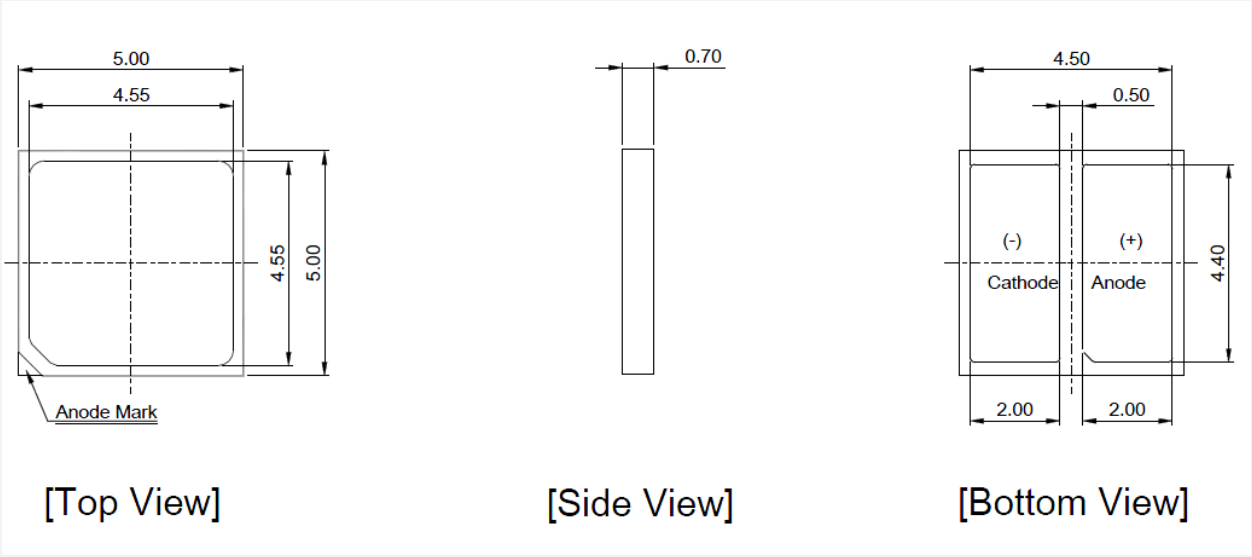
CRI (R_a) Min.	Nominal CCT (K)	I_F	Typ. @ T_j = 25 °C		
			V_F, Forward voltage	Im, Flux	Im/W, Luminous efficacy
70	4000K	180mA	5.49 V	211 lm	213 lm/W
		360mA	5.74 V	409 lm	198 lm/W
		600mA	6.03 V	660 lm	182 lm/W
		640mA	6.08 V	700 lm	180 lm/W
		800mA	6.26 V	857 lm	171 lm/W
		880mA	6.35 V	929 lm	166 lm/W

Notes:

1) Reference Only

4. Outline Drawing & Dimension

a) Mechanical Dimensions



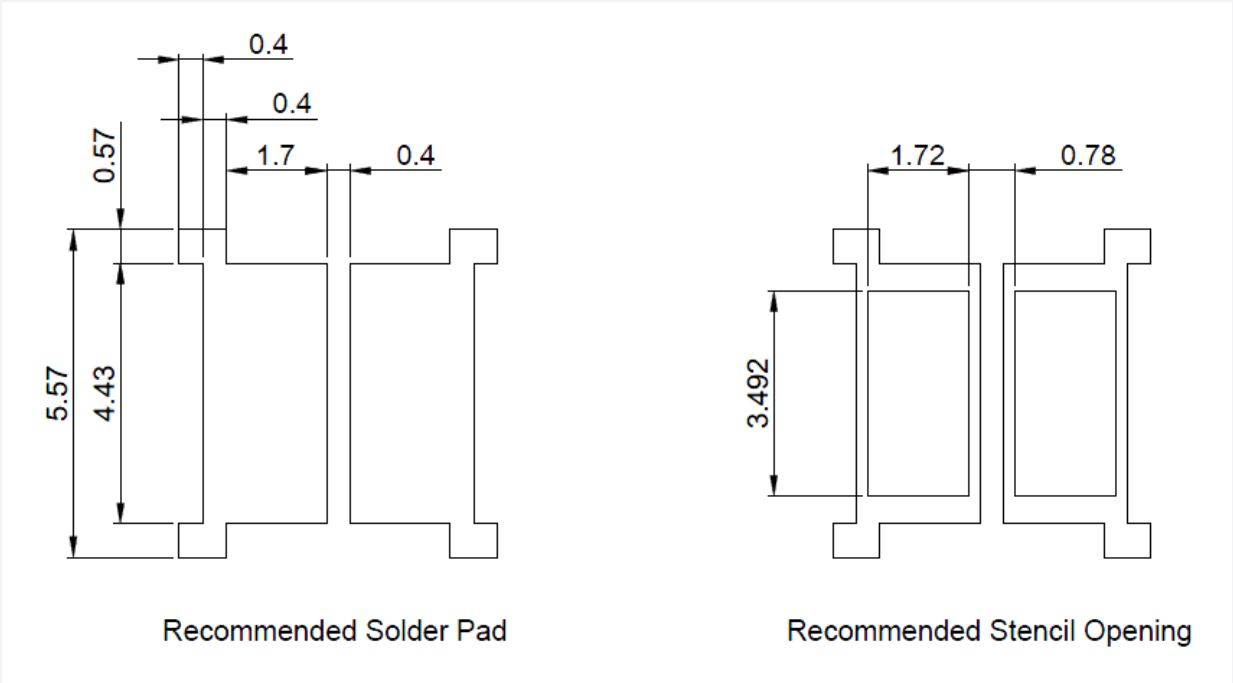
Notes:

1) Mark for the Anode

2) Unit : mm

3) Tolerance : ±0.1mm

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℃, 440mA	1000 h
Wet High Temperature Operating Life Test	85℃, 85 % RH, DC 440mA	1000 h
Temperature Cycling	-45℃ / 15min ~ 125℃ / 15min Temperature change within 5min	500 cycles
ESD (HBM)	R1: 10 MΩ R2: 1.5 kΩ C: 100 pF V: ±2 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

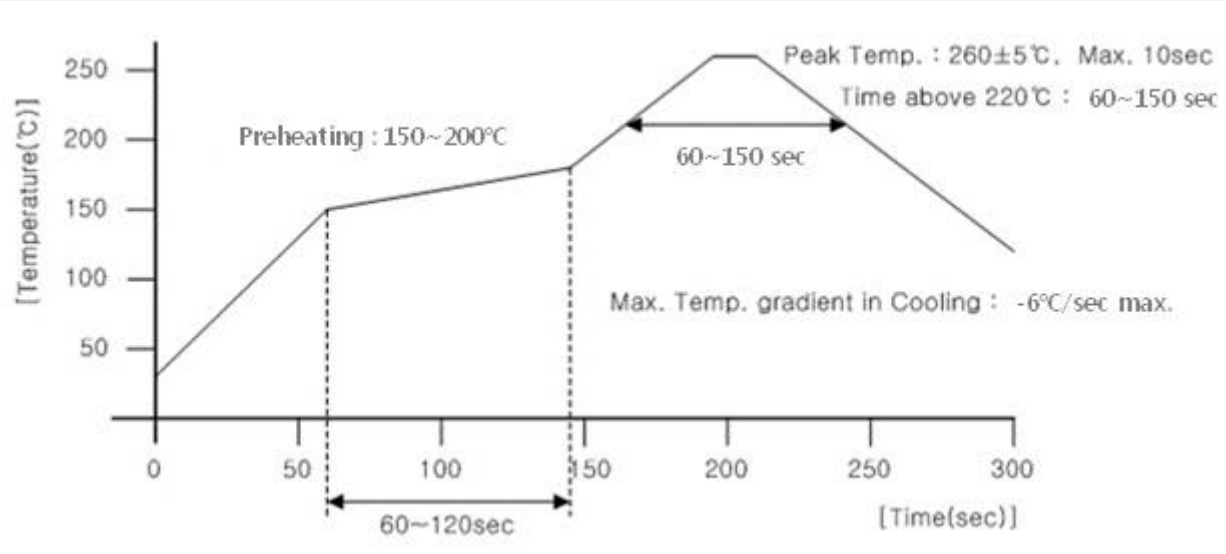
b) Criteria for Judging the Damage

Item	Symbol	Test Condition (T_c = 25℃)	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

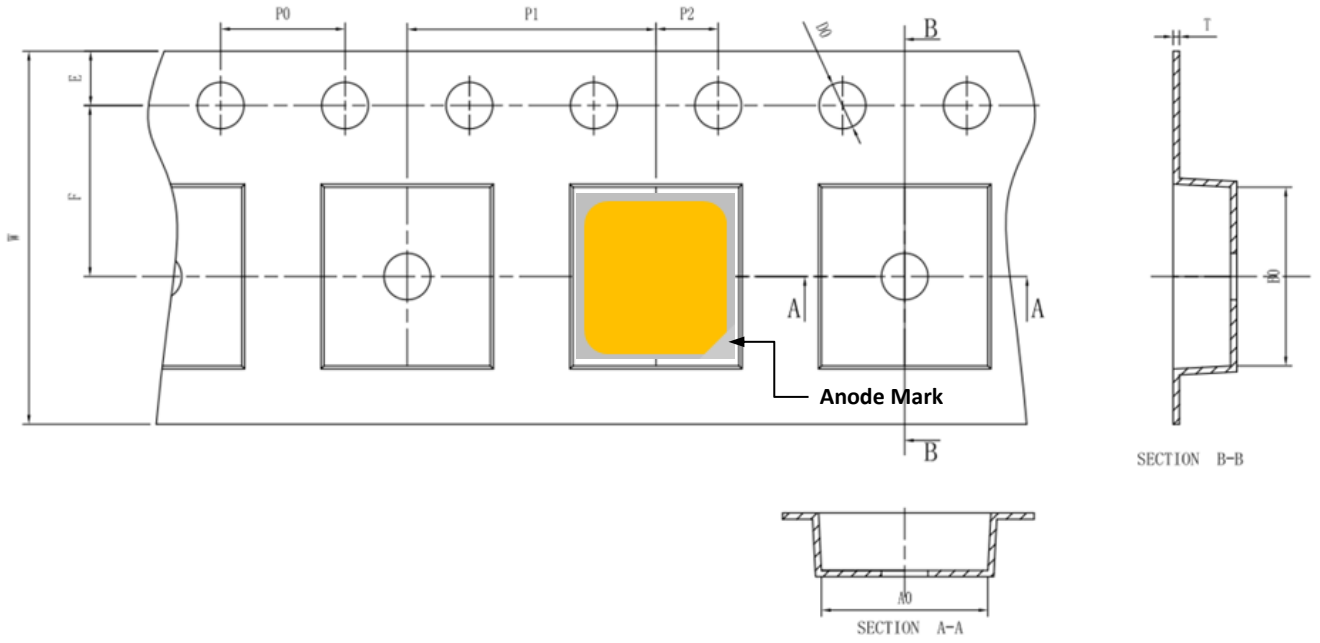
Not more than 5 seconds @ max. 300℃, under soldering iron.

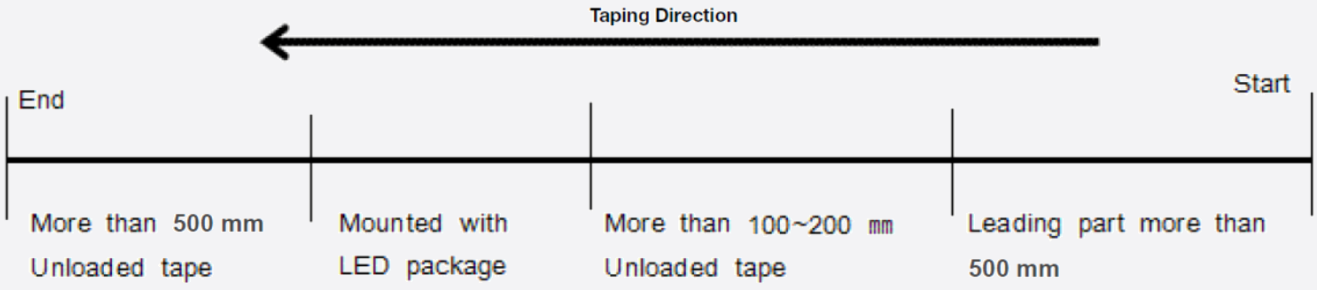
7. Tape & Reel

a) Taping Dimension

(unit: mm)

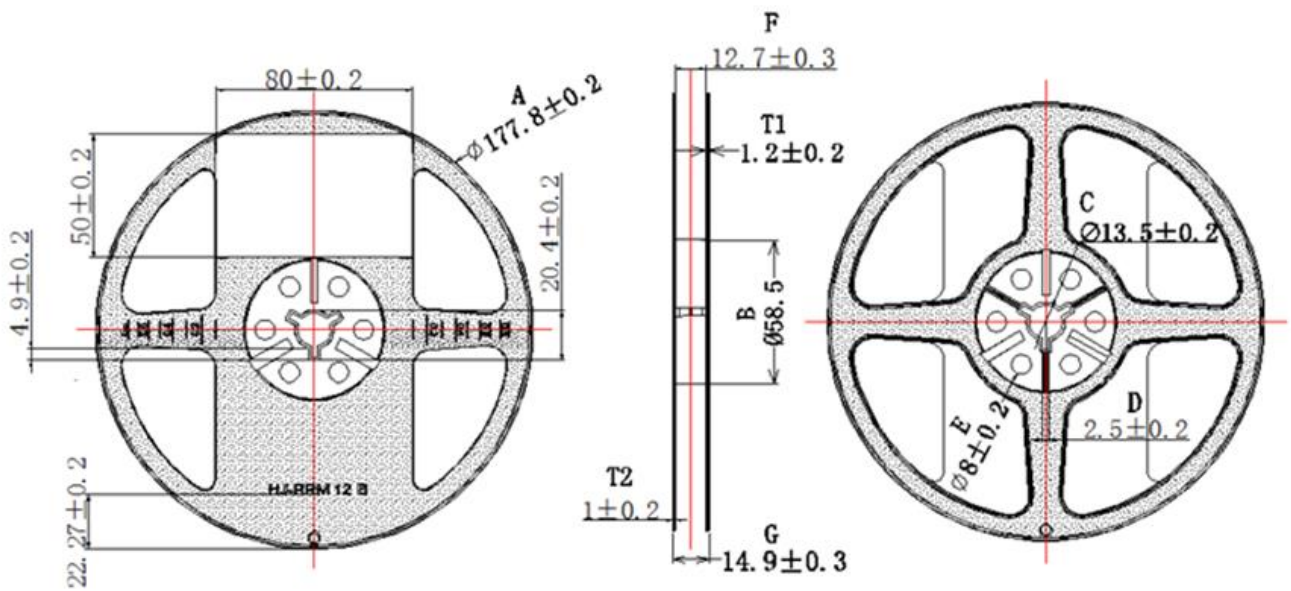
ITEM	W	A0	B0	K0	E	F	D0	D1	P0	P1	P2	T		
DIM	12.00	5.40	5.20	0.95	1.75	5.50	1.50	1.50	4.00	8.00	2.00	0.20	LENGTH	PCS/REEL
5.35	+0.10 −0.10	+0.05 −0.05	+0.05 −0.05	+0.05 −0.05	+0.10 −0.10	+0.10 −0.10	+0.10 −0.00	+0.10 −0.00	+0.10 0.00	+0.10 −0.10	+0.10 −0.10	+0.05 −0.05	m	PCS





b) Reel Dimension (max 2,000 pcs)

(unit: mm)



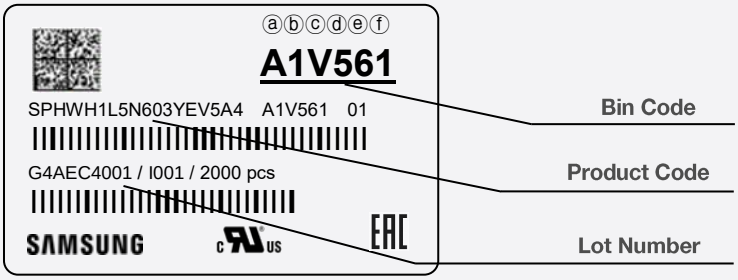
A±0.2	B±0.2	C±0.2	D±0.2	E±0.2	F±0.3	G±0.3	T1±0.2	T2±0.2
ø177.8	ø58.5	ø13.5	2.5	ø8	12.7	14.9	1.2	1

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 (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

Aluminum Vinyl Packing Bag

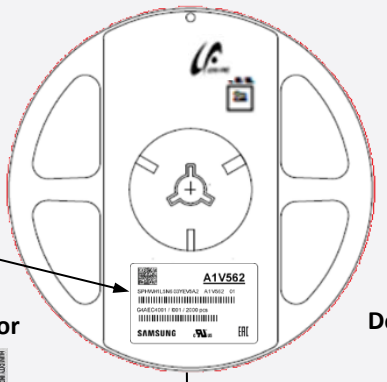
Outer Box

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

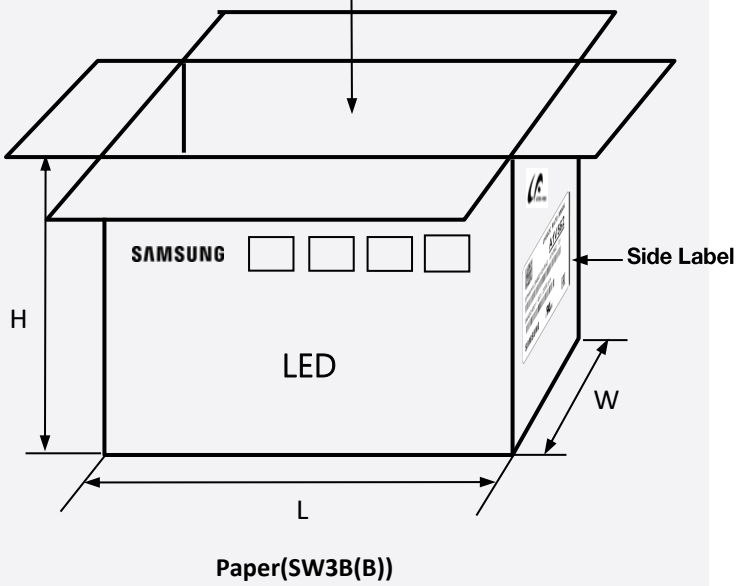
Side Label

Reel



Humidity indicator

Desiccant



b) Aluminum Vinyl Packing Bag

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℃, 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℃ / 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℃

8) Devices must be baked for 1 hour at 60 ± 5℃, 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.

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