High Power LED Series

LH502C General

Preliminary



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
- Color binning @ 85℃

SAMSUNG

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PRELIMINARY

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℃)

Item	Unit	Rank	Min.	Typ.	Max.
Forward Voltage (V_F)	V	YE	5.9	6.2	6.3
Color Rendering Index (R_a)	-	3	70	-	-
		5	80	-	-
		7	90	-	-
Thermal Resistance (junction to chip point)	°C/W		-	3	-
Beam Angle	°		-	120	-
ESD (HBM)	kV			±4	

Notes:

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

PRELIMINARY

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	2700K	A2	590		
	3000K	A2	620		
	3500K	A2	640		
	4000K	A2	660		
	5000K	A2	660		
	5700K	A2	650		
	6500K	A2	640		
80	2700K	A2	545		
	3000K	A2	570		
	3500K	A2	585		
	4000K	A2	600		
	5000K	A2	600		
	5700K	A2	600		
	6500K	A2	590		
90	2700K	A2	460	-	-
	3000K	A2	585	-	-
	3500K	A2	500	-	-
	4000K	A2	510	-	-
	5000K	A2	510	-	-
	5700K	A2	510	-	-

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

PRELIMINARY

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	LH502C		
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)	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)	A2			

PRELIMINARY

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	2700	SPHWH1L5N603YEW3A2	YE	W3, W5	A2	59	590-630
		SPHWH1L5N603YEW5A2				63	630-670
	3000	SPHWH1L5N603YEV3A2		V3, V5		61	610-650
		SPHWH1L5N603YEV5A2				65	650-690
	3500	SPHWH1L5N603YEU3A2		U3, U5		64	640-680
		SPHWH1L5N603YEU5A2				68	680-720
	4000	SPHWH1L5N603YET3A2		T3, T5		66	660-700
		SPHWH1L5N603YET5A2				70	700-740
	5000	SPHWH1L5N603YER3A2		R3, R5		66	660-700
		SPHWH1L5N603YER5A2				70	700-740
	5700	SPHWH1L5N603YEQ3A2		Q3, Q5		65	650-690
		SPHWH1L5N603YEQ5A2				69	690-730
	6500	SPHWH1L5N603YEP3A2		P3, P5		64	640-680
		SPHWH1L5N603YEP5A2				68	680-720
80	2700	SPHWH1L5N605YEW3A2	YE	W3, W5	A2	54	540-580
		SPHWH1L5N605YEW5A2				58	580-620
	3000	SPHWH1L5N605YEV3A2		V3, V5		56	560-600
		SPHWH1L5N605YEV5A2				60	600-640
	3500	SPHWH1L5N605YEU3A2		U3, U5		58	580-620
		SPHWH1L5N605YEU5A2				62	620-660
	4000	SPHWH1L5N605YET3A2		T3, T5		60	600-640
		SPHWH1L5N605YET5A2				64	640-680
	5000	SPHWH1L5N605YER3A2		R3, R5		60	600-640
		SPHWH1L5N605YER5A2				64	640-680
	5700	SPHWH1L5N605YEQ3A2		Q3, Q5		60	600-640
		SPHWH1L5N605YEQ5A2				64	640-680
	6500	SPHWH1L5N605YEP3A2		P3, P5		59	590-630
		SPHWH1L5N605YEP5A2				63	630-670
90	2700	SPHWH1L5N607YEW3A2	YE	W3, W5	A2	45	450-490
		SPHWH1L5N607YEW5A2				49	490-530
	3000	SPHWH1L5N607YEV3A2		V3, V5		47	470-510
		SPHWH1L5N607YEV5A2				51	510-550
	3500	SPHWH1L5N607YEU3A2		U3, U5		49	490-530
		SPHWH1L5N607YEU5A2				53	530-570
	4000	SPHWH1L5N607YET3A2		T3, T5		50	500-540
		SPHWH1L5N607YET5A2				54	540-580
	5000	SPHWH1L5N607YER3A2		R3, R5		50	500-540
		SPHWH1L5N607YER5A2				54	540-580
	5700	SPHWH1L5N607YEQ3A2		Q3, Q5		50	500-540
		SPHWH1L5N607YEQ5A2				54	540-580

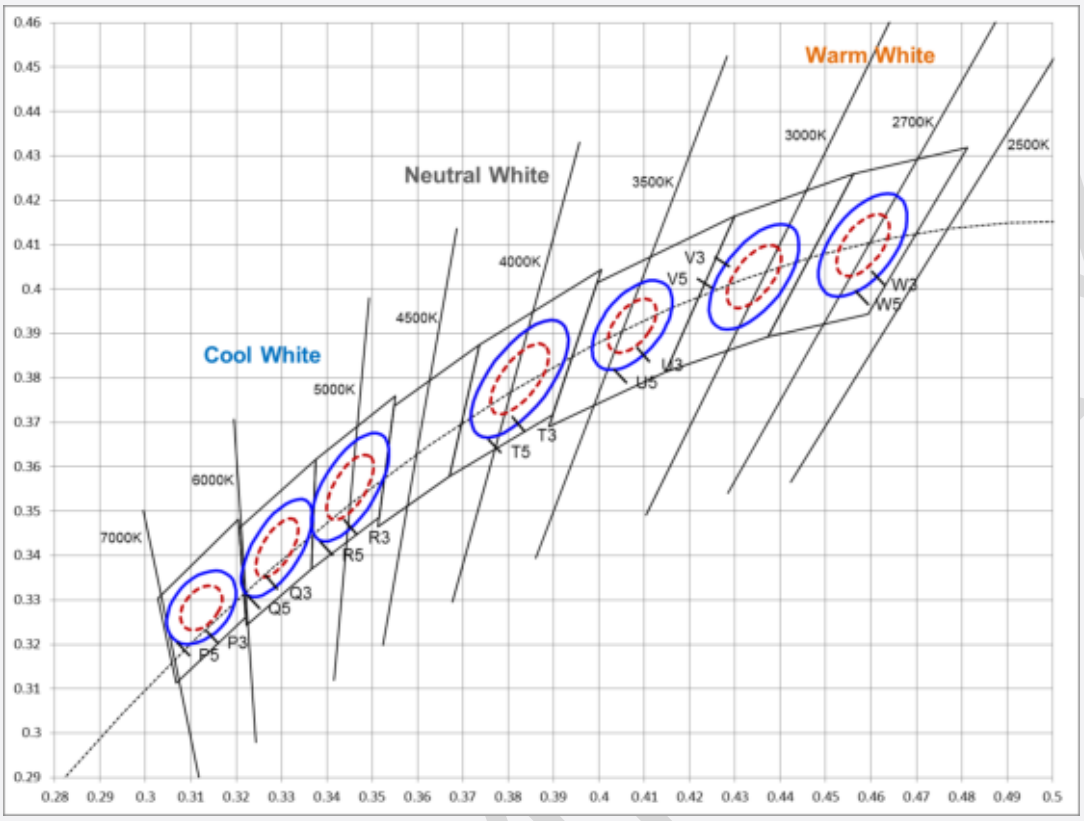
PRELIMINARY

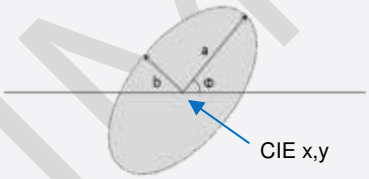
b) Voltage Bins (I_F = 640 mA, T_j = 25℃)

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

PRELIMINARY

c) Chromaticity Region & Coordinates (I_F = 640 mA, T_j = 85℃)





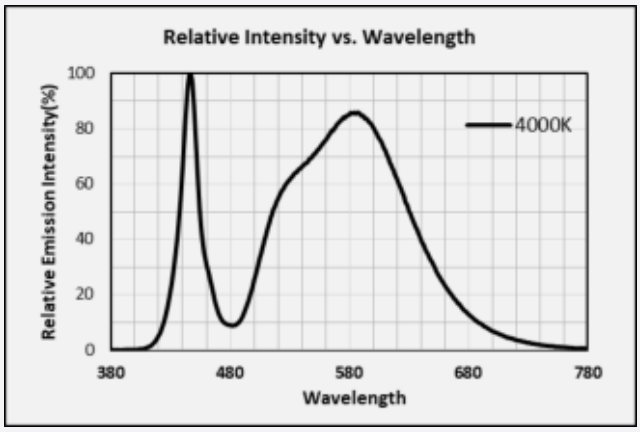
CRI	CCT	Rank	CIE x	CIE y	Φ	A	b
70 80 90	2700K	W3	0.4578	0.4101	53.7	0.0081	0.0042
		W5				0.0135	0.0070
	3000K	V3	0.4338	0.4030	53.2	0.0083	0.0041
		V5				0.0138	0.0068
	3500K	U3	0.4073	0.3917	54.0	0.0093	0.0041
		U5				0.0155	0.0069
	4000K	T3	0.3818	0.3797	53.7	0.0094	0.0040
		T5				0.0157	0.0067
	5000K	R3	0.3447	0.3553	59.6	0.0082	0.0035
		R5				0.0137	0.0058
	5700K	Q3	0.3287	0.3417	59.1	0.0094	0.0040
		Q5				0.0157	0.0067
	6500K	P3	0.3123	0.3282	58.6	0.0067	0.0029
		P5				0.0112	0.004

Note : Samsung maintains measurement tolerance of: Cx, Cy = ±0.005

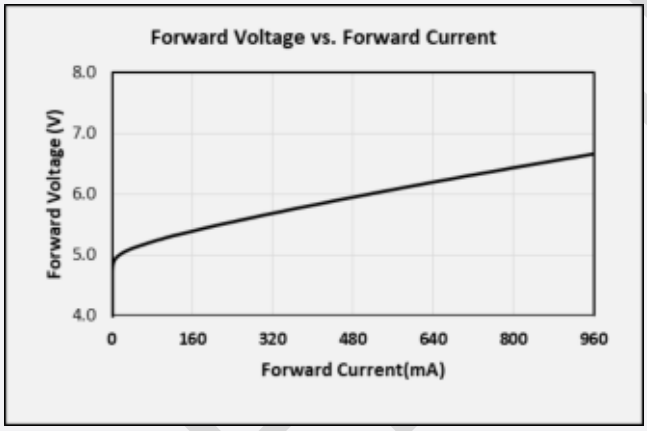
PRELIMINARY

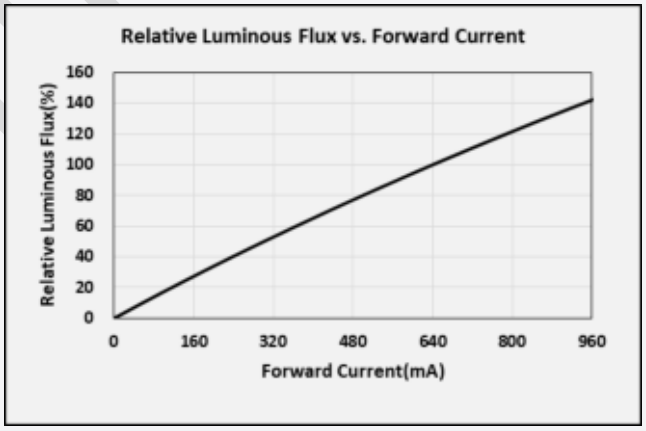
3. Typical Characteristic Graphs

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



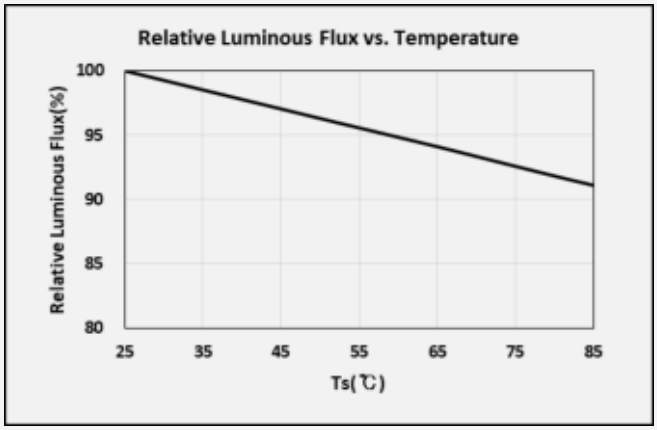
b) Forward Current Characteristics (T_j = 25℃)

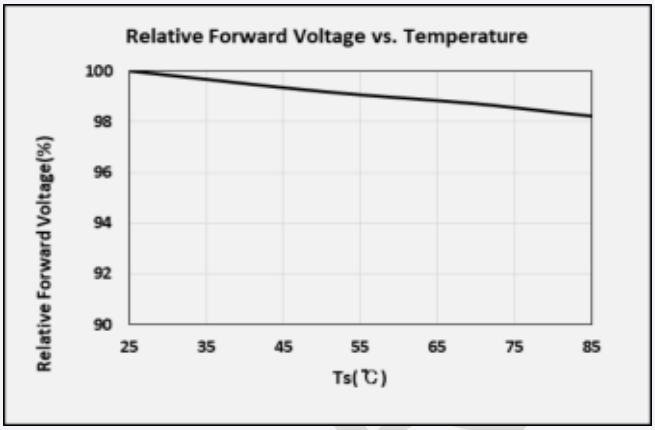




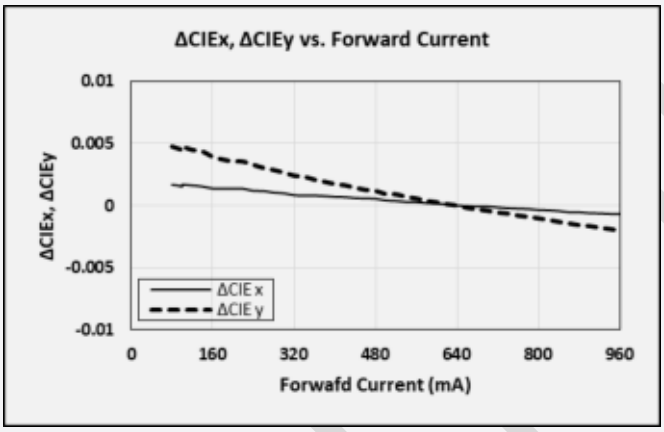
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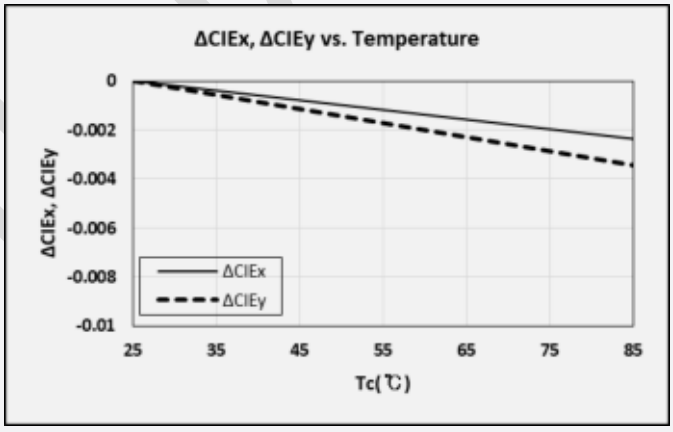
c) Temperature Characteristics (I_F = 640 mA)



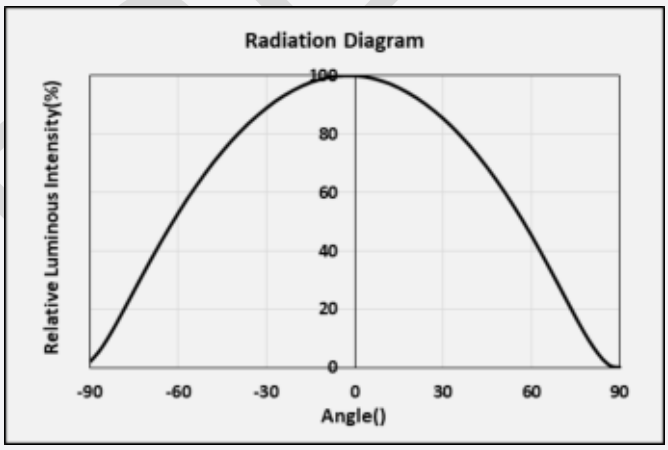


d) Color Shift Characteristics (I_F = 640 mA, T_j = 25℃)





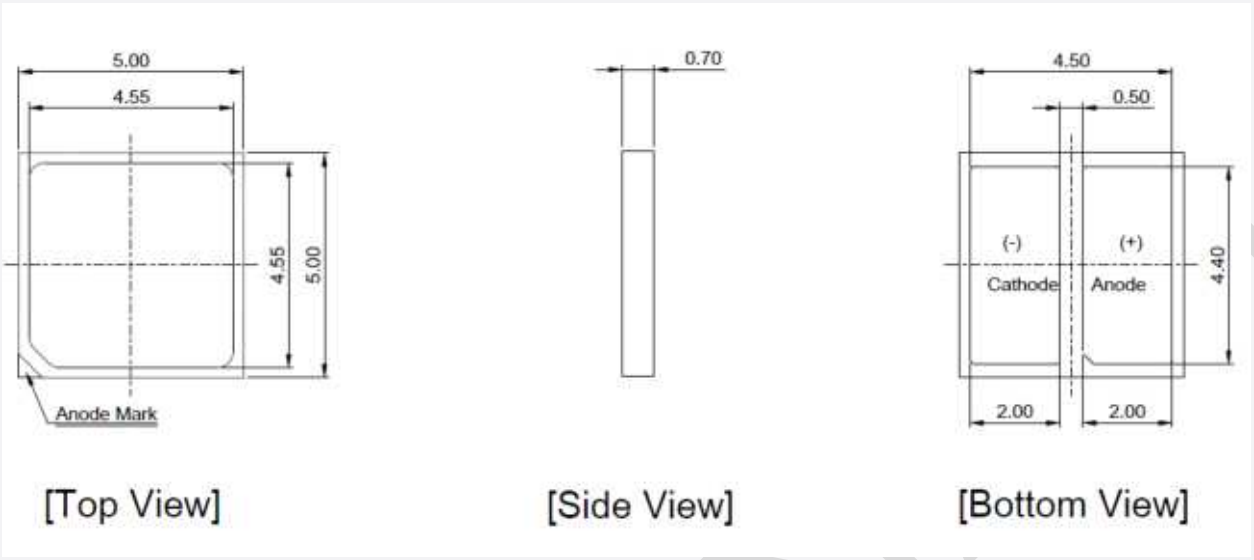
e) Beam Angle Characteristics (I_F = 640 mA, T_j = 25℃)



PRELIMINARY

4. Outline Drawing & Dimension

a) Mechanical Dimensions



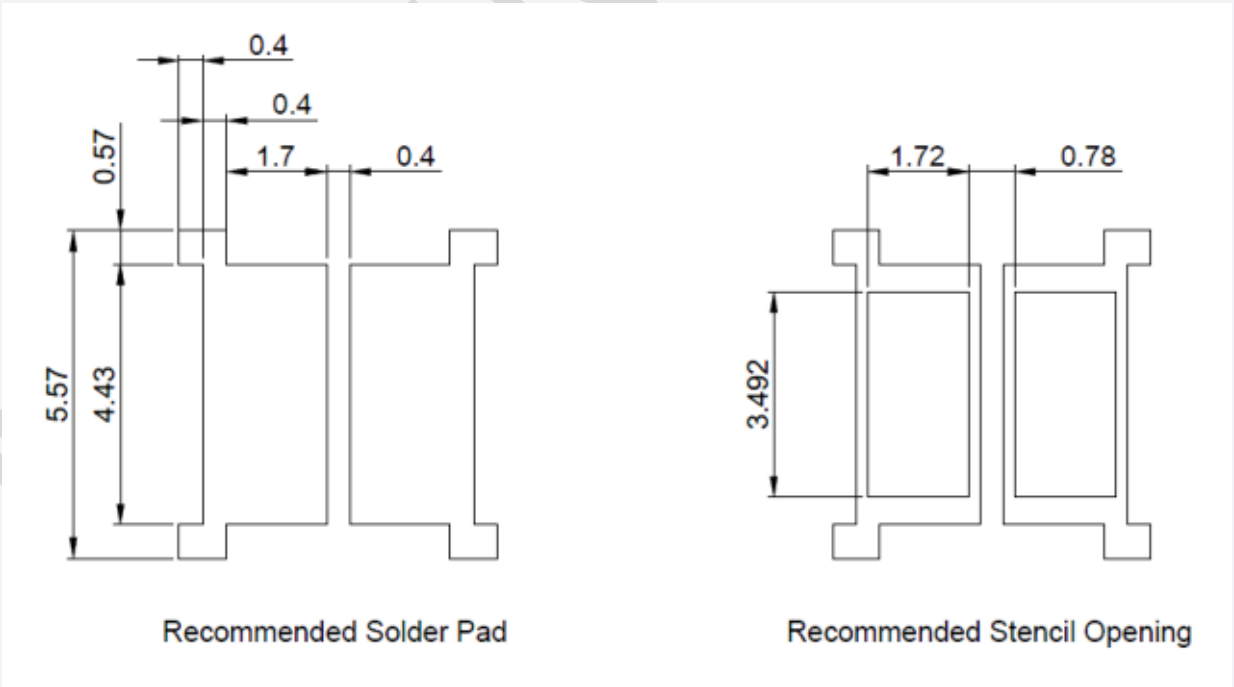
Notes:

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℃, DC Derating, I_F	1000 h
Wet High Temperature Operating Life Test	60℃, 90 % RH, DC Derating, I_F	1000 h
Low Temperature Operating Life Test	-40℃, DC Derating I_F	1000 h
High Temperature Storage	120℃	1000 h
Low Temperature Storage	-40℃	1000 h
Wet High Temperature Storage		1000h
Powered Temperature Cycle		100 cycles
Temperature Cycling	/ 15min ge within 5min	500 cycles
ESD (HBM)	R_1: 10 MΩ R_2: 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

TBD

b) Criteria for Judging the Damage

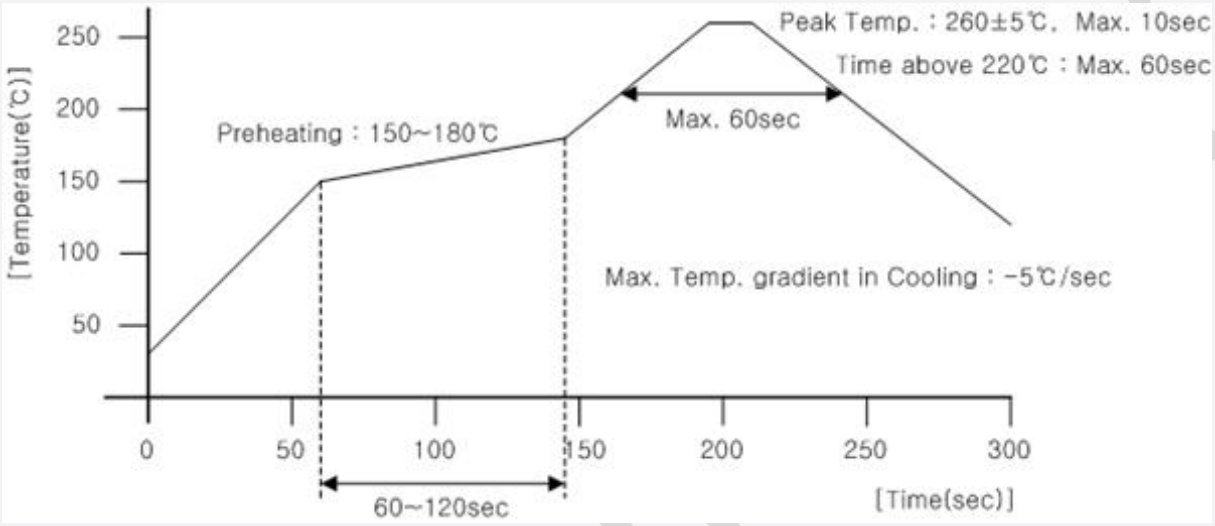
Item	Symbol	Test Condition (T_c = 25℃)	Limit	
			Min.	Max.
Forward Voltage	V_F	I_F = Sorting Current	L.S.L. * 0.9	U.S.L. * 1.1
Luminous Flux	Φ_v	I_F = Sorting Current	L.S.L * 0.7	U.S.L * 1.3

PRELIMINARY

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.

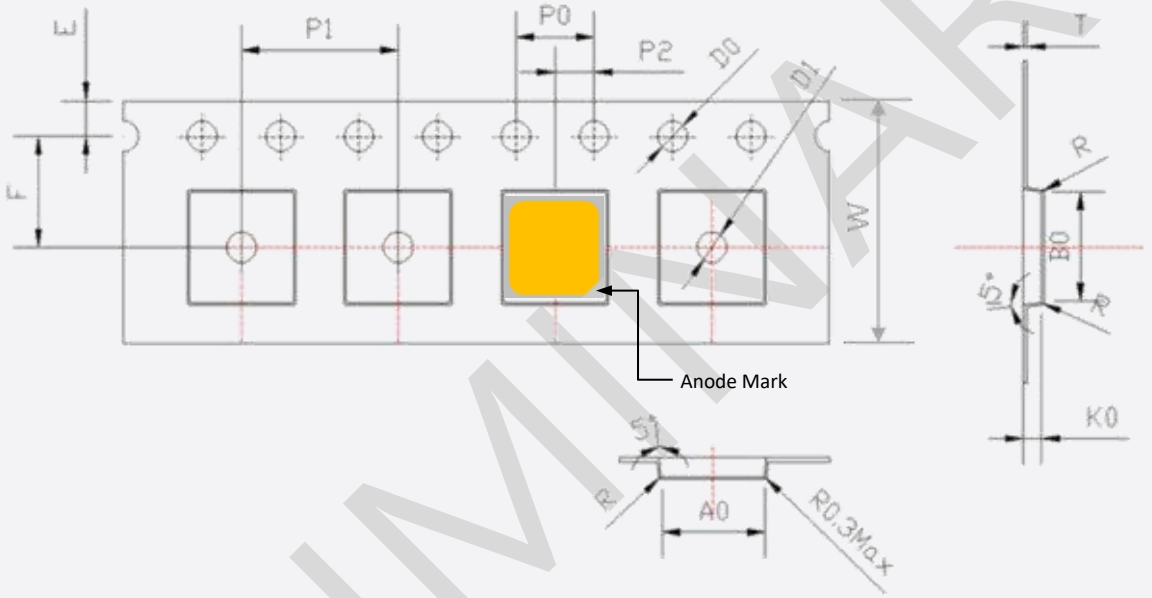
PRELIMINARY

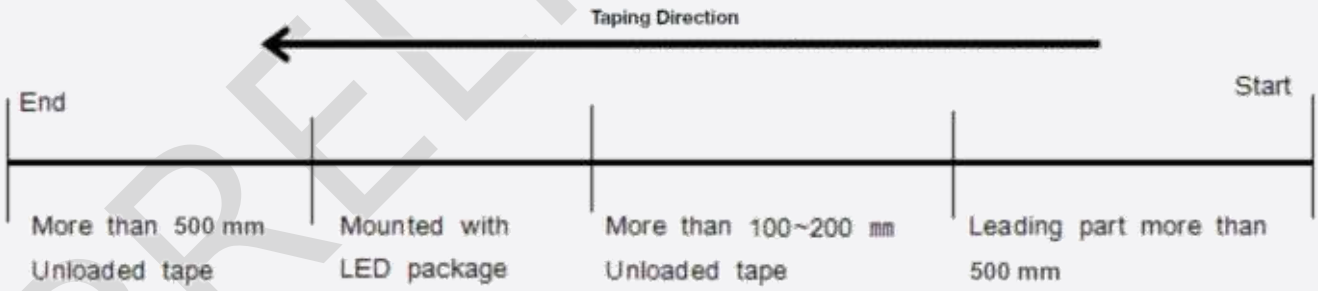
7. Tape & Reel

a) Taping Dimension

(unit: mm)

symbol	AO	BO	KO	PO	P1	P2
Spec	5.20±0.10	5.40±0.10	0.95±0.10	4.00±0.10	8.0±0.10	2.0±0.10
symbol	W	T	E	F	DO	D1
Spec	12.0±0.2	0.20±0.05	1.75±0.10	5.50±0.05	1.50+0.1/-0	1.50±0.10

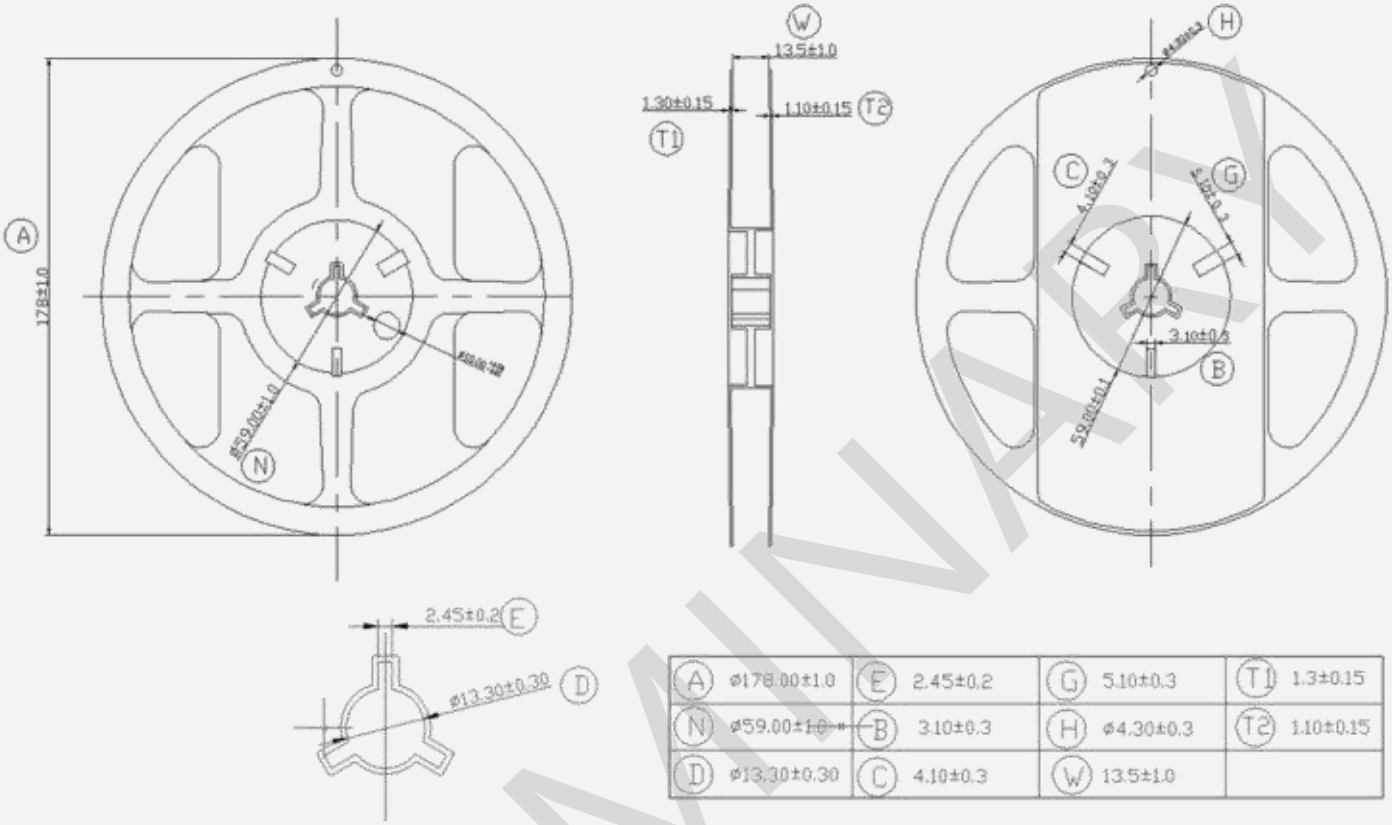




PRELIMINARY

b) Reel Dimension (max 2,000 pcs)

(unit: mm)



A	ø178.00±1.0	E	2.45±0.2	G	5.10±0.3	T1	1.3±0.15
N	ø59.00±1.0	B	3.10±0.3	H	ø4.30±0.3	T2	1.10±0.15
D	ø13.30±0.30	C	4.10±0.3	W	13.5±1.0		

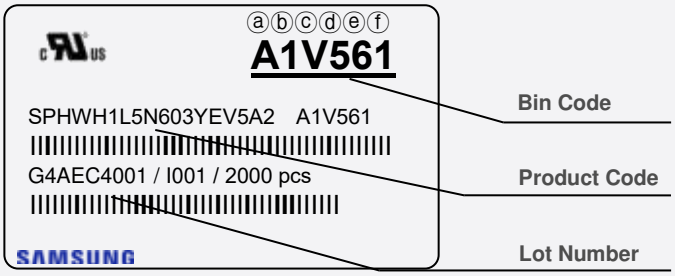
Notes:

1) Quantity: The quantity/reel is 2000 pcs
2) All dimensions are millimeters (Tolerance : ±0.2mm)
3) Packaging : P/N, Manufacturing data code no. and quantity are indicated on the aluminum packing bag.

PRELIMINARY

8. Label Structure

a) Label Structure



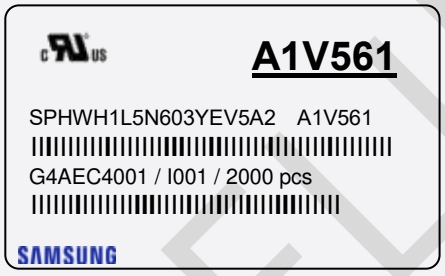
Note: Denoted bin code and product code above is only an example (see description on page 5)

Bin Code:

ⓐⓑ: Forward Voltage bin (refer to page 8)
ⓒⓓ: Chromaticity bin (refer to page 9)
ⓔⓕ: Luminous Flux bin (refer to page 7)

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)

PRELIMINARY

9. Packing Structure

a) Packing Process

Reel

c UL us **A1V561**

SPHWH1L5N603YEV5A2 A1V561

G4AEC4001 / I001 / 2000 pcs

SAMSUNG

Reel



Humidity indicator



Desiccant



Aluminum Vinyl Packing Bag

c UL us **A1V561**

SPHWH1L5N603YEV5A2 A1V561

G4AEC4001 / I001 / 2000 pcs

SAMSUNG



Contains up to 2 bags

Inner Box

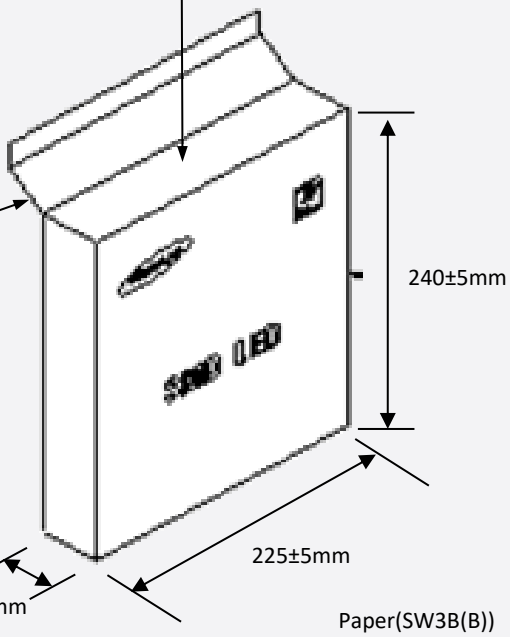
c UL us **A1V561**

SPHWH1L5N603YEV5A2 A1V561

G4AEC4001 / I001 / 2000 pcs

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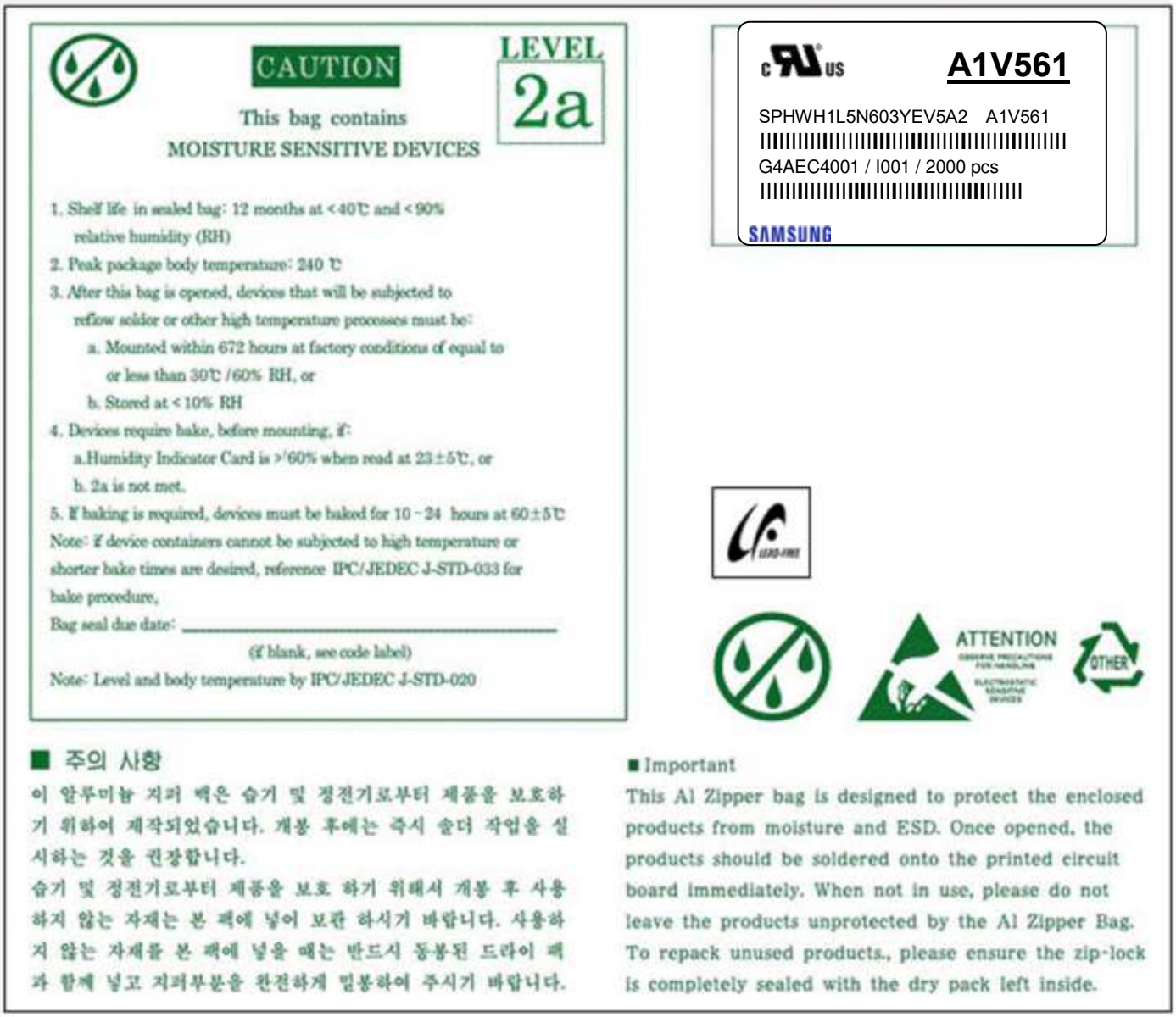
On top of the box



Paper(SW3B(B))

PRELIMINARY

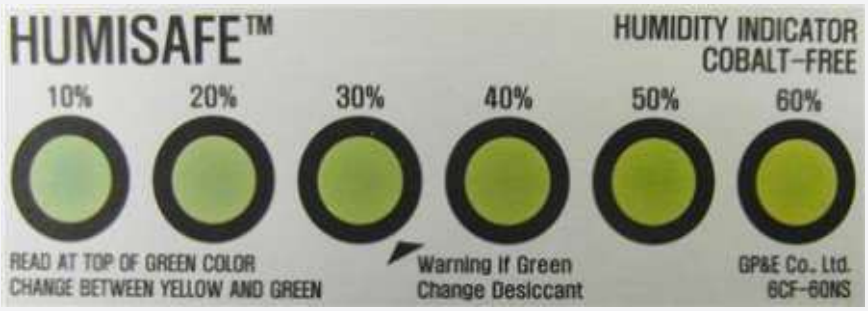
b) Aluminum Vinyl Packing Bag



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. If the LEDs are to be stored for three months or more after being shipped from Samsung, they should be packed with a nitrogen-filled container (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.

PRELIMINARY

Legal and additional information.

About Samsung Electronics Co., Ltd.

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