THE DATASHEET OF

SPHWHAHDNC25YZW3H1

High Voltage LED Series
Chip on Board

LC009D – Gen.1

High efficacy COB LED package
well-suited for use in spotlight applications

Features & Benefits

- Chip on Board (COB) solution makes it easy to design in
- Simple assembly reduces manufacturing cost
- Low thermal resistance
- InGaN/GaN MQW LED with long time reliability

Applications

- Spotlight / Downlight
- LED Retrofit Bulbs
- Outdoor Illumination

SAMSUNG

Table of Contents

1. Characteristics

a) Absolute Maximum Rating

Item	Symbol	Rating	Unit	Condition
Ambient / Operating Temperature	T_a	-40 ~ +105	ºC	-
Storage Temperature	T_{stg}	-40 ~ +120	ºC	-
LED Junction Temperature	T_J	140	ºC	-
Case Temperature	Tc	105	ºC	
Forward Current	I_F	690	mA	-
Power Dissipation	P_D	25.9	W	-
ESD (HBM)	-	±2	kV	-
ESD (MM)	-	±0.5	kV	-

b) Electro-optical Characteristics (I_F = 270 mA, T_J = 85 ºC)

Item	Unit	Rank	Min.	Typ.	Max.
Forward Voltage (V_F)	V	YZ	31.8	34.6	37.5
Color Rendering Index (R_a)	-	5	80	-	-
		7	90		
Thermal Resistance (junction to chip point)	ºC/W		-	1.7	-
Beam Angle	º		-	115	-
Nominal Power	W			10.1	

Notes:

1) The COB is tested in pulsed condition at rated test current (10 ms pulse width) and rated temperature (T_J = T_C = T_a = 85 °C)
2) Samsung maintains measurement tolerance of: forward voltage = ±5 %, CRI = ±1
3) Refer to the derating curve, '3. Typical Characteristics Graph' designed within the range.

c) Luminous Flux Characteristics (I_F = 270 mA)

CRI (R_a) Min.	Nominal CCT (K)	Flux Rank	Flux @ T_J = 85 °C (lm)		
			Min.	Typ.	Max.
80	2700	H1	1149	1209	-
		D1	1209	1270	-
	3000	H2	1214	1278	-
		D1	1278	1342	-
	3500	H2	1249	1315	-
		D1	1315	1381	-
	4000	H2	1279	1347	-
		D1	1347	1414	-
	5000	H2	1289	1357	-
		D1	1357	1425	-
	5700	H2	1289	1357	-
		D1	1357	1425	-
	6500	H2	1274	1341	-
		D1	1341	1408	-

CRI (R_a) Min.	Nominal CCT (K)	Flux Rank	Flux @ T_J = 85 °C (lm)		
			Min.	Typ.	Max.
90	2700	G8	986	1038	-
		D1	1038	1090	-
	3000	H0	1032	1087	-
		D1	1087	1141	-
	3500	H0	1066	1122	-
		D1	1122	1178	-
	4000	H0	1090	1147	-
		D1	1147	1204	-
	5000	H1	1094	1152	-
		D1	1152	1210	-

Notes:

1) The COB is tested in pulsed operating condition at rated test current (10 ms pulse width) and rated temperature (T_J = T_C = 85 °C).
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	A	H	D	N	C	2	5	Y	Z	W	3	H	1

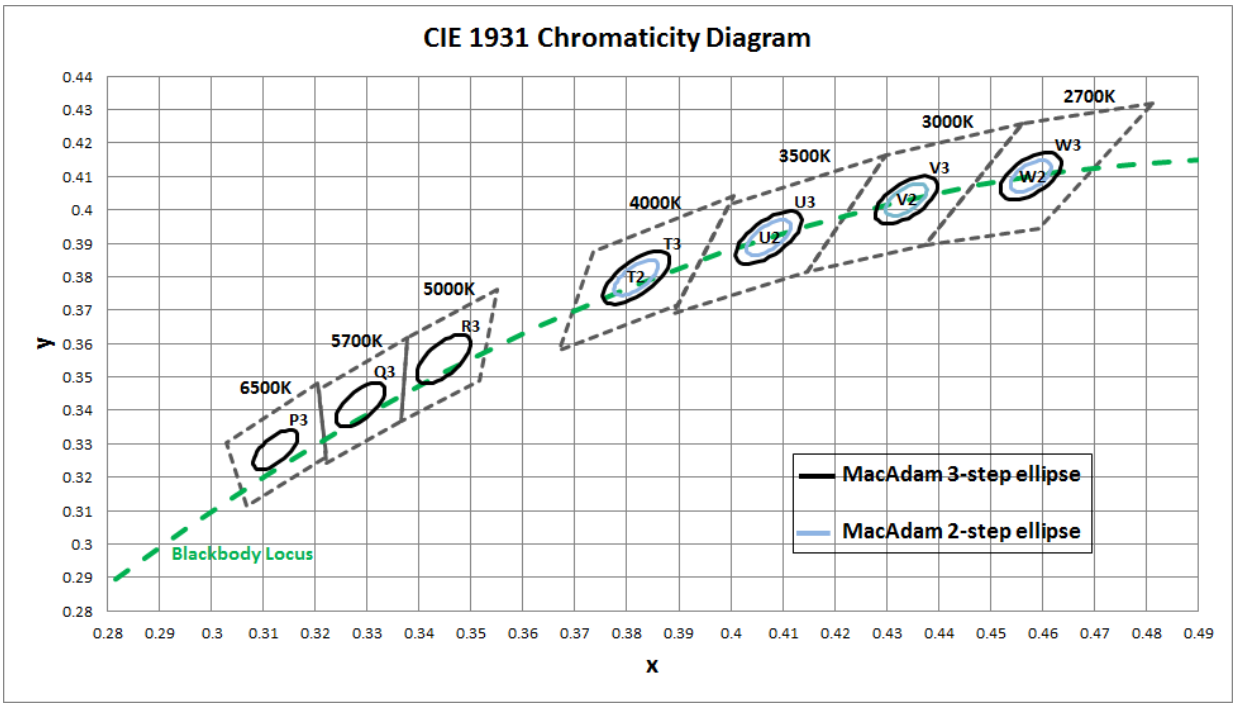
Digit	PKG Information	Code	Specification
1 2 3	Samsung Package High Power	SPH	
4 5	Color	WH	White
6	Product Version	A	
7 8	Form Factor	HD	COB
9	Lens Type	N	No lens
10	Wattage or Model	C	LC009D
11	Internal Code	2	
12	CRI & Sorting Temperature	5	Min. 80 (85℃)
		7	Min. 90 (85℃)
13 14	Forward Voltage (V)	YZ	31.8~37.5
15	CCT (K)	W	2700K
		V	3000K
		U	3500K
		T	4000K
		R	5000K
		Q	5700K
		P	6500K
16	MacAdam Step	2	MacAdam 2-step
		3	MacAdam 3-step
17 18	Luminous Flux (Lm)	G8	980
		H0	1000
		H1	1100
		H2	1200
		D1	Add rank

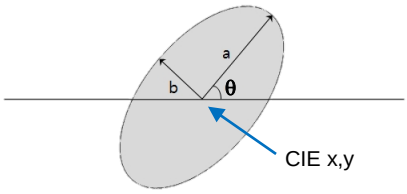
a) Binning Structure (I_F = 270 mA, T_J = 85 ºC)

CRI (R_a) Min.	Nominal CCT (K)	Product Code	V_F Rank	Color Rank	Flux Rank	Flux Range (Φ_v, lm)
80	2700	SPHWHAHDNC25YZW2H1	YZ	W2	H1	1149 ~
		SPHWHAHDNC25YZW3H1		W3		
		SPHWHAHDNC25YZW2D1		W2	D1	1209 ~
		SPHWHAHDNC25YZW3D1		W3		
	3000	SPHWHAHDNC25YZV2H2	YZ	V2	H2	1214 ~
		SPHWHAHDNC25YZV3H2		V3		
		SPHWHAHDNC25YZV2D1		V2	D1	1278 ~
		SPHWHAHDNC25YZV3D1		V3		
	3500	SPHWHAHDNC25YZU2H2	YZ	U2	H2	1249 ~
		SPHWHAHDNC25YZU3H2		U3		
		SPHWHAHDNC25YZU2D1		U2	D1	1315 ~
		SPHWHAHDNC25YZU3D1		U3		
	4000	SPHWHAHDNC25YZT2H2	YZ	T2	H2	1279 ~
		SPHWHAHDNC25YZT3H2		T3		
		SPHWHAHDNC25YZT2D1		T2	D1	1347 ~
		SPHWHAHDNC25YZT3D1		T3		
	5000	SPHWHAHDNC25YZR3H2	YZ	R3	H2	1289 ~
		SPHWHAHDNC25YZR3D1			D1	1357 ~
	5700	SPHWHAHDNC25YZQ3H2	YZ	Q3	H2	1289 ~
		SPHWHAHDNC25YZQ3D1			D1	1357 ~
	6500	SPHWHAHDNC25YZP3H2	YZ	P3	H2	1274 ~
		SPHWHAHDNC25YZP3D1			D1	1341 ~

CRI (R_a) Min.	Nominal CCT (K)	Product Code	V_F Rank	Color Rank	Flux Rank	Flux Range (Φ_v, lm)
90	2700	SPHWHAHDNC27YZW2G8	YZ	W2	G8	986 ~
		SPHWHAHDNC27YZW3G8		W3		
		SPHWHAHDNC27YZW2D1		W2	D1	1038 ~
		SPHWHAHDNC27YZW3D1		W3		
	3000	SPHWHAHDNC27YZV2H0		V2	H0	1032 ~
		SPHWHAHDNC27YZV3H0		V3		
		SPHWHAHDNC27YZV2D1		V2	D1	1087 ~
		SPHWHAHDNC27YZV3D1		V3		
	3500	SPHWHAHDNC27YZU2H0		U2	H0	1066 ~
		SPHWHAHDNC27YZU3H0		U3		
		SPHWHAHDNC27YZU2D1		U2	D1	1122 ~
		SPHWHAHDNC27YZU3D1		U3		
	4000	SPHWHAHDNC27YZT2H0		T2	H0	1090 ~
		SPHWHAHDNC27YZT3H0		T3		
		SPHWHAHDNC27YZT2D1		T2	D1	1147 ~
		SPHWHAHDNC27YZT3D1		T3		
	5000	SPHWHAHDNC27YZR3H1		R3	H1	1094 ~
		SPHWHAHDNC27YZR3D1		R3	D0	1152 ~

b) Chromaticity Region & Coordinates (I_F = 270 mA, T_J = 85 ºC)





MacAdam Ellipse (W2, W3)					
Step	CIE x	CIE y	θ	a	b
2-step	0.4578	0.4101	53.70	0.0054	0.0028
3-step	0.4578	0.4101	53.70	0.0081	0.0042

MacAdam Ellipse (V2, V3)					
Step	CIE x	CIE y	θ	a	b
2-step	0.4338	0.403	53.22	0.0056	0.0027
3-step	0.4338	0.4030	53.22	0.0083	0.0041

MacAdam Ellipse (U2, U3)					
Step	CIE x	CIE y	θ	a	b
2-step	0.4073	0.3917	54.00	0.0062	0.0028
3-step	0.4073	0.3917	54.00	0.0093	0.0041

MacAdam Ellipse (T2, T3)					
Step	CIE x	CIE y	θ	a	b
2-step	0.3818	0.3797	53.72	0.0063	0.0027
3-step	0.3818	0.3797	53.72	0.0094	0.0040

MacAdam Ellipse (R3)					
Step	CIE x	CIE y	θ	a	b
3-step	0.3447	0.3553	59.62	0.0082	0.0035

MacAdam Ellipse (Q3)					
Step	CIE x	CIE y	θ	a	b
3-step	0.3287	0.3417	59.0950	0.0075	0.0032

MacAdam Ellipse (P3)					
Step	CIE x	CIE y	θ	a	b
3-step	0.3123	0.3282	58.5700	0.0067	0.0029

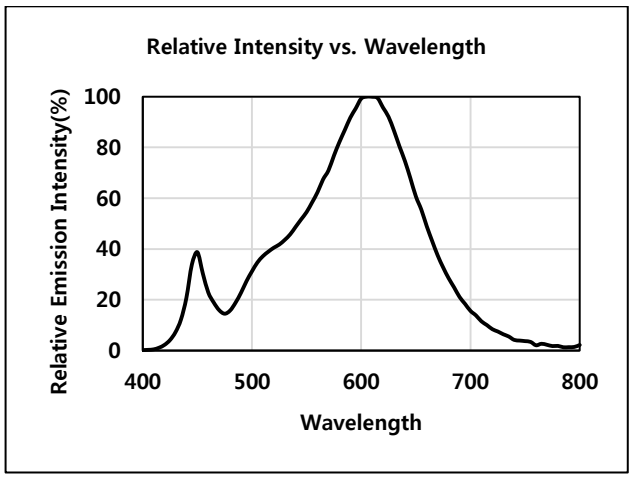
Note:

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

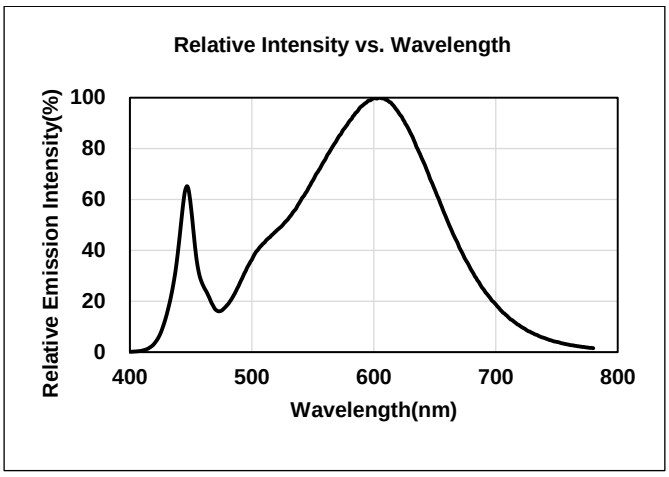
3. Typical Characteristics Graphs

a) Spectrum Distribution (I_F = 270 mA, T_J = 85 ºC)

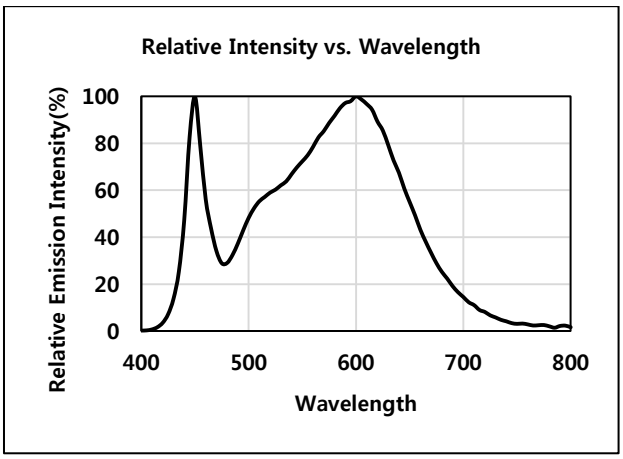
CCT: 2700 K (80 CRI)



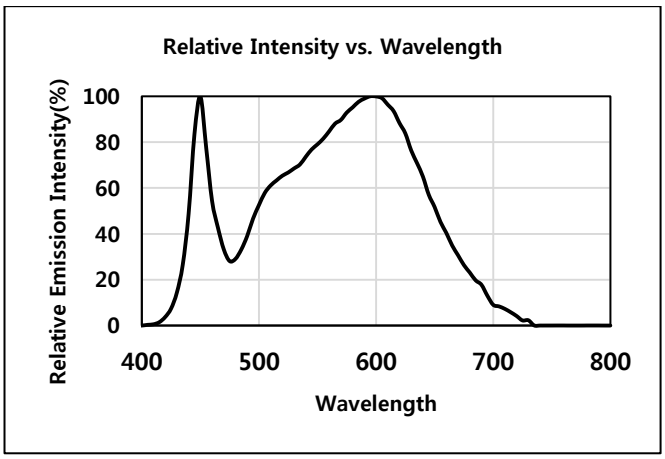
CCT: 3000 K (80 CRI)



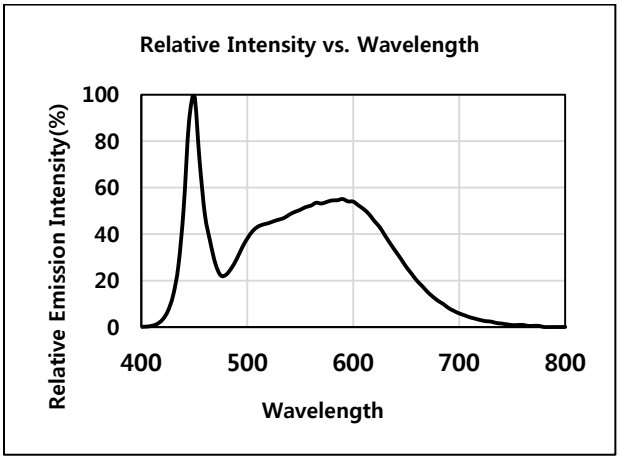
CCT: 3500 K (80 CRI)



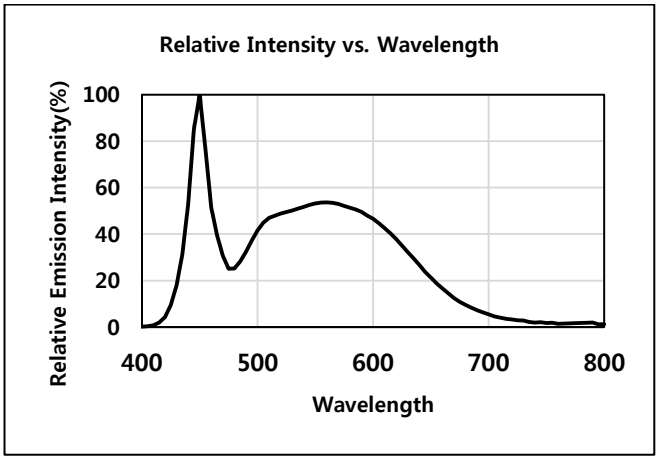
CCT: 4000 K (80 CRI)



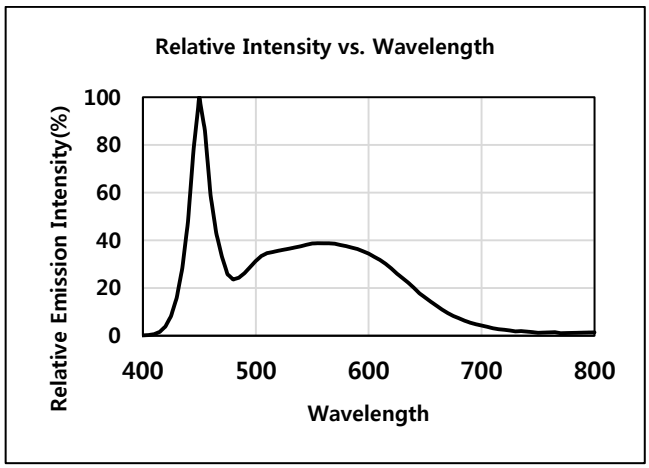
CCT: 5000 K (80 CRI)



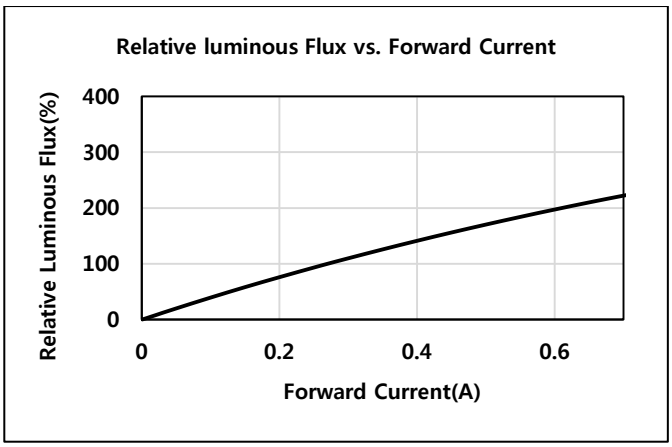
CCT: 5700 K (80 CRI)

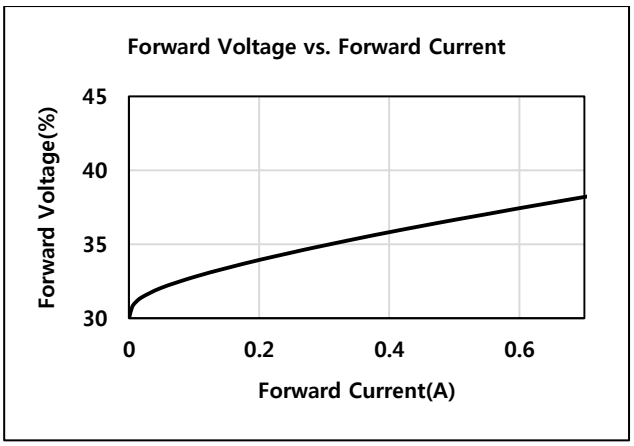


CCT: 6500 K (80 CRI)

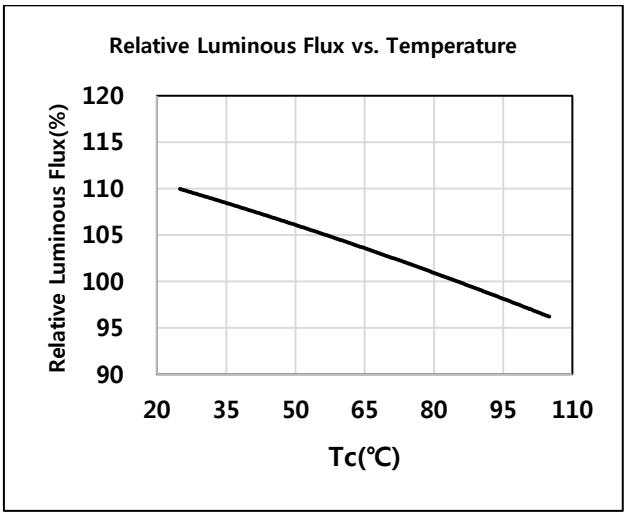


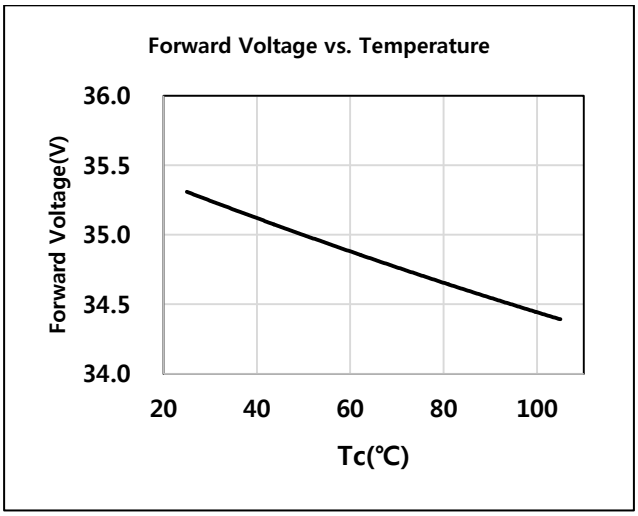
b) Forward Current Characteristics (T_J = 85 ºC)



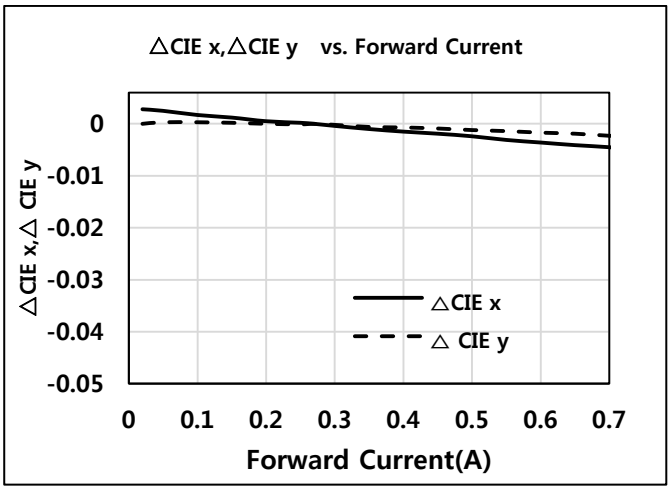


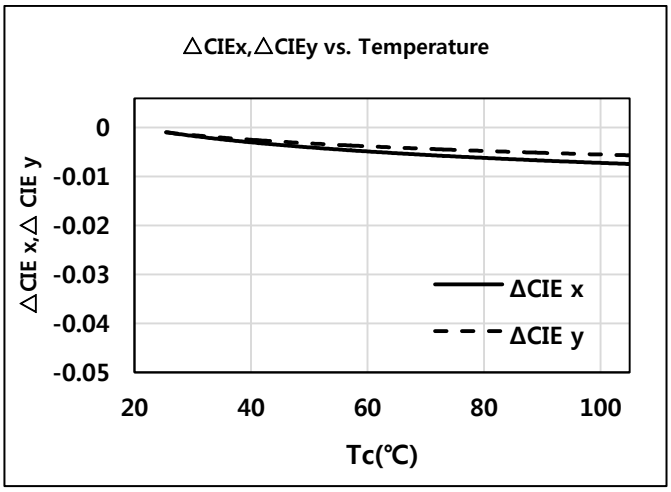
C) Temperature Characteristics (I_F = 270mA)



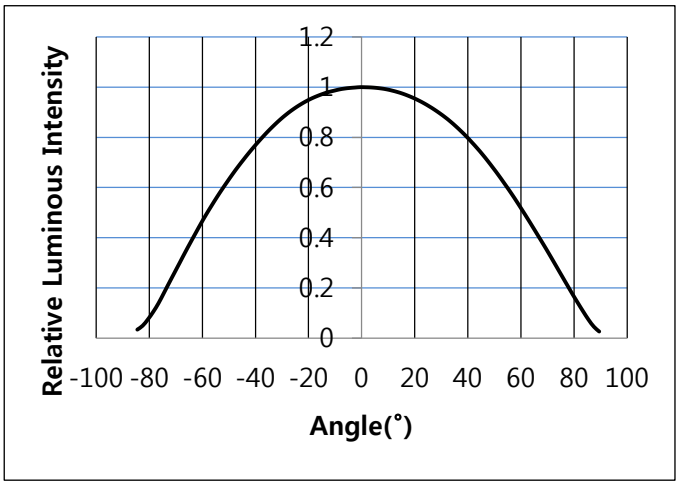


d) Color Shift Characteristics (T_J = 25 °C, I_F = 270mA, CRI80+)

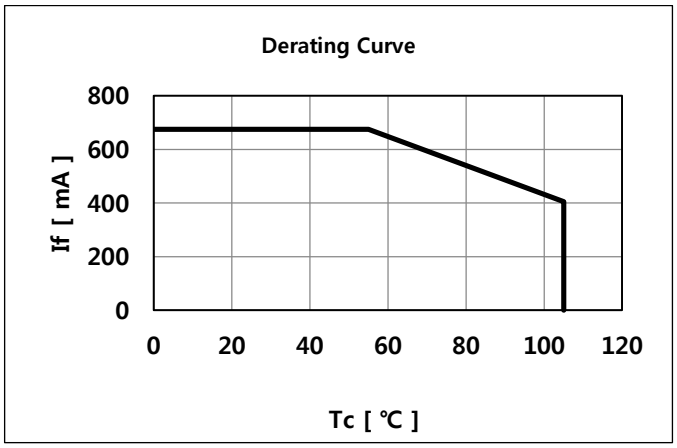




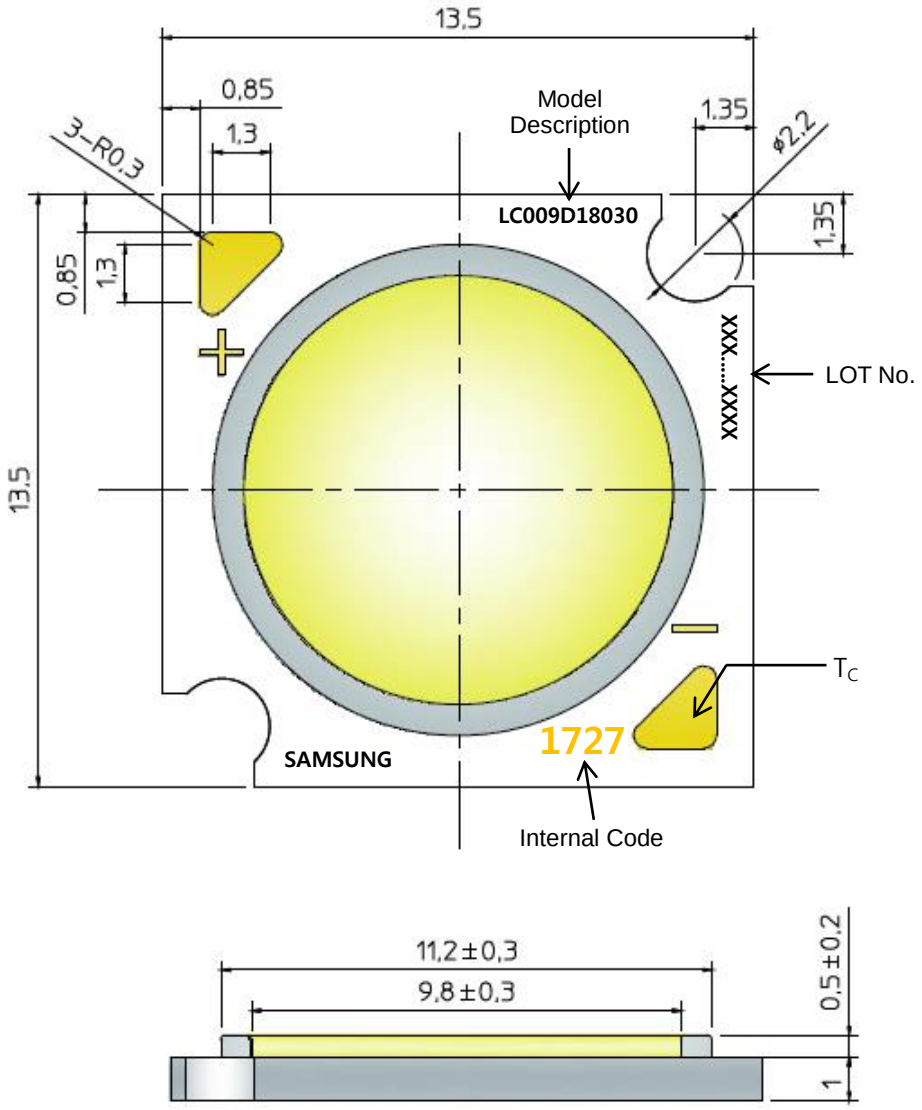
e) Beam Angle Characteristics (I_F = 270 mA, T_J = 85 °C)



f) Derating Characteristics



4. Outline Drawing & Dimension



1. Unit: mm
2. Tolerance: ± 0.30 mm

Item	Dimension	Tolerance	Unit
Length	13.5	±0.15	mm
Width	13.5	±0.15	mm
Height	1.50	±0.20	mm
Light Emitting Surface (LES) Diameter	9.8	±0.30	mm

Note: Denoted product information above is only an example
(LC009D18030 : LC009D, CRI80+, 3000K)

5. Reliability Test Items & Conditions

a) Test Items

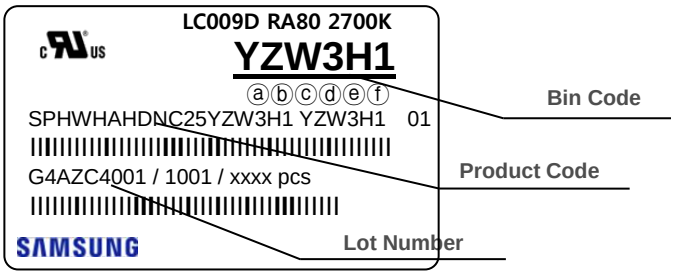
Test Item	Test Condition	Test Hour / Cycle
High Temperature Humidity Life Test	60 ºC, 90 % RH,, DC Derating, I_F	1000 h
High Temperature Life Test	85 ºC, DC Derating, I_F	1000 h
Low Temperature Life Test	-40 ºC, DC , I_F = 480 mA	1000 h
Pulsed Operating Life Test	55 ℃, Pulse width 100 μs, duty cycle 3 %	1000 h
High Temperature Storage	120 ºC	1000 h
Low Temperature Storage	-40 ºC	1000 h
Temperature Humidity Storage	60 ºC, 90% RH	1000h
Temperature Cycle On/Off Test	-40 ºC / 85 ºC each 20 min, 30 min transfer power on/off each 5 min, DC Derating, I_F = max	100 cycles
ESD (HBM)	R_1: 10 MΩ R_2: 1.5 kΩ C: 100 pF V: ±2 kV	5 times
ESD (MM)	R_1: 10 MΩ R_2: 0 kΩ C: 200 pF V: ±0.2 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	1500 g, 0.5 ms each of the 6 surfaces (3 axis x 2 sides)	5 times
Sulfur Resistance	25 °C, 75%, H2S 15 ppm	504h

b) Criteria for Judging the Damage

Item	Symbol	Test Condition (T_c = 25 ºC)	Limit	
			Min.	Max.
Forward Voltage	V_F	I_F = 270 mA	L.S.L. * 0.9	U.S.L. * 1.1
Luminous Flux	Φ_v	I_F = 270 mA	L.S.L * 0.7	U.S.L * 1.3

6. Label Structure

a) Label Structure



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

Bin Code:

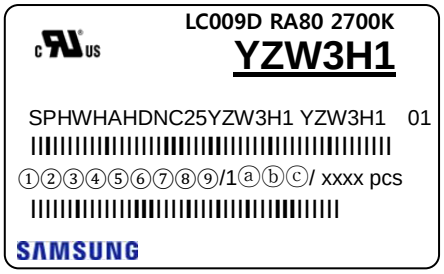
ⓐⓑ: Forward Voltage bin (refer to page 11)

ⓒⓓ: Chromaticity bin (refer to page 9-10)

ⓔⓕ: Luminous Flux bin (refer to page 6)

b) Lot Number

The lot number is composed of the following characters:



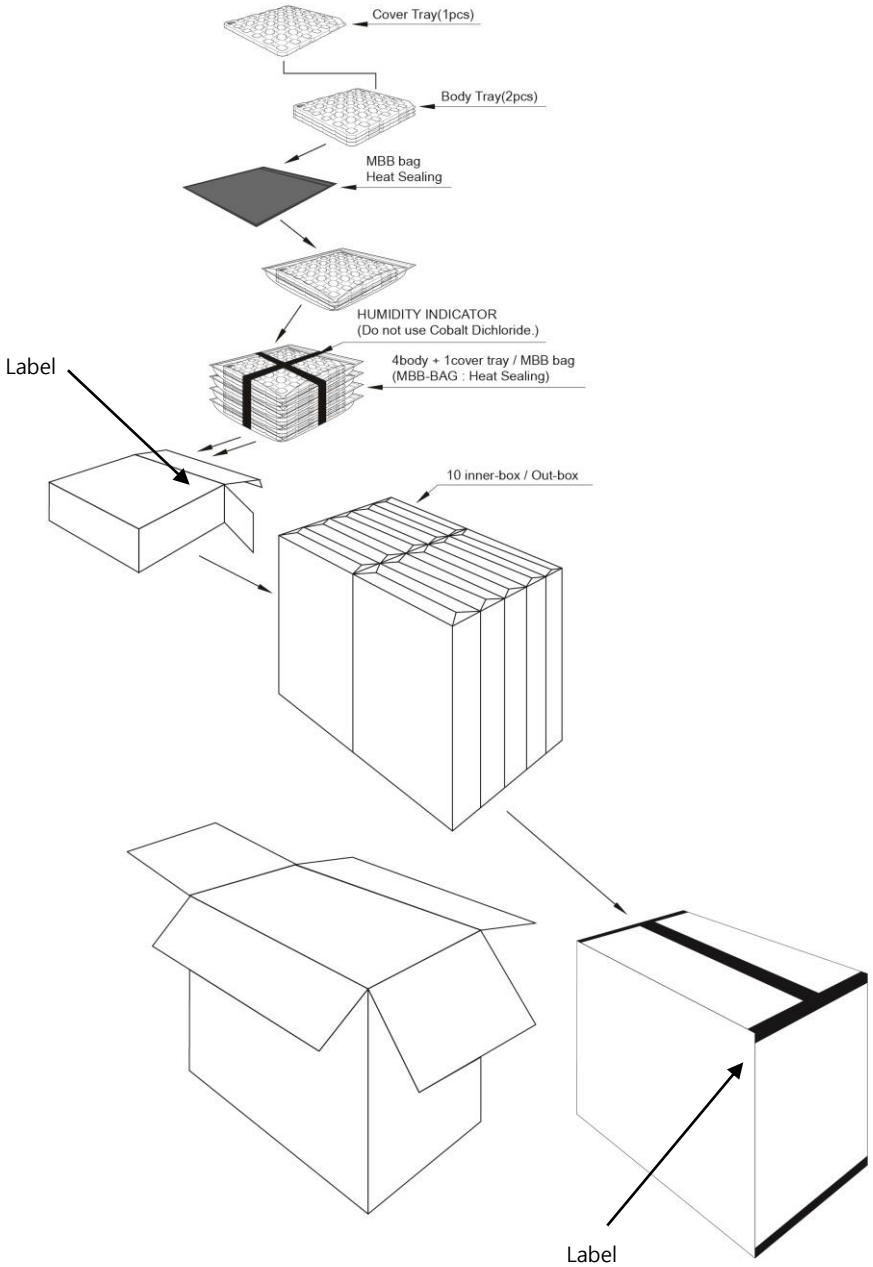
① ③④⑤⑥⑦⑧⑨ / 1ⓐⓑⓒ / xxxx pcs

①	:	Production site (S: Giheung, Korea, G: Tianjin, China)
②	:	4 (LED)
③	:	Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
④	:	Year (Z: 2015, A: 2016, B: 2017…)
⑤	:	Month (1~9, A, B, C)
⑥⑦⑧⑨	:	Day (1~9, A, B~V)
ⓐⓑⓒ	:	Product serial number (001 ~ 999)

7. Packing Structure

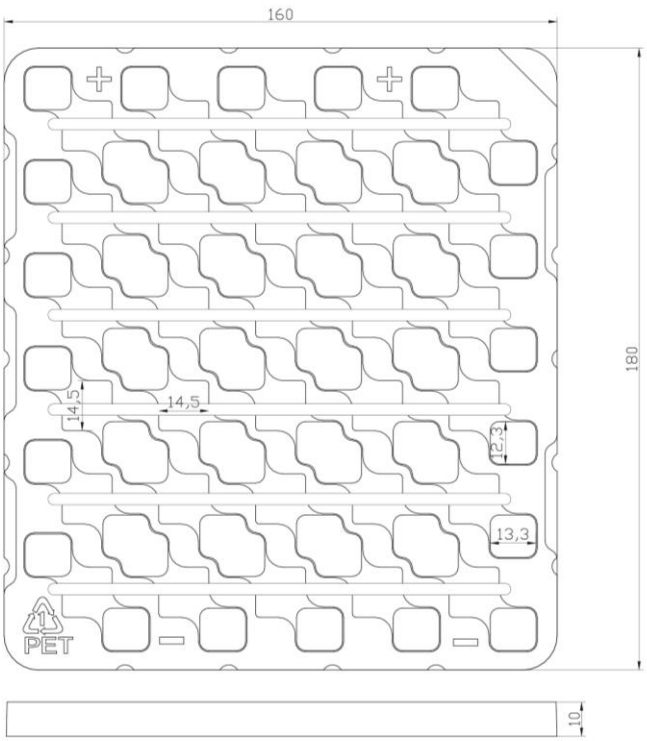
Packing material	Max. quantity in pcs of COB	Dimension(mm)			
		Length	Width	Height	Tolerance
Tray	30	160	180	10	1.0
Aluminum Bag	60(2 trays)	210	241		10
Inner Box	240	230	84	260	2
Outer Box	2400	476	445	272	5

a) Packing Structure

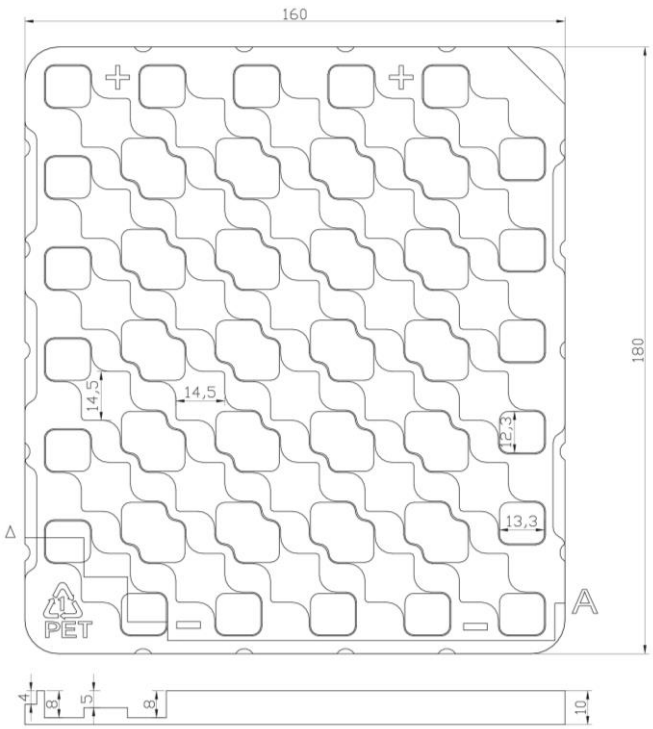


b) Tray

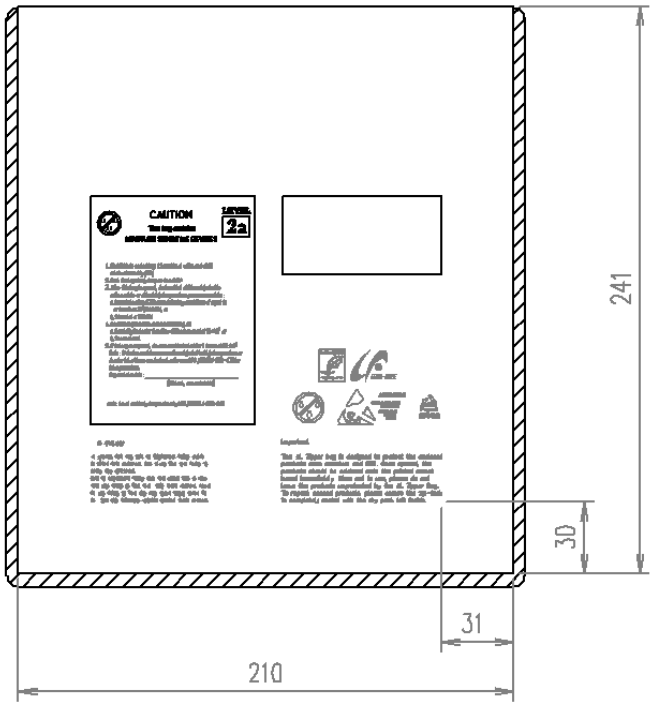
① Cover



② Body



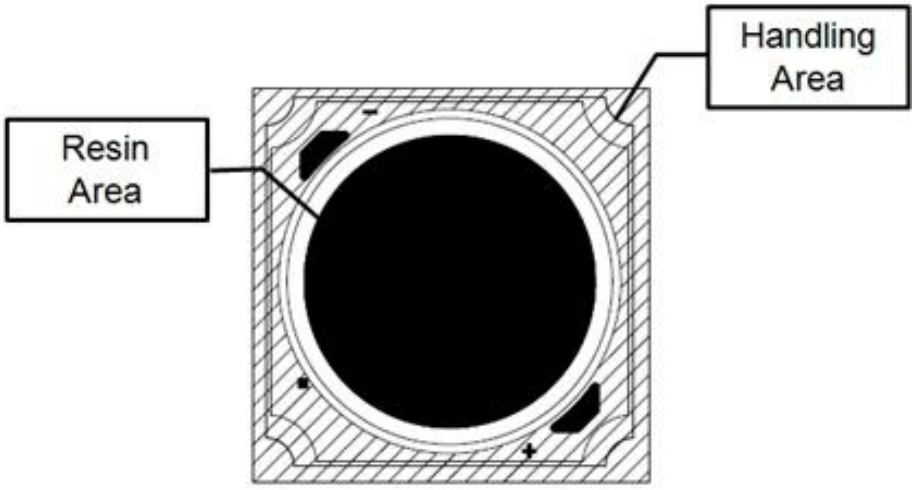
c) Aluminum Vinyl Packing Bag



8. Precautions in Handling & Use

1) 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.
2) 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 ºC, 0~90 % RH).
3) 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 ºC / 60 % RH, or
   b. Stored at <10 % RH
4) Repack unused products with anti-moisture packing, fold to close any opening and then store in a dry place.
5) Devices require baking before mounting, if humidity card reading is >60 % at 23 ± 5 ºC.
6) Devices must be baked for 1 hour at 60 ± 5 ºC, if baking is required.
7) 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.
8) The thermal management is one of the most critical factors for the LED lighting system. Especially the LED junction temperature should not exceed the absolute maximum rating while operation of LED lighting system.

   For more information, please refer to Application Note ‘Mechanical & Thermal Guide for COB’.
9) In case of driving LEDs around the minimum current level (If_min), chips might exhibit different brightness due to the variation in I-V characteristics of each one. This is normal and does not adversely affect the performance of product.
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) The resin area is very sensitive, please do not handle, press, touch, rub, clean, or pick by with tweezers on it. Instead, please pick at the handling area as indicated below.



Legal and additional information.

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