

High Voltage LED Series Chip on Board

LCo6oD – Gen.2



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



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1. Characteristics

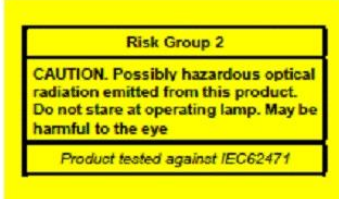
a) Absolute Maximum Rating

Item	Symbol	Rating	Unit	Condition
Ambient / Operating Temperature	T_A	-40 ~ +105	°C	-
Storage Temperature	T_{stg}	-40 ~ +120	°C	-
LED Junction Temperature	T_J	150	°C	-
Case Temperature	T_C	115	°C	-
Forward Current	I_F	2760	mA	-
Power Dissipation	P_D	155.1	W	-
ESD (HBM)	-	±2	kV	-
ESD (MM)	-	±0.5	kV	-

b) Electro-optical Characteristics ($I_F = 1080 \text{ mA}$, $T_A = 85 \text{ °C}$)

Item	Unit	Rank	Min.	Typ.	Max.
Forward Voltage (V_F)	V	1Z	47.8	52	56.2
		3	70	-	-
Color Rendering Index (R_a)	-	5	80	-	-
		9	90	-	-
Thermal Resistance (junction to case point)	°C/W		-	0.24	-
Beam Angle	°		-	115	-
Nominal Power	W			56.2	

c) Photo-biological Safety

Item	Contents
Photo-biological Safety	<p>Risk Group2, Ethr(lux) - 695, Distance to reach RG1(m) - 2.4 In the I_f-sorting current, This product is Risk Group1. by certificate of Samsung Electronics</p> 

Notes:

- 1) The COB is tested in pulsed condition at rated test current (10 ms pulse width) and rated temperature ($T_J = T_C = T_A = 85 \text{ °C}$)
- 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 ($I_F = 1080 \text{ mA}$)

CRI (Ra) Min.	Nominal CCT (K)	Flux Rank	Flux @ $T_c = 85 \text{ }^\circ\text{C}$ (lm)		
			Min.	Typ.	Max.
70	3000	D2	8764	9225	
	4000	D2	9045	9521	
	5000	D2	9185	9668	
80	2700	D2	7702	8107	-
	3000	D2	8115	8542	-
	3500	D2	8371	8812	-
	4000	D2	8545	8995	-
	5000	D2	8587	9039	-
	5700	D2	8629	9084	-
	6500	D2	8540	8990	-
90	2700	D2	6611	6959	
	3000	D2	6984	7352	
	3500	D2	7162	7539	
	4000	D2	7320	7706	
	5000	D2	7404	7793	

Notes:

- 1) The COB is tested in pulsed operating condition at rated test current (10 ms pulse width) and rated temperature ($T_J = T_C = 85 \text{ }^\circ\text{C}$).
- 2) Samsung maintains measurement tolerance of: Luminous flux = $\pm 7 \%$, CRI = ± 1

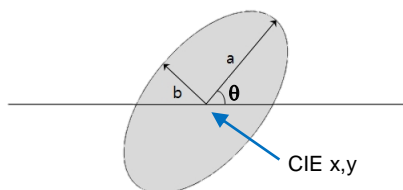
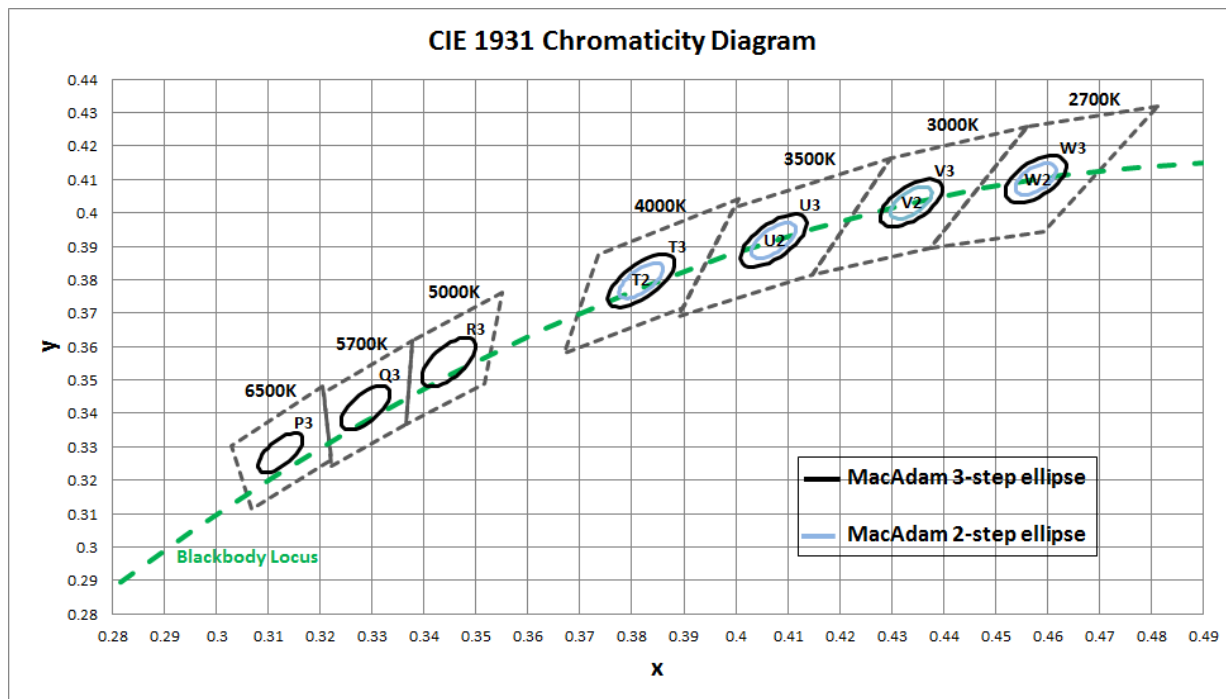
2. Product Code Information

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	L	2	5	1	Z	W	3	D	2

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	L	LC060D
11	Internal Code	2	
12	CRI & Sorting Temperature	3 5 7	Min. 70 (85°C) Min. 80 (85°C) Min. 90 (85°C)
13 14	Forward Voltage (V)	1Z	47.8~56.2
15	CCT (K)	W V U T R Q P	2700K 3000K 3500K 4000K 5000K 5700K 6500K
16	MacAdam Step	2 3	MacAdam 2-step MacAdam 3-step
17 18	Luminous Flux	D2	COB D-series Gen.2 level

a) Binning Structure ($I_F = 1080 \text{ mA}$, $T_c = 85 \text{ }^\circ\text{C}$)

CRI (R_a) Min.	Nominal CCT (K)	Product Code	V_F Rank	Chrom. Bin	Flux Rank	Flux Range (Φ_v , lm)
70	3000	SPHWWAHDNL231ZV3D2	1Z	V3	D2	8764 ~
	4000	SPHWWAHDNL231ZT3D2	1Z	T3	D2	9045 ~
	5000	SPHWWAHDNL231ZR3D2	1Z	R3	D2	9185 ~
80	2700	SPHWWAHDNL251ZW3D2	1Z	W3	D2	7702 ~
		SPHWWAHDNL251ZW2D2		W2		
	3000	SPHWWAHDNL251ZV3D2	1Z	V3	D2	8115 ~
		SPHWWAHDNL251ZV2D2		V2		
	3500	SPHWWAHDNL251ZU3D2	1Z	U3	D2	8371 ~
		SPHWWAHDNL251ZU2D2		U2		
	4000	SPHWWAHDNL251ZT3D2	1Z	T3	D2	8545 ~
		SPHWWAHDNL251ZT2D2		T2		
	5000	SPHWWAHDNL251ZR3D2	1Z	R3	D2	8587 ~
	5700	SPHWWAHDNL251ZQ3D2	1Z	Q3	D2	8629 ~
	6500	SPHWWAHDNL251ZP3D2	1Z	P3	D2	8540 ~
	90	2700	SPHWWAHDNL271ZW3D2	1Z	W3	D2
SPHWWAHDNL271ZW2D2			W2			
3000		SPHWWAHDNL271ZV3D2	1Z	V3	D2	6984 ~
		SPHWWAHDNL271ZV2D2		V2		
3500		SPHWWAHDNL271ZU3D2	1Z	U3	D2	7162 ~
		SPHWWAHDNL271ZU2D2		U2		
4000		SPHWWAHDNL271ZT3D2	1Z	T3	D2	7320 ~
		SPHWWAHDNL271ZT2D2		T2		
5000	SPHWWAHDNL271ZR3D2	1Z	R3	D2	7404 ~	

b) Chromaticity Region & Coordinates ($I_F = 1080 \text{ mA}$, $T_J = 85 \text{ }^\circ\text{C}$)


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

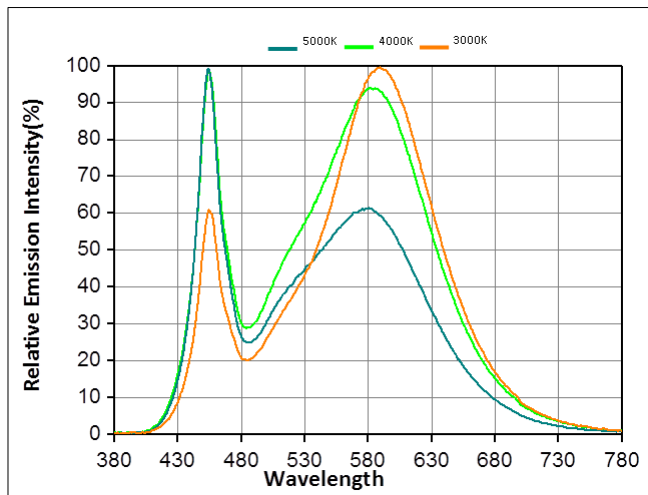
Note:

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

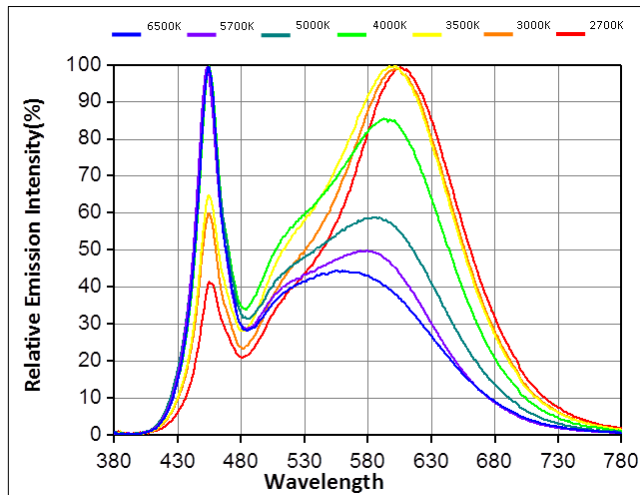
3. Typical Characteristics Graphs

a) Spectrum Distribution ($I_f = 1080 \text{ mA}$, $T_J = 85 \text{ }^\circ\text{C}$)

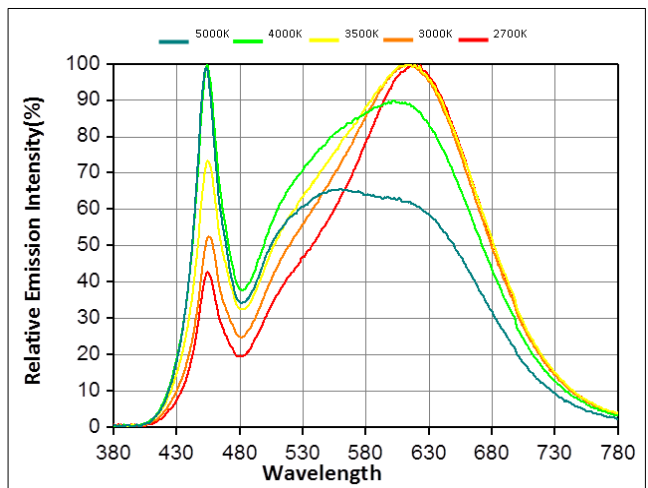
CRI Ra 70+



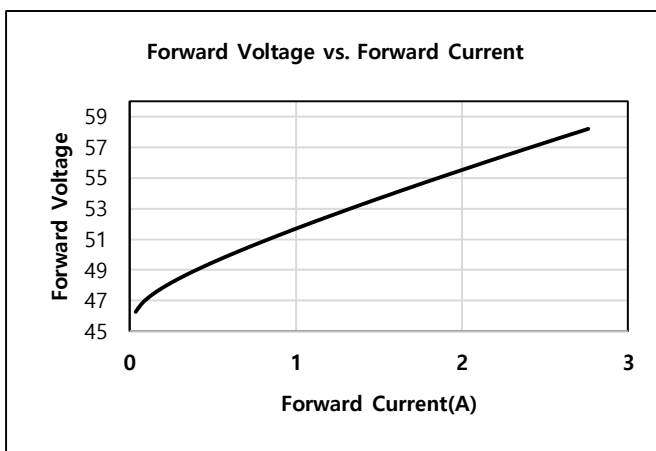
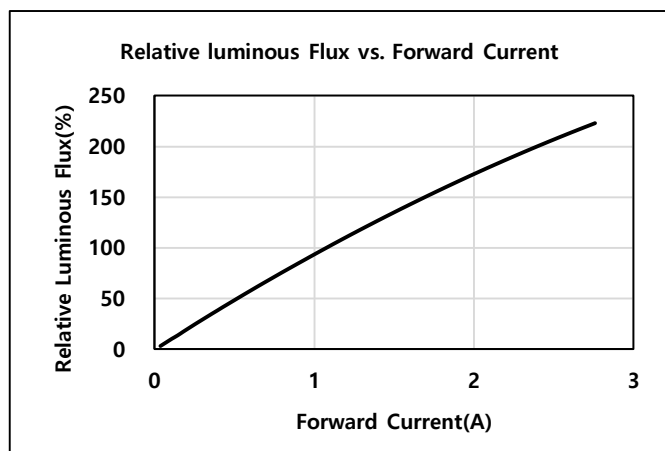
CRI Ra 80+



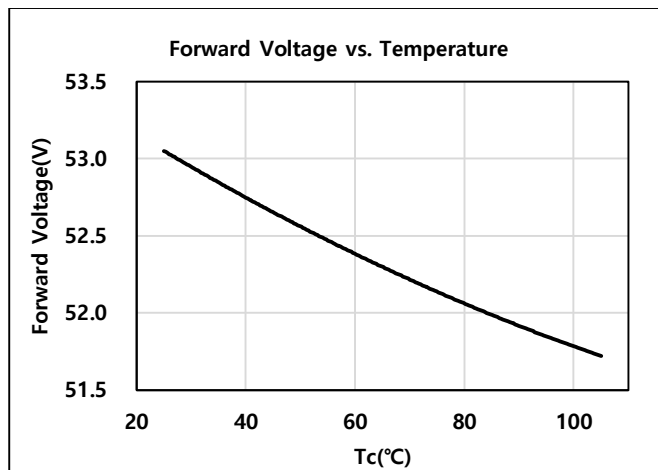
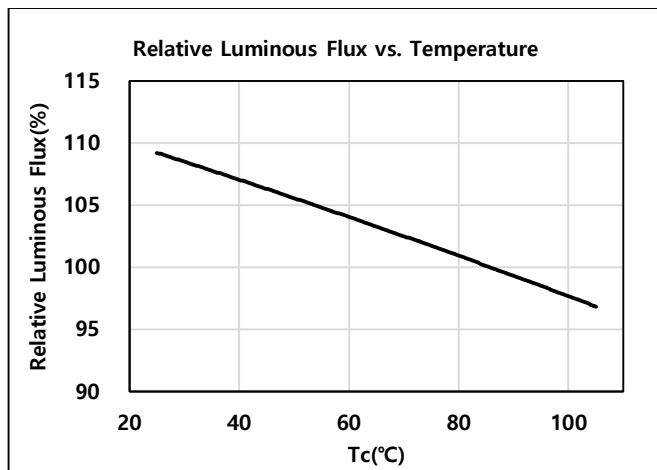
CRI Ra 90+



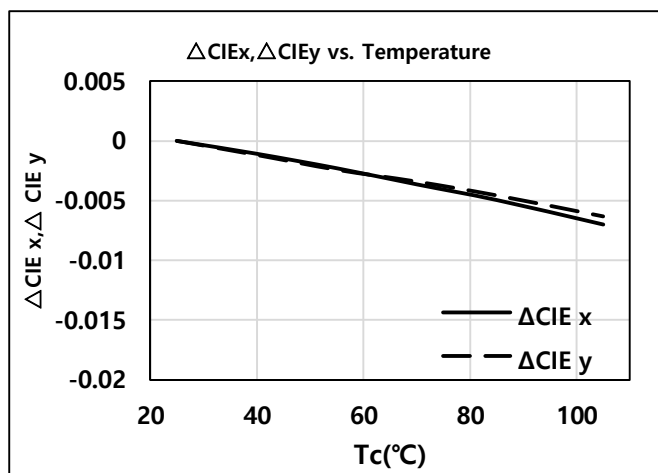
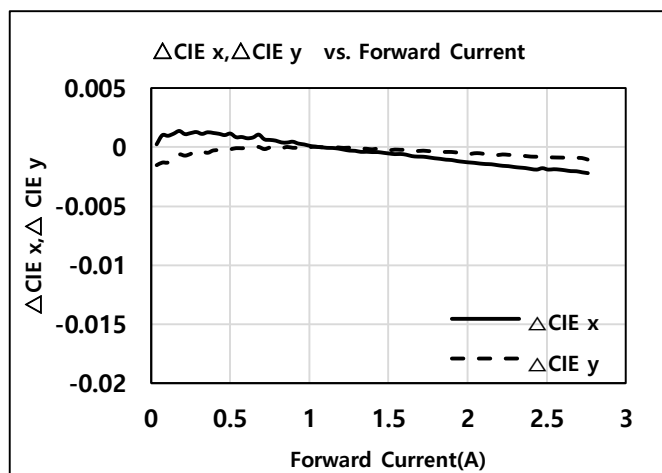
b) Forward Current Characteristics ($T_J = 85 \text{ }^\circ\text{C}$)



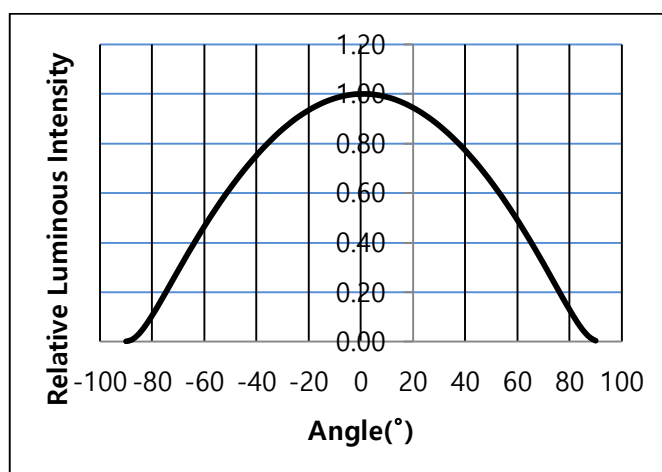
c) Temperature Characteristics ($I_f = 1080\text{mA}$)



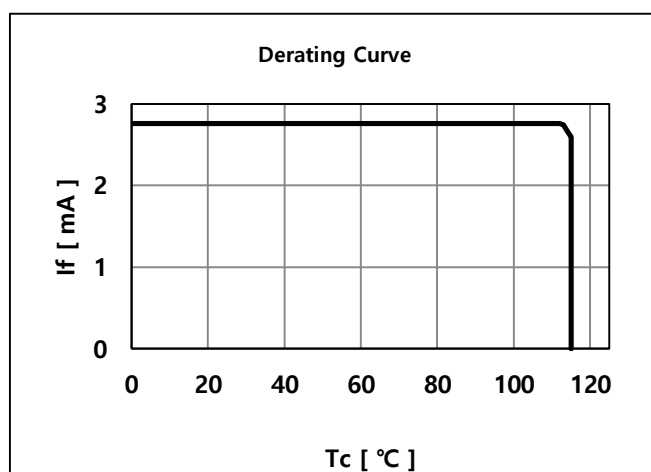
d) Color Shift Characteristics ($T_J = 85\text{ }^\circ\text{C}$, $I_f = 1080\text{mA}$, $\text{CRI} = 80+$)



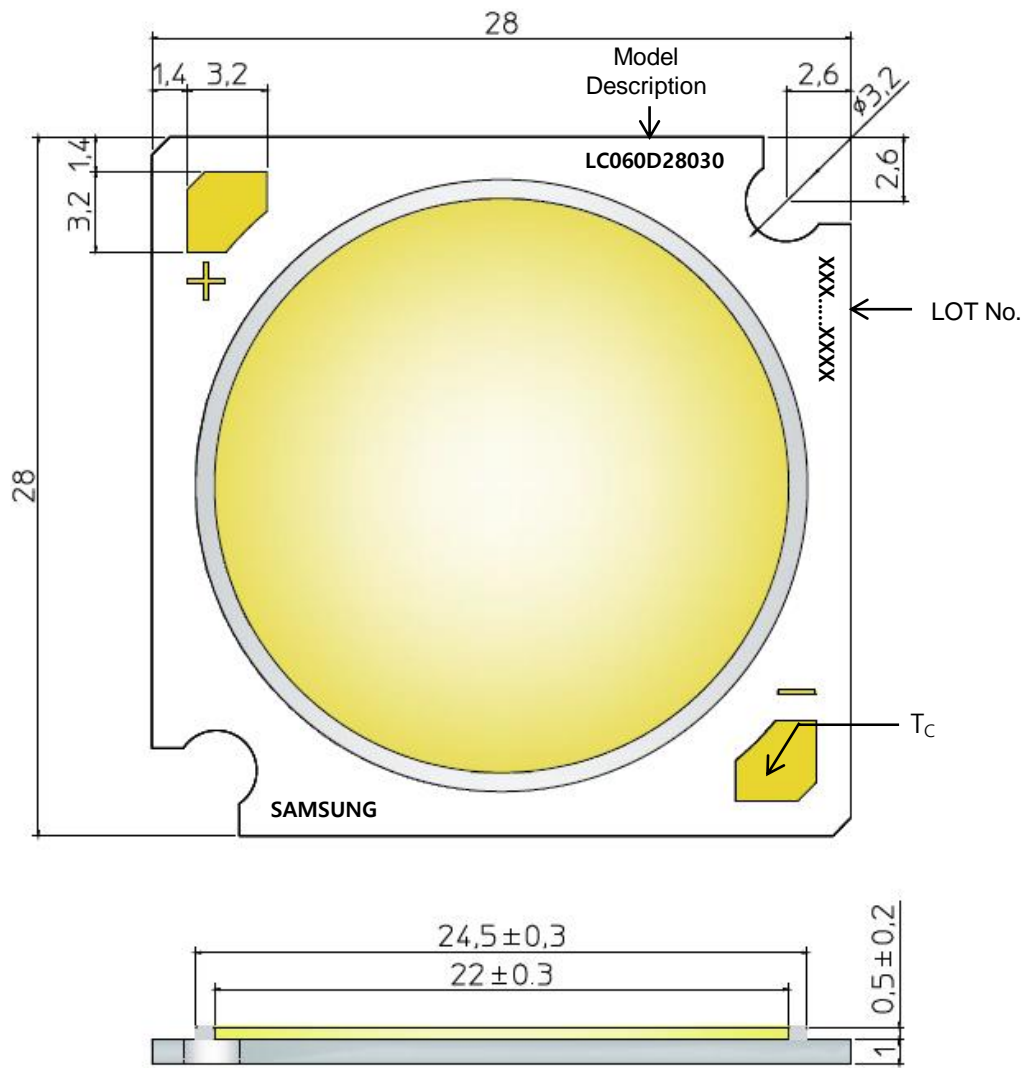
e) Beam Angle Characteristics ($I_f = 1080\text{ mA}$, $T_J = 85\text{ }^\circ\text{C}$)



f) Derating Characteristics



4. Outline Drawing & Dimension



- 1. Unit: mm
- 2. Tolerance: ± 0.3 mm

Item	Dimension	Tolerance	Unit
Length	28.0	±0.15	mm
Width	28.0	±0.15	mm
Height	1.50	±0.20	mm
Light Emitting Surface (LES) Diameter	22.0	±0.30	mm

Note: Denoted product information above is only an example
 (LC060D28030 : LC060D, Gen2, CRI80+, 3000K)

5. Reliability Test Items & Conditions

a) Test Items

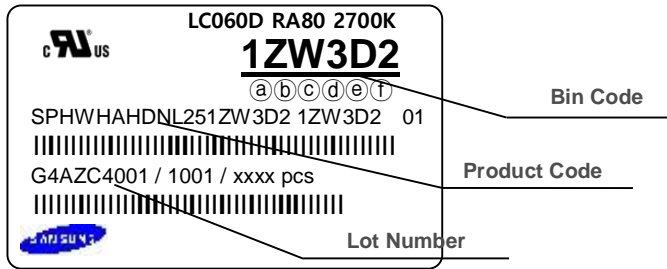
Test Item	Test Condition	Test Hour / Cycle
High Temperature Humidity Life Test	60 °C, 90 % RH,, DC Derating, I _F	1000 h
High Temperature Life Test	85 °C, DC Derating, I _F	1000 h
Low Temperature Life Test	-40 °C, DC, Derating I _F	1000 h
High Temperature Storage	120 °C	1000 h
Low Temperature Storage	-40 °C	1000 h
Temperature Humidity Storage	60 °C, 90% RH	1000h
Temperature Cycle On/Off Test	-40 °C / 85 °C 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	5 times
ESD (MM)	R ₁ : 10 MΩ R ₂ : 0 kΩ C: 200 pF	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
Sulfur Resistance	25 °C, 75%, H2S 15 ppm	504h

b) Criteria for Judging the Damage

Item	Symbol	Test Condition (T _c = 25 °C)	Limit	
			Min.	Max.
Forward Voltage	V _F	I _F = 1080 mA	L.S.L. * 0.9	U.S.L. * 1.1
Luminous Flux	Φ _v	I _F = 1080 mA	L.S.L. * 0.7	U.S.L. * 1.3

6. Label Structure

a) Label Structure



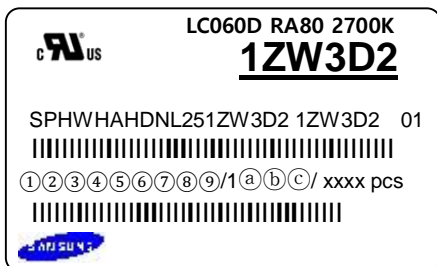
Note: Denoted bin code and product code above is only an example (see description on page 5)

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:



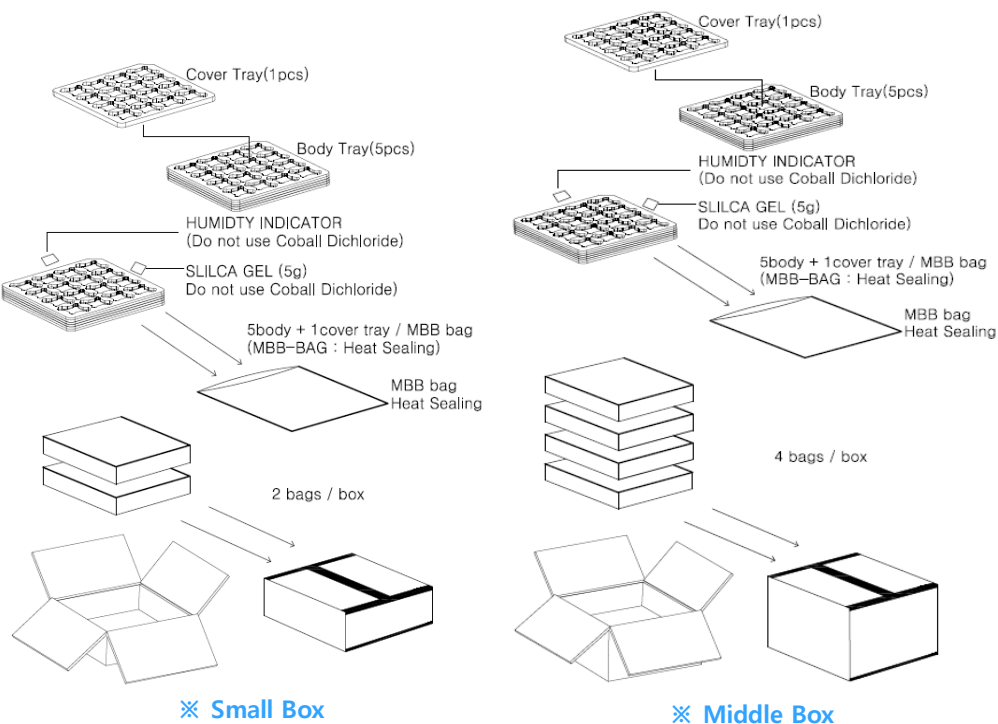
① ③④⑤⑥⑦⑧⑨ / 1ⒶⒷⒸ / xxxx pcs

- 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)

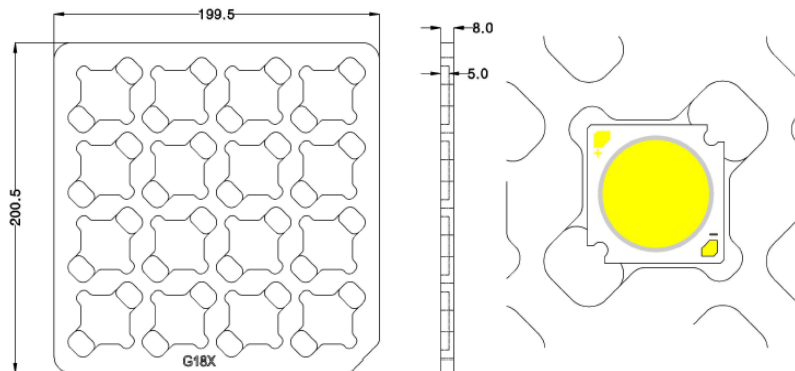
7. Packing Structure

Packing material	Max. quantity in pcs of COB	Dimension(mm)			
		Length	Width	Height	Tolerance
Tray	16	200	200	8	1
Anti-Static Bag	80 (5 trays)	320	270	-	+/- 0.5
Outer Box (Small)	160 (2 bags)	225	225	65	5
Outer Box (Middle)	320 (4 bags)	225	225	130	5

a) Packing Structure

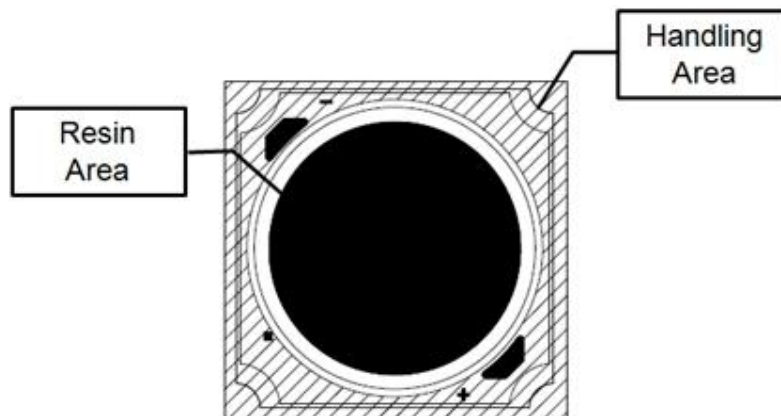


b) Tray



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 °C, 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 °C / 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 °C.
- 6) Devices must be baked for 1 hour at 60 ± 5 °C, 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 (I_{f_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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