Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

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Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
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High Voltage LED Series
Chip on Board

LC060D – 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

SAMSUNG

Table of Contents

1. Characteristics

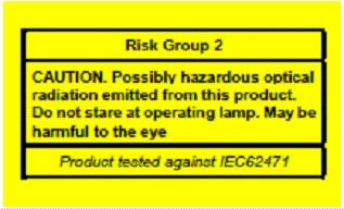
a) Absolute Maximum Rating

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	150	ºC	-
Case Temperature	Tc	115	ºC	
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 mA, T_A = 85 ºC)

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

C) Photo-biological Safety

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

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 = 1080 mA)

CRI (R_a) Min.	Nominal CCT (K)	Flux Rank	Flux @ T_c = 85 °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 °C).
2) Samsung maintains measurement tolerance of: Luminous flux = ±7 %, CRI = ±1

2. Product Code Information

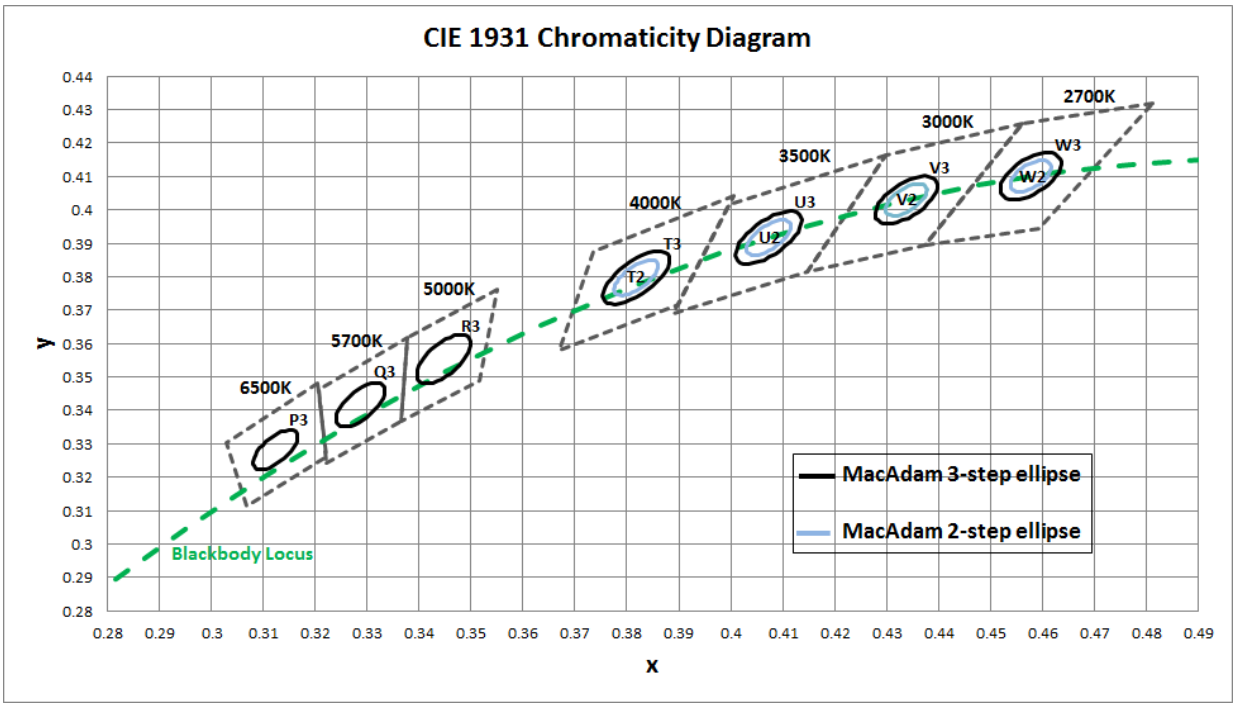
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
S	P	H	W	H	A	H	D	N	L	2	5	1	Z	W	3	D	2

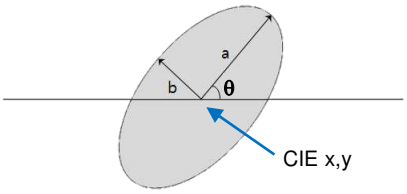
Digit	PKG Information	Code	Specification
1 2 3	Samsung Package High Power	SPH	
4 5	Color	WH	White
6	Product Version	A	
7 8	Form Factor	HD	COB
9	Lens Type	N	No lens
10	Wattage or Model	L	LC060D
11	Internal Code	2	
12	CRI & Sorting Temperature	3	Min. 70 (85℃)
		5	Min. 80 (85℃)
		7	Min. 90 (85℃)
13 14	Forward Voltage (V)	1Z	47.8~56.2
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	D2	COB D-series Gen.2 level

a) Binning Structure (I_F = 1080 mA, T_C = 85 ºC)

CRI (R_a) Min.	Nominal CCT (K)	Product Code	V_F Rank	Chrom. Bin	Flux Rank	Flux Range (Φ_v, lm)
70	3000	SPHWHAHDNL231ZV3D2	1Z	V3	D2	8764 ~
	4000	SPHWHAHDNL231ZT3D2	1Z	T3	D2	9045 ~
	5000	SPHWHAHDNL231ZR3D2	1Z	R3	D2	9185 ~
80	2700	SPHWHAHDNL251ZW3D2	1Z	W3	D2	7702 ~
		SPHWHAHDNL251ZW2D2		W2		
	3000	SPHWHAHDNL251ZV3D2	1Z	V3	D2	8115 ~
		SPHWHAHDNL251ZV2D2		V2		
	3500	SPHWHAHDNL251ZU3D2	1Z	U3	D2	8371 ~
		SPHWHAHDNL251ZU2D2		U2		
	4000	SPHWHAHDNL251ZT3D2	1Z	T3	D2	8545 ~
		SPHWHAHDNL251ZT2D2		T2		
	5000	SPHWHAHDNL251ZR3D2	1Z	R3	D2	8587 ~
	5700	SPHWHAHDNL251ZQ3D2	1Z	Q3	D2	8629 ~
	6500	SPHWHAHDNL251ZP3D2	1Z	P3	D2	8540 ~
90	2700	SPHWHAHDNL271ZW3D2	1Z	W3	D2	6611 ~
		SPHWHAHDNL271ZW2D2		W2		
	3000	SPHWHAHDNL271ZV3D2	1Z	V3	D2	6984 ~
		SPHWHAHDNL271ZV2D2		V2		
	3500	SPHWHAHDNL271ZU3D2	1Z	U3	D2	7162 ~
		SPHWHAHDNL271ZU2D2		U2		
	4000	SPHWHAHDNL271ZT3D2	1Z	T3	D2	7320 ~
		SPHWHAHDNL271ZT2D2		T2		
	5000	SPHWHAHDNL271ZR3D2	1Z	R3	D2	7404 ~

b) Chromaticity Region & Coordinates (I_F = 1080 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

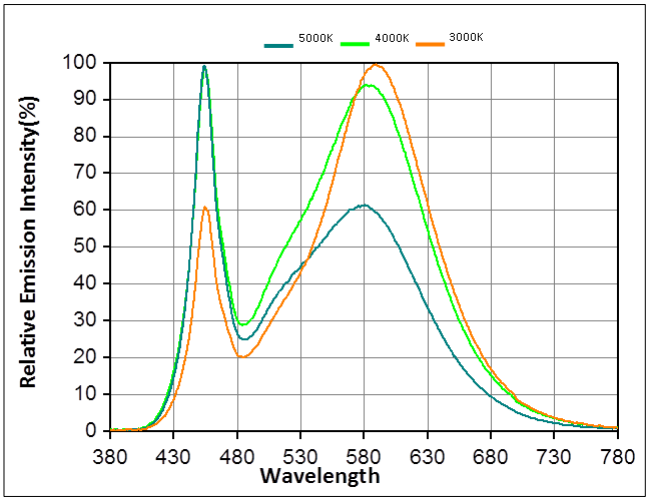
Note:

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

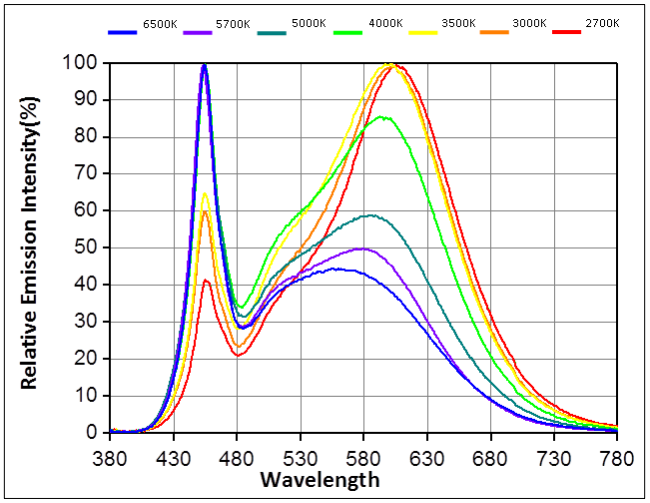
3. Typical Characteristics Graphs

a) Spectrum Distribution (I_F = 1080 mA, T_J = 85 ºC)

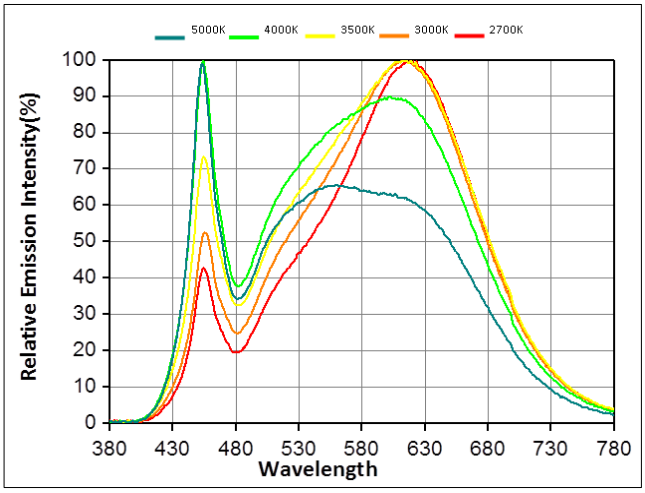
CRI Ra 70+



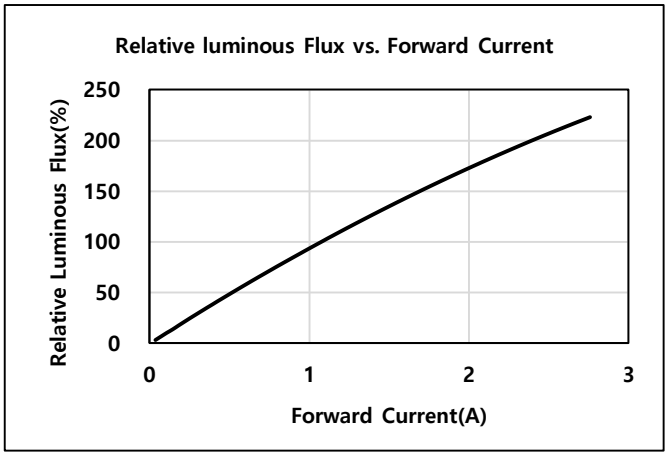
CRI Ra 80+

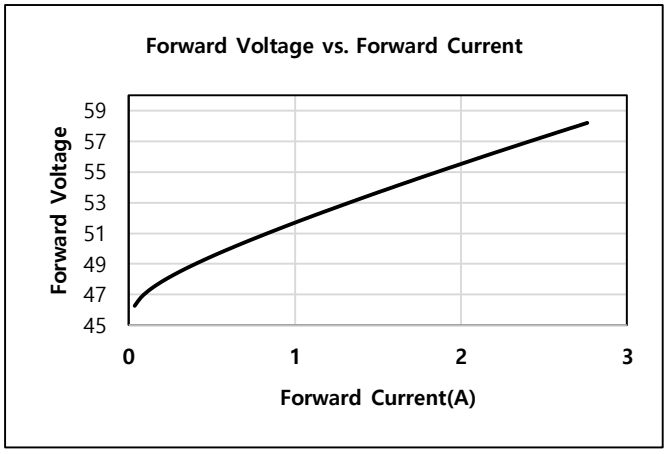


CRI Ra 90+

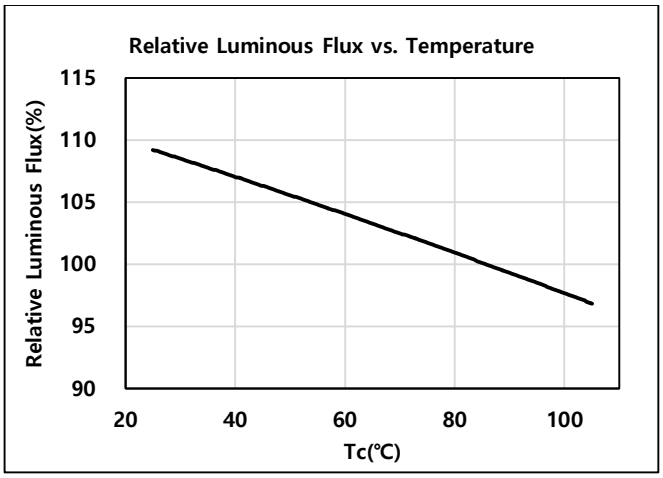


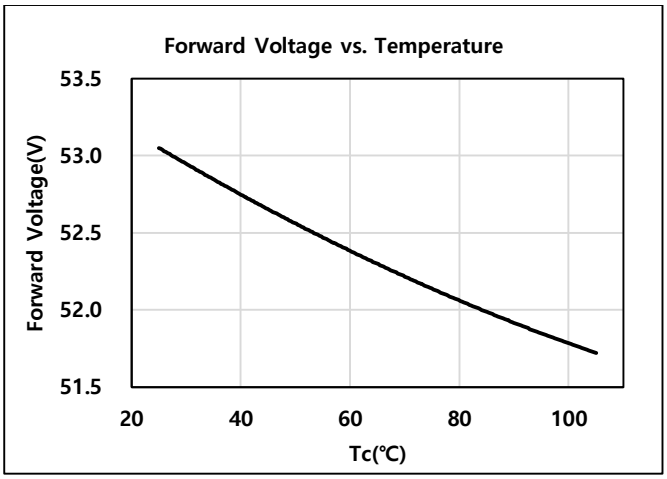
b) Forward Current Characteristics (T_J = 85 ºC)



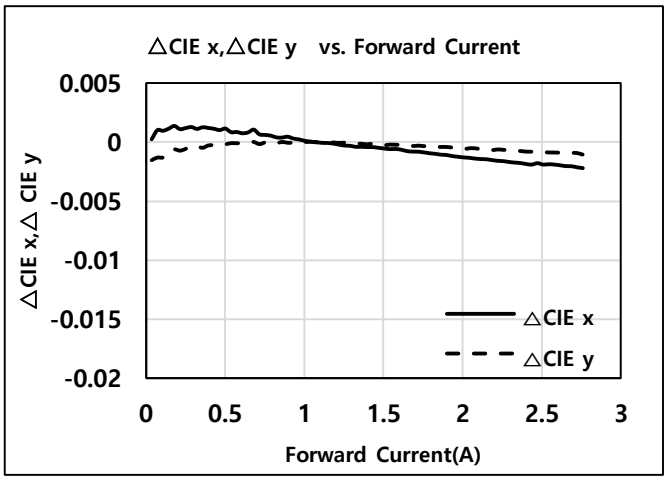


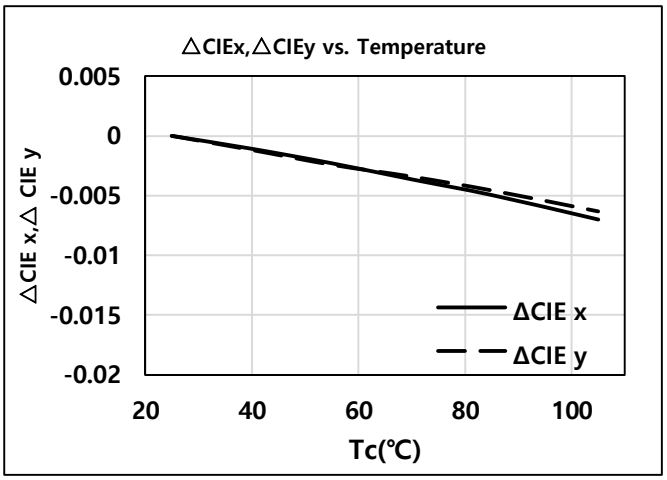
c) Temperature Characteristics (I_F = 1080mA)



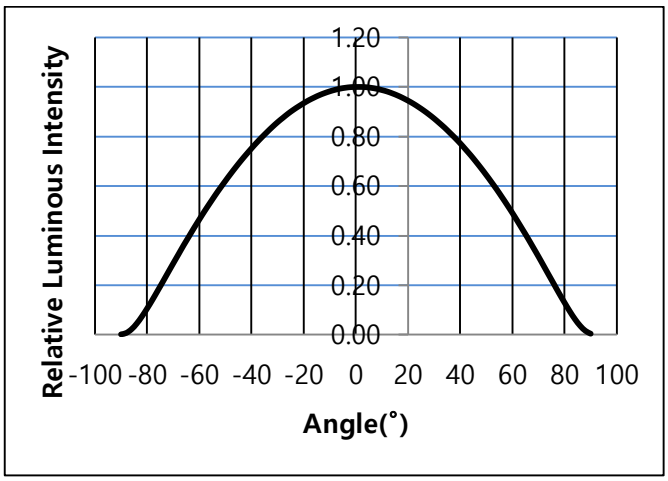


d) Color Shift Characteristics (T_J = 85 ºC, I_F = 1080mA, CRI = 80+)

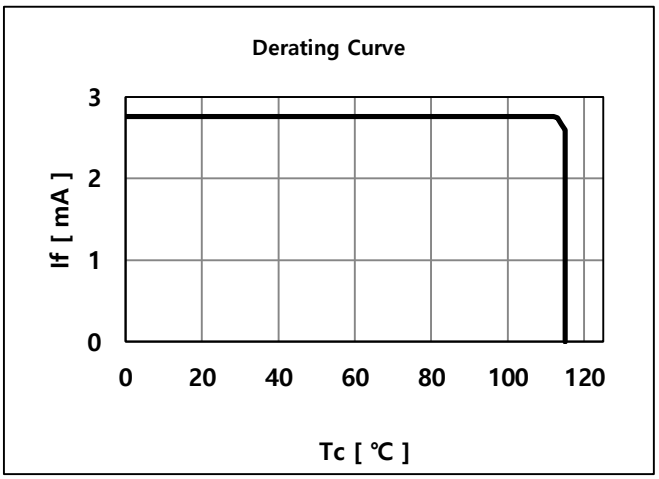




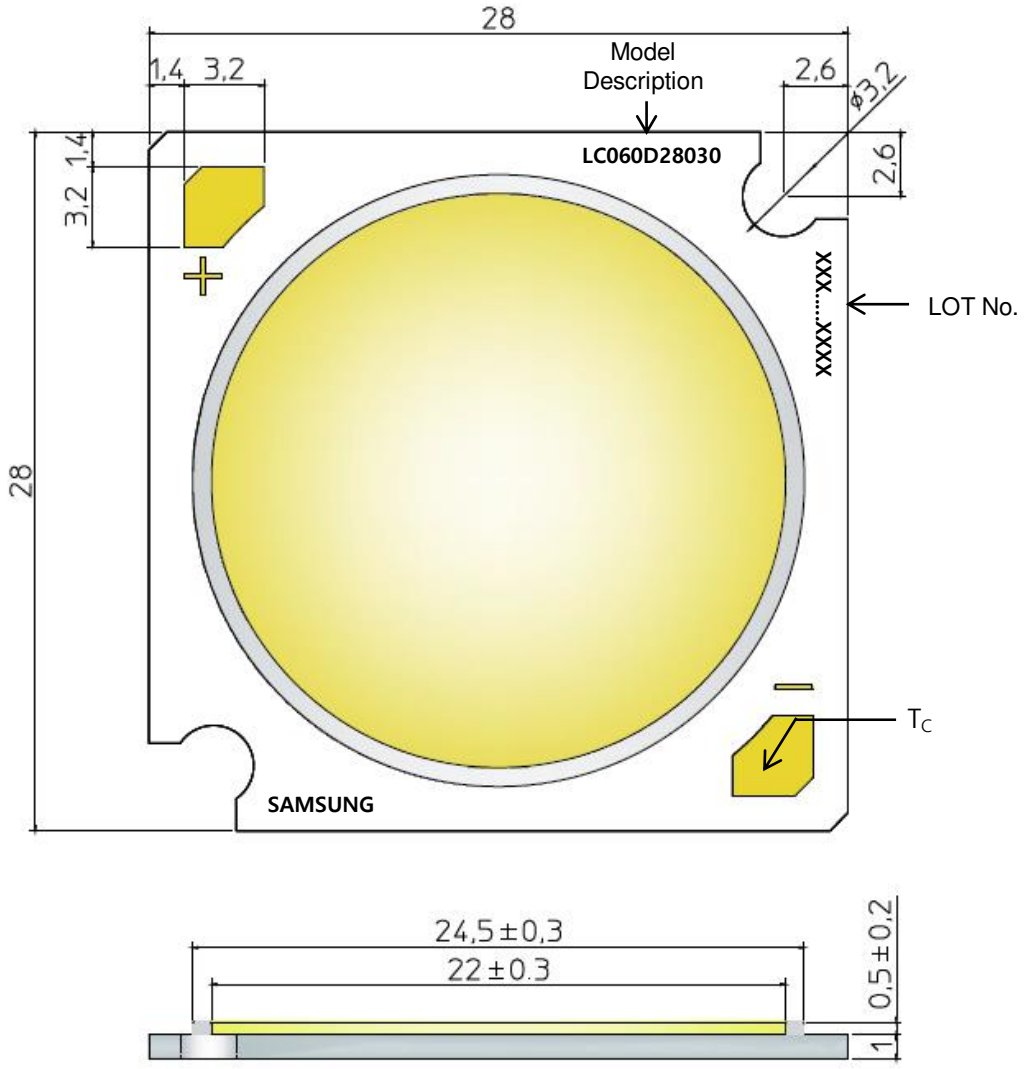
e) Beam Angle Characteristics (I_F = 1080 mA, T_J = 85 ºC)



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

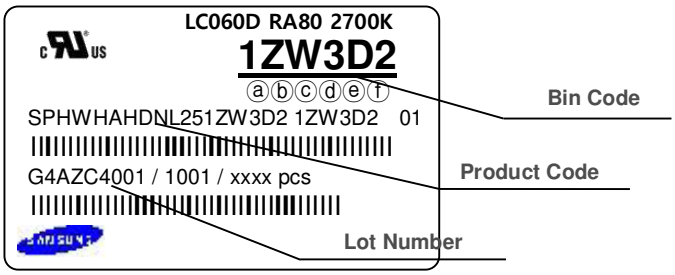
Test Item	Test Condition	Test Hour / Cycle
High Temperature Humidity Life Test	60 ºC, 90 % RH,, DC Derating, I_F	1000 h
High Temperature Life Test	85 ºC, DC Derating, I_F	1000 h
Low Temperature Life Test	-40 ºC, DC, Derating I_F	1000 h
High Temperature Storage	120 ºC	1000 h
Low Temperature Storage	-40 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	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 ºC)	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:

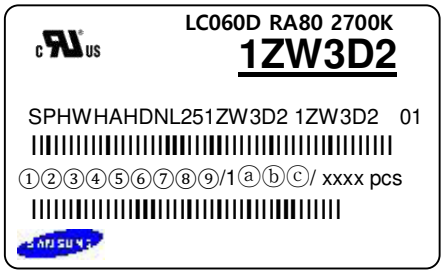
ⓐⓑ: Forward Voltage bin (refer to page 11)

ⓒⓓ: 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:



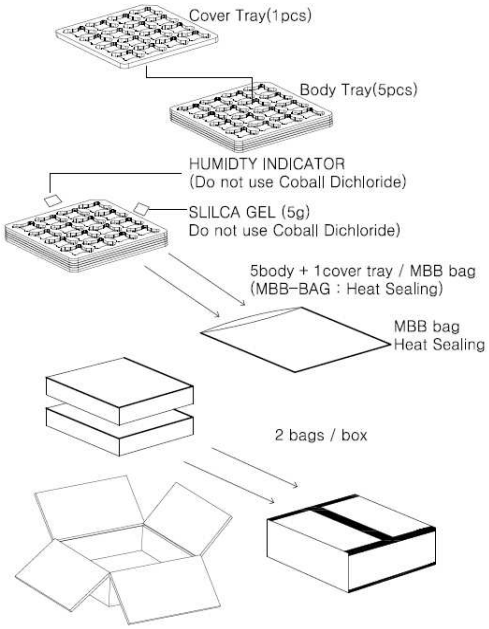
① ③④⑤⑥⑦⑧⑨ / 1ⓐⓑⓒ / xxxx pcs

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)

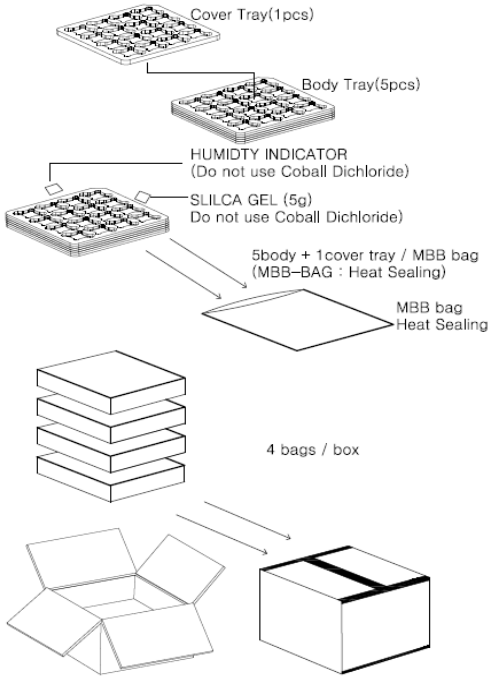
7. Packing Structure

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

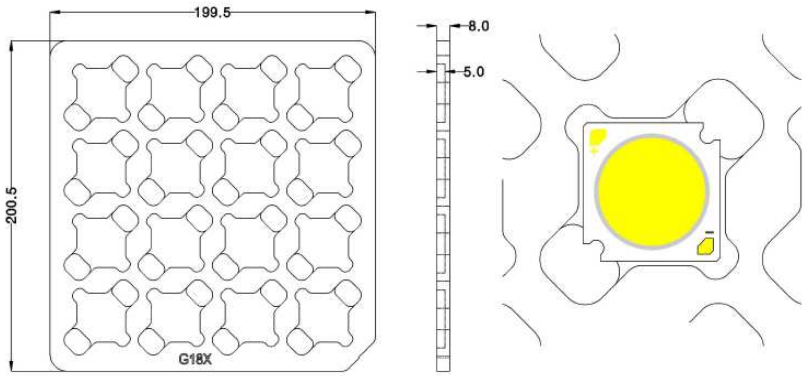


※ Small Box



※ Middle Box

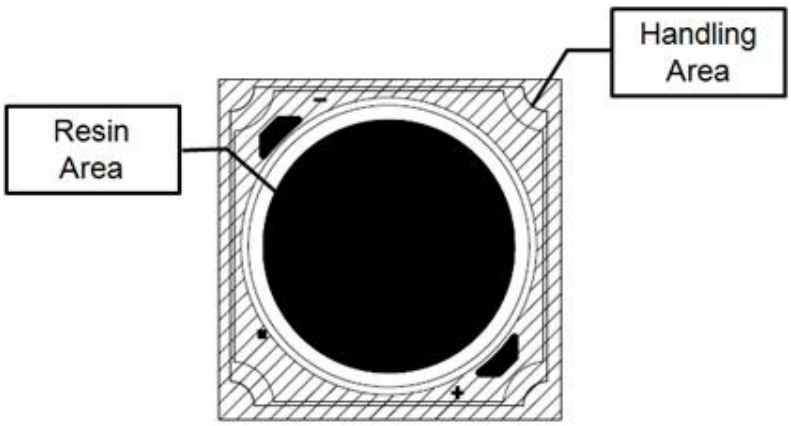
b) Tray



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 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.

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. 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.

Samsung Electronics Co., Ltd.
95, Samsung 2-ro
Giheung-gu
Yongin-si, Gyeonggi-do, 446-711
KOREA

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