

High Power LED Series Chip on Board

COB D-series

High CRI

【Premium Color Line-up】



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



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1. Characteristics

a) Absolute Maximum Rating

Item	Symbol	Model	Rating	Unit	Condition
Ambient / Operating Temperature	T _a	-	-40 ~ +105	°C	-
Storage Temperature	T _{stg}	-	-40 ~ +120	°C	-
LED Junction Temperature	T _J	-	140	°C	-
Case Temperature	T _c	-	105	°C	-
Forward Current / Power Dissipation	I _F / P _D	LC013D	920 / 34.5	mA / W	-
		LC016D	1150 / 43.1		-
		LC019D	1380 / 51.8		-
		LC026D	1840 / 69.0		-
		LC033D	2300 / 86.3		-
		LC040D	2760 / 103.5		-
ESD (HBM)	-	-	±2	kV	-
ESD (MM)	-	-	±0.5	kV	-

b) Electro-optical Characteristics (I_F = Sorting Current, T_J = 85°C)

Item	Unit	Model	Rank	Min.	Typ.	Max.
Forward Voltage (V _F)	V	All Model	YH	31.8	34.6	37.5
Color Rendering Index (R _a)	-	All Model	-	95	-	-
		LC013D	-	-	0.85	-
		LC016D	-	-	0.67	-
		LC019D	-	-	0.6	-
		LC026D	-	-	0.47	-
		LC033D	-	-	0.4	-
		LC040D	-	-	0.32	-
Thermal Resistance (junction to case point)	°C/W	All Model	-	-	115	-
		LC013D	-	-	12.5 (360)	-
		LC016D	-	-	15.6 (450)	-
		LC019D	-	-	18.7 (540)	-
		LC026D	-	-	24.9 (720)	-
		LC033D	-	-	31.1 (900)	-
		LC040D	-	-	37.4 (1080)	-
Beam Angle	°	All Model	-	-	115	-
Nominal Power (Sorting Current)	W (mA)	All Model	-	-	115	-
		LC013D	-	-	12.5 (360)	-
		LC016D	-	-	15.6 (450)	-
		LC019D	-	-	18.7 (540)	-
		LC026D	-	-	24.9 (720)	-
		LC033D	-	-	31.1 (900)	-
		LC040D	-	-	37.4 (1080)	-

Notes:

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

c) Luminous Flux Characteristics ($I_F = \text{Sorting Current}$)

Model	Nominal CCT (K)	Flux Rank	$T_c = 85\text{ }^\circ\text{C}$ (lm)		
			Min.	Typ.	Max.
LC013D	2700	D2	1161	1223	-
	3000	D2	1221	1285	-
	3500	D2	1270	1337	-
	4000	D2	1310	1379	-
	5000	D2	1321	1390	-
LC016D	2700	D2	1496	1575	-
	3000	D2	1572	1655	-
	3500	D2	1636	1722	-
	4000	D2	1687	1776	-
	5000	D2	1701	1791	-
LC019D	2700	D2	1786	1880	-
	3000	D2	1877	1976	-
	3500	D2	1954	2056	-
	4000	D2	2015	2121	-
	5000	D2	2031	2138	-
LC026D	2700	D2	2346	2470	-
	3000	D2	2466	2596	-
	3500	D2	2566	2701	-
	4000	D2	2646	2786	-
	5000	D2	2669	2809	-
LC033D	2700	D2	2904	3057	-
	3000	D2	3051	3212	-
	3500	D2	3176	3343	-
	4000	D2	3275	3447	-
	5000	D2	3302	3476	-
LC040D	2700	D2	3572	3760	-
	3000	D2	3754	3952	-
	3500	D2	3907	4113	-
	4000	D2	4029	4241	-
	5000	D2	4063	4277	-

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

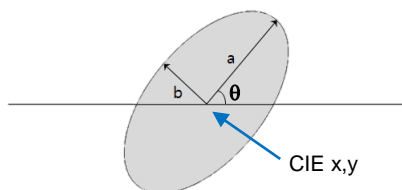
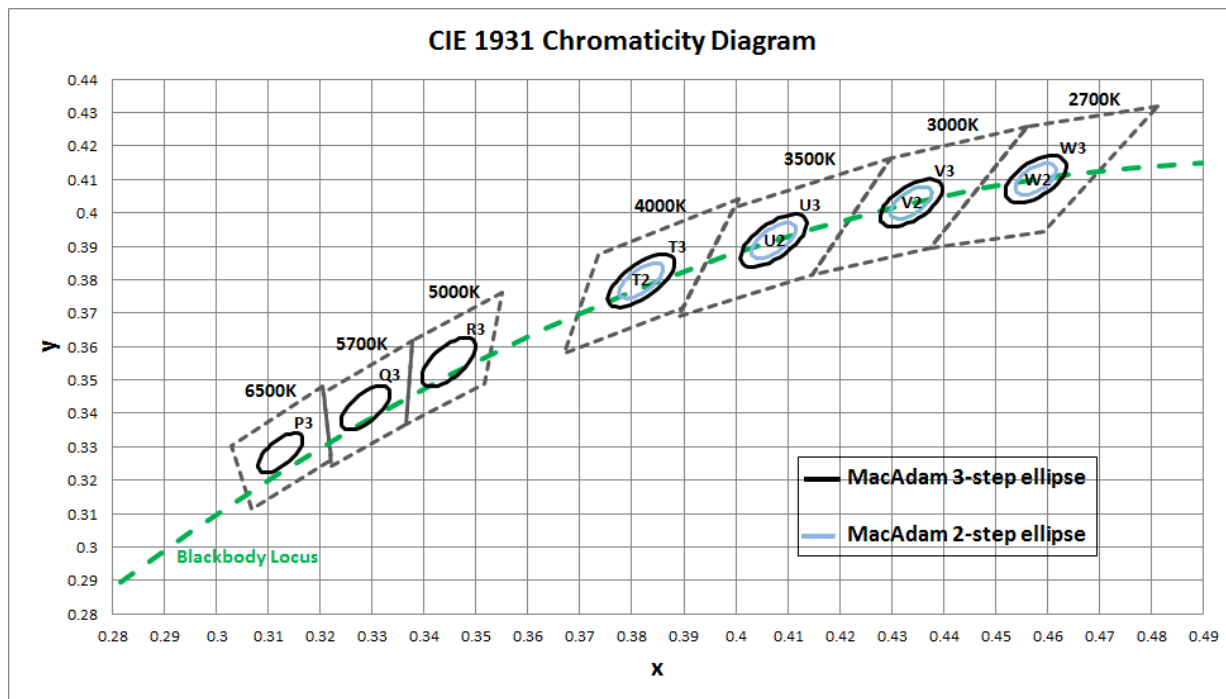
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
S	P	H	W	H	A	H	D	N	G	2	8	Y	Z	R	3	D	2

Digit	PKG Information	Code	Specification
1 2 3	Samsung Package High Power	SPH	
4 5	Color	WH	Warm White (T/U/V/W Ranks)
6	Product Version	A	
7 8	Form Factor	HD	COB
9	Lens Type	N	No lens
10	Wattage or Model	D E F G H K	LC013D LC016D LC019D LC026D LC033D LC040D
11	Internal Code	2	
12	CRI & Sorting Temperature	8	Typ. 95 (85 °C)
13 14	Forward Voltage (V)	YZ	31.8~37.5
15	CCT (K)	W V U T R	2700 K 3000 K 3500 K 4000 K 5000 K
16	MacAdam	2 3	MacAdam 2-step MacAdam 3-step
17 18	Luminous Flux	D2	COB D-series Gen.2 level

a) Binning Structure (I_F = Sorting Current, T_J =85 °C)

Model	Nominal CCT (K)	Product Code	V_F Rank	Color Rank	Flux Rank	Flux Range (Φ_v , lm)	
LC013D	2700	SPHWHAHNDND28YZW2D2	YZ	W2	D2	1161~	
		SPHWHAHNDND28YZW3D2		W3			
	3000	SPHWHAHNDND28YZV2D2	YZ	V2	D2	1221~	
		SPHWHAHNDND28YZV3D2		V3			
	3500	SPHWHAHNDND28YZU2D2	YZ	U2	D2	1270~	
		SPHWHAHNDND28YZU3D2		U3			
	4000	SPHWHAHNDND28YZT2D2	YZ	T2	D2	1310~	
		SPHWHAHNDND28YZT3D2		T3			
	5000	SPHWHAHNDND28YZR3D2	YZ	R3	D2	1321~	
	LC016D	2700	SPHWHAHNDNE28YZW2D2	YZ	W2	D2	1496~
			SPHWHAHNDNE28YZW3D2		W3		
		3000	SPHWHAHNDNE28YZV2D2	YZ	V2	D2	1572~
SPHWHAHNDNE28YZV3D2			V3				
3500		SPHWHAHNDNE28YZU2D2	YZ	U2	D2	1636~	
		SPHWHAHNDNE28YZU3D2		U3			
4000		SPHWHAHNDNE28YZT2D2	YZ	T2	D2	1687~	
		SPHWHAHNDNE28YZT3D2		T3			
5000		SPHWHAHNDNE28YZR3D2	YZ	R3	D2	1701~	
LC019D		2700	SPHWHAHDNF28YZW2D2	YZ	W2	D2	1786~
			SPHWHAHDNF28YZW3D2		W3		
		3000	SPHWHAHDNF28YZV2D2	YZ	V2	D2	1877~
	SPHWHAHDNF28YZV3D2		V3				
	3500	SPHWHAHDNF28YZU2D2	YZ	U2	D2	1954~	
		SPHWHAHDNF28YZU3D2		U3			
	4000	SPHWHAHDNF28YZT2D2	YZ	T2	D2	2015~	
		SPHWHAHDNF28YZT3D2		T3			
	5000	SPHWHAHDNF28YZR3D2	YZ	R3	D2	2031~	

Model	Nominal CCT (K)	Product Code	V _F Rank	Color Rank	Flux Rank	Flux Range (Φ _v , lm)	
LC026D	2700	SPHWHAHNDNG28YZW2D2	YZ	W2	D2	2346~	
		SPHWHAHNDNG28YZW3D2		W3			
	3000	SPHWHAHNDNG28YZV2D2	YZ	V2	D2	2466~	
		SPHWHAHNDNG28YZV3D2		V3			
	3500	SPHWHAHNDNG28YZU2D2	YZ	U2	D2	2566~	
		SPHWHAHNDNG28YZU3D2		U3			
	4000	SPHWHAHNDNG28YZT2D2	YZ	T2	D2	2646~	
		SPHWHAHNDNG28YZT3D2		T3			
	5000	SPHWHAHNDNG28YZR3D2	YZ	R3	D2	2669~	
	LC033D	2700	SPHWHAHNDNH28YZW2D2	YZ	W2	D2	2904~
			SPHWHAHNDNH28YZW3D2		W3		
		3000	SPHWHAHNDNH28YZV2D2	YZ	V2	D2	3051
SPHWHAHNDNH28YZV3D2			V3				
3500		SPHWHAHNDNH28YZU2D2	YZ	U2	D2	3176~	
		SPHWHAHNDNH28YZU3D2		U3			
4000		SPHWHAHNDNH28YZT2D2	YZ	T2	D2	3275~	
		SPHWHAHNDNH28YZT3D2		T3			
5000		SPHWHAHNDNH28YZR3D2	YZ	R3	D2	3302~	
LC040D		2700	SPHWHAHNDNK28YZW2D2	YZ	W2	D2	3572~
			SPHWHAHNDNK28YZW3D2		W3		
		3000	SPHWHAHNDNK28YZV2D2	YZ	V2	D2	3754~
	SPHWHAHNDNK28YZV3D2		V3				
	3500	SPHWHAHNDNK28YZU2D2	YZ	U2	D2	3907~	
		SPHWHAHNDNK28YZU3D2		U3			
	4000	SPHWHAHNDNK28YZT2D2	YZ	T2	D2	4029~	
		SPHWHAHNDNK28YZT3D2		T3			
	5000	SPHWHAHNDNK28YZR3D2	YZ	R3	D2	4063~	

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


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

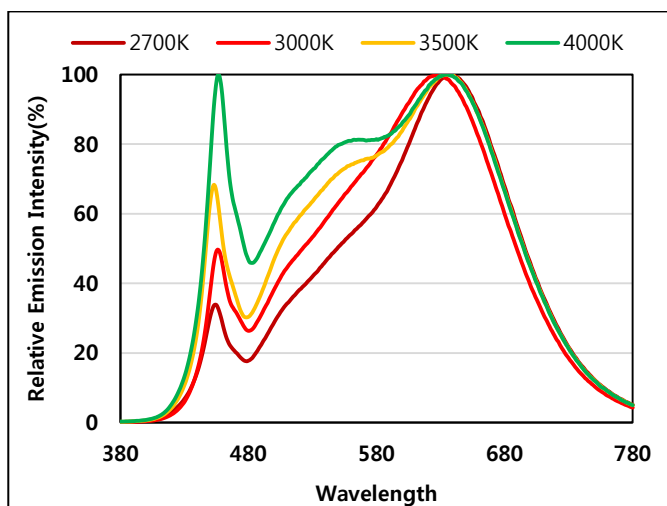
MacAdam Ellipse (R3)					
Step	CIE x	CIE y	θ	a	b
3-step	0.3447	0.3553	59.62	0.0082	0.0035

Note:

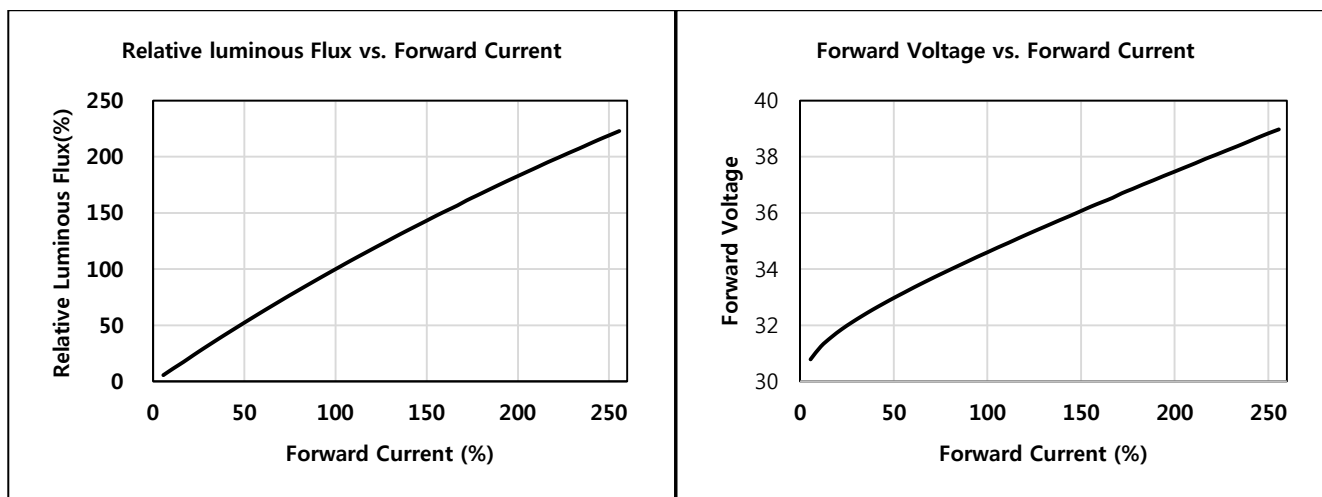
Samsung maintains measurement tolerance of: $C_x, C_y = \pm 0.005$

3. Typical Characteristics Graphs

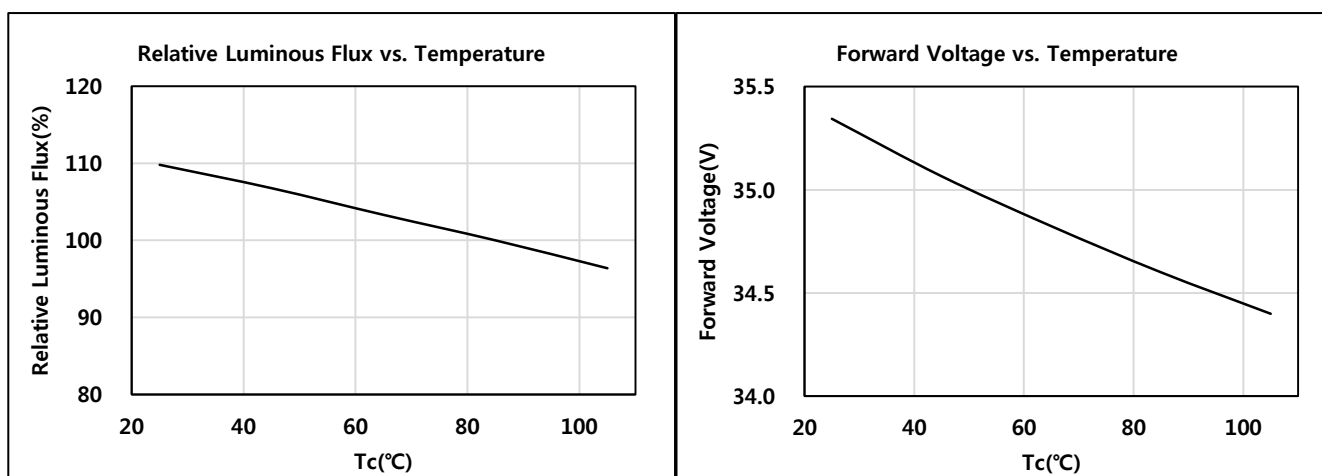
a) Spectrum Distribution (I_f = Sorting Current, $T_J = 85^\circ\text{C}$)



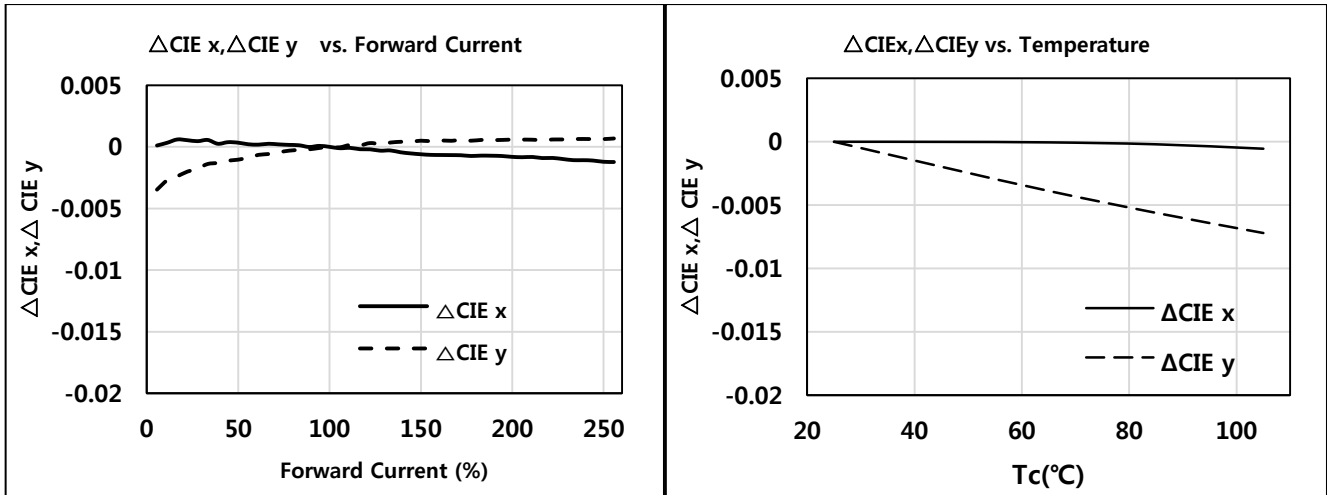
b) Forward Current Characteristics ($T_J = 85^\circ\text{C}$)



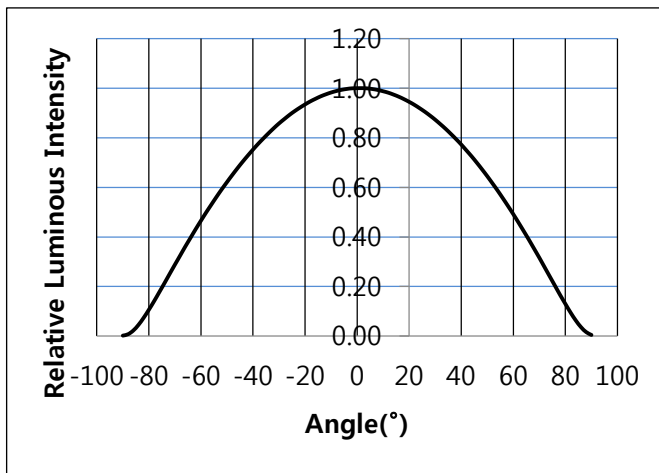
c) Temperature Characteristics (I_f = Sorting Current)



d) Color Shift Characteristics ($T_J = 85\text{ }^\circ\text{C}$, $I_F = \text{Sorting Current}$, $\text{CRI} = 80+$)

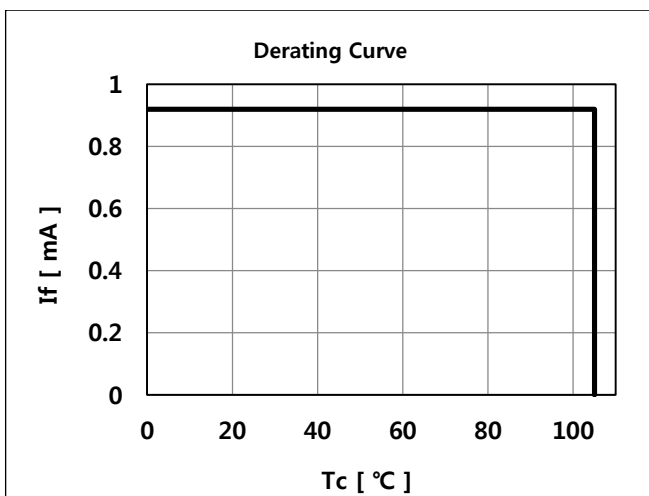


e) Beam Angle Characteristics ($I_F = \text{Sorting Current}$, $T_J = 85\text{ }^\circ\text{C}$)

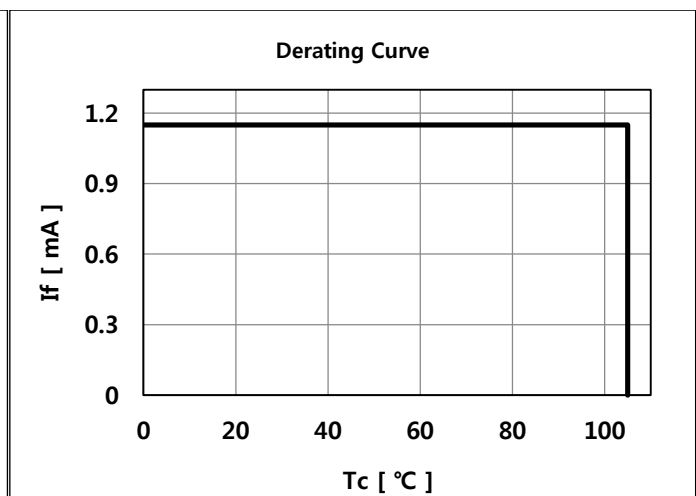


f) Derating Characteristics

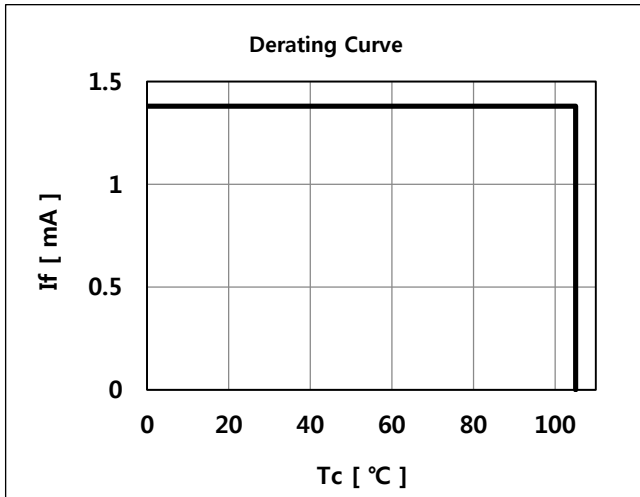
1) LC013D



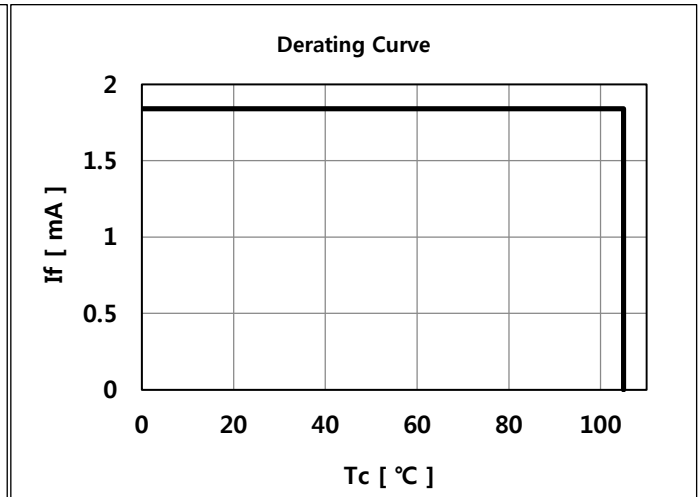
2) LC016D



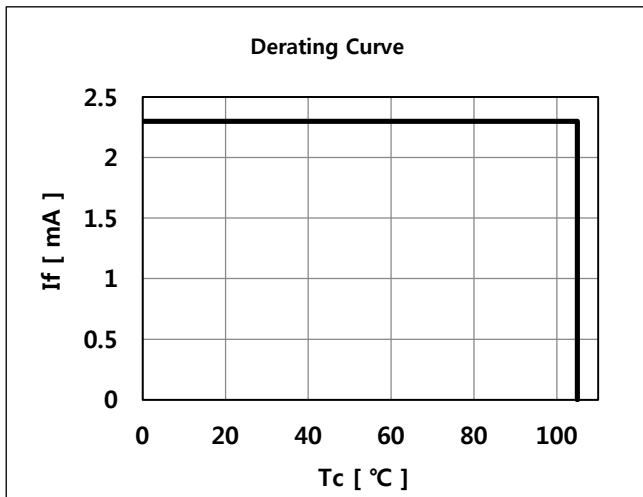
3) LC019D



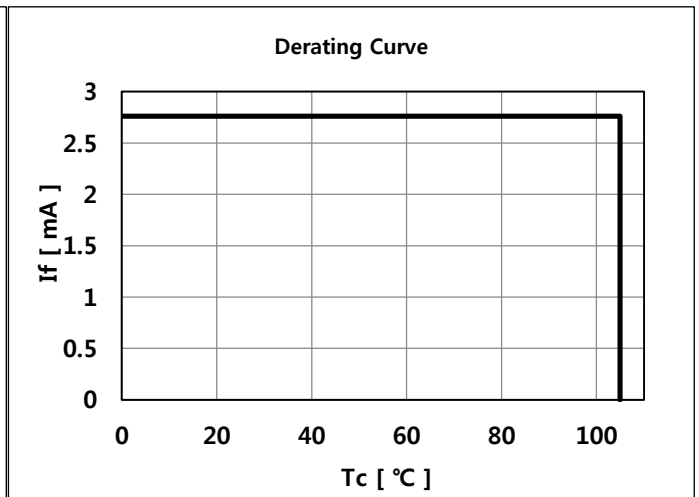
4) LC026D



5) LC033D

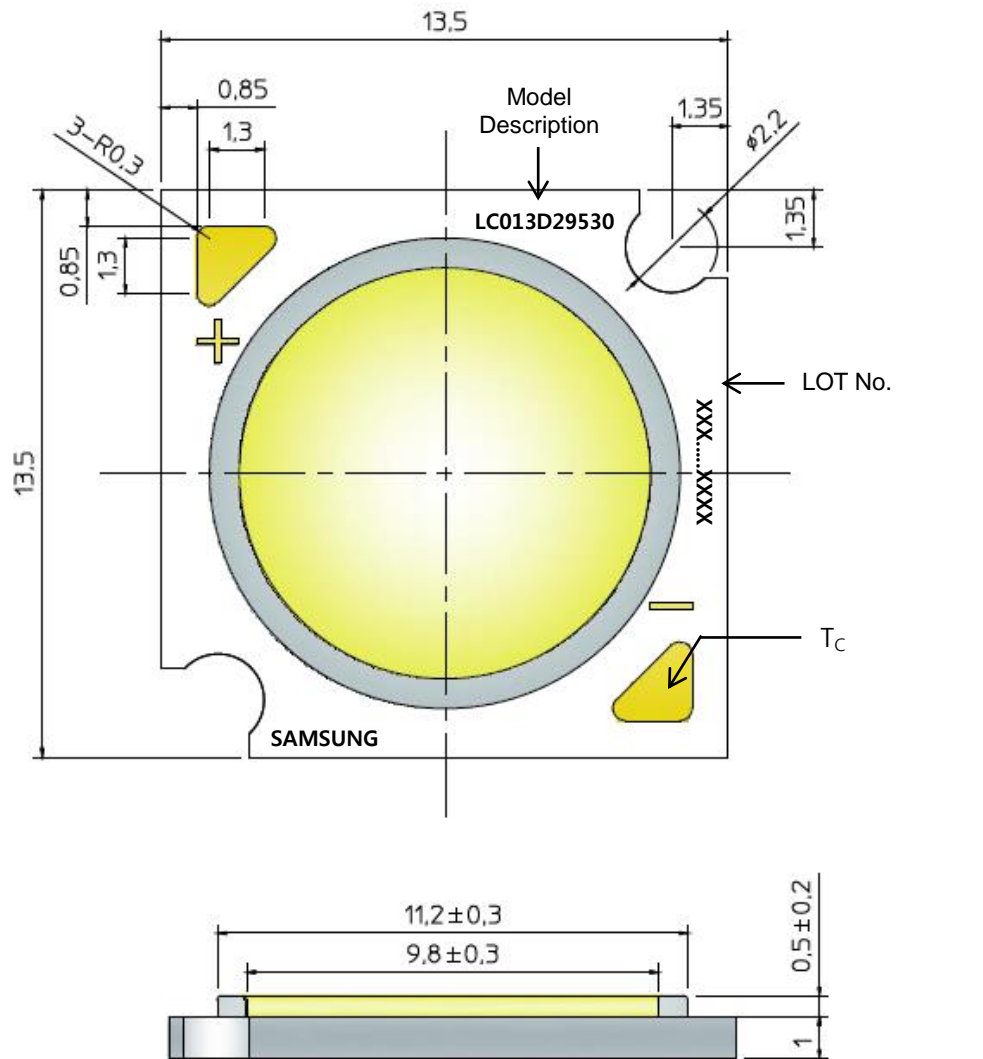


6) LC040D



4. Outline Drawing & Dimension

※ Model : LC013D

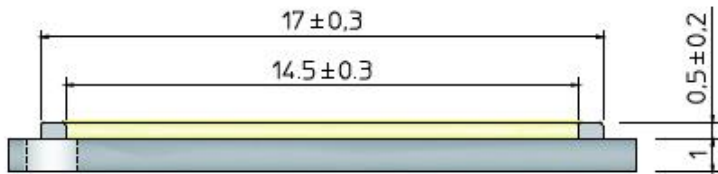
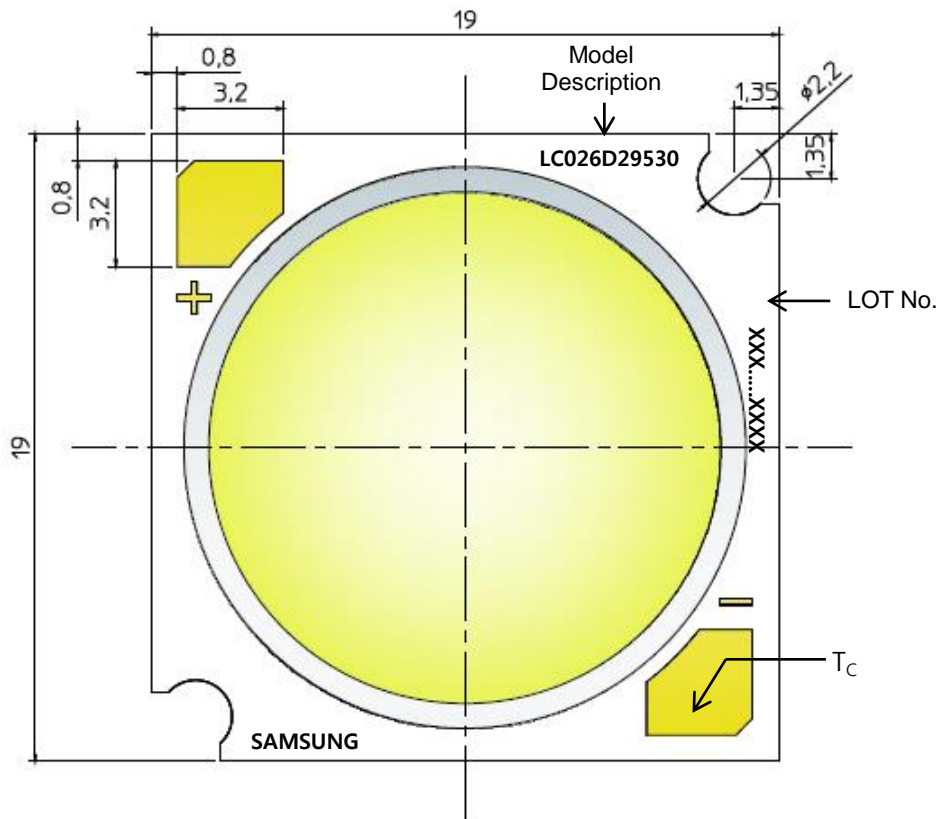


- 1. Unit: mm
- 2. Tolerance: ± 0.3 mm

Item	Dimension	Tolerance	Unit
Length	13.5	±0.3	mm
Width	13.5	±0.3	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
 (LC013D29530 : 13W, Ra95, 3000K)

※Model : LC016D, LC019D, LC026D, LC033D

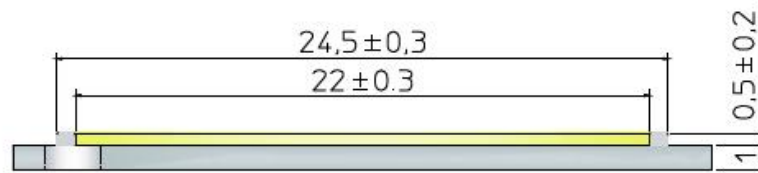
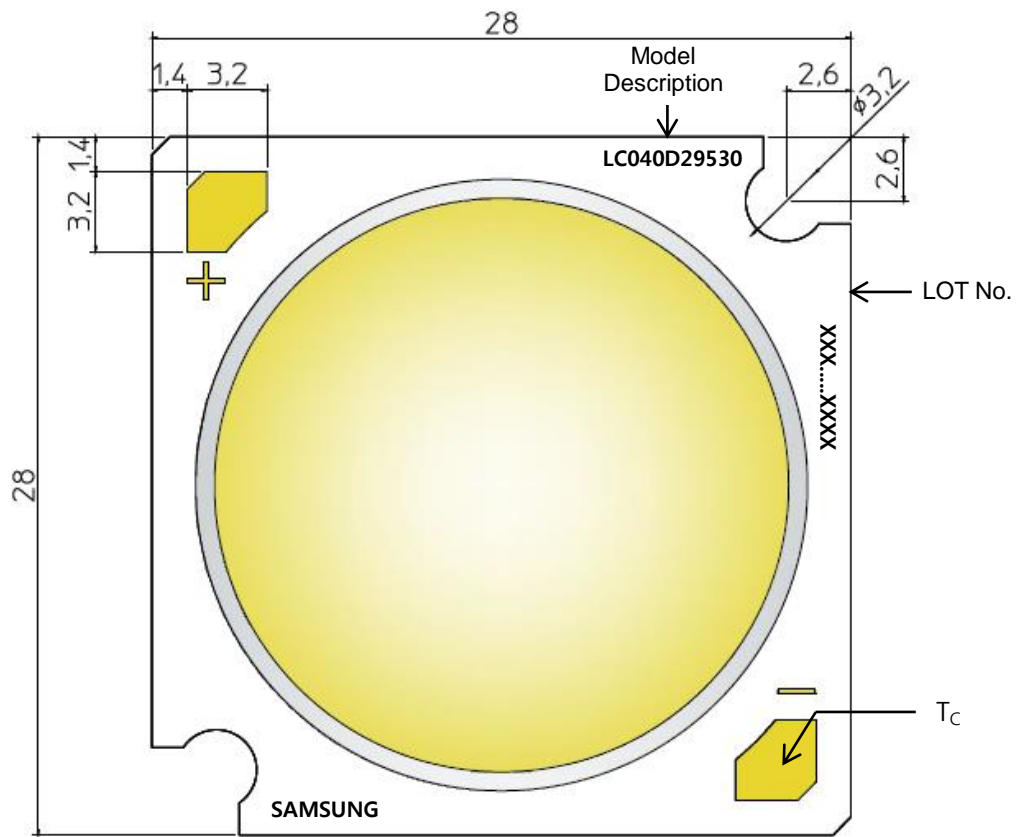


- 1. Unit: mm
- 2. Tolerance: ± 0.3 mm

Item	Dimension	Tolerance	Unit
Length	19.0	±0.30	mm
Width	19.0	±0.30	mm
Height	1.50	±0.20	mm
Light Emitting Surface (LES) Diameter	14.5	±0.30	mm

Note: Denoted product information above is only an example
 (LC026D29530 : 26W, Ra95, 3000K)

※Model : LC040D



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

Item	Dimension	Tolerance	Unit
Length	28.0	±0.30	mm
Width	28.0	±0.30	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
 (LC026D29530 : 26W, Ra95, 3000K)

5. Reliability Test Items & Conditions

a) Test Items

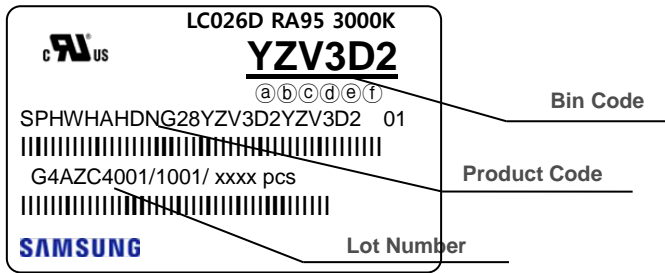
Test Item	Test Condition	Test Hour / Cycle
High Temperature Humidity Life Test	60 °C, 90 % RH., DC Derating, I_F	1000 h
High Temperature Life Test	85 °C, DC Derating, I_F	1000 h
Low Temperature Life Test	-40 °C, DC, Derating I_F	1000 h
High Temperature Storage	120 °C	1000 h
Low Temperature Storage	-40 °C	1000 h
Temperature Humidity Storage	60 °C, 90% RH	1000h
TemperatureCycle On/Off Test	-40 °C/ 85 °C each 20 min, 30 min transfer power on/off each 5 min, DC Derating, $I_F = \text{max}$	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 ($T_c = 25\text{ °C}$)	Limit	
			Min.	Max.
Forward Voltage	V_F	$I_F = 90\text{ mA}$	L.S.L. * 0.9	U.S.L. * 1.1
Luminous Flux	Φ_v	$I_F = 90\text{ mA}$	L.S.L. * 0.7	U.S.L. * 1.3

6. Label Structure

a) Label Structure



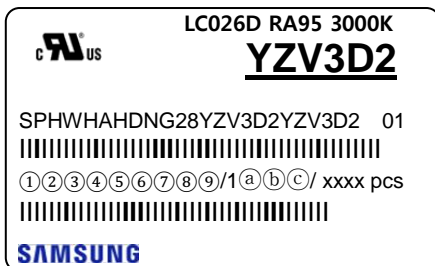
Note: Denoted bincode and product code above is only an example (see description on page 5)

Bin Code:

- ⒶⒷ: Forward Voltagebin (refer to page11)
- ⒸⒹ: Chromaticitybin (refer to page 9-10)
- ⒺⒻ: Luminous Fluxbin (refer to page 6)

b) Lot Number

The lot number is composed of the following characters:



① ③④⑤⑥⑦⑧⑨ / 1ⒶⒷⒸ / xxxx pcs

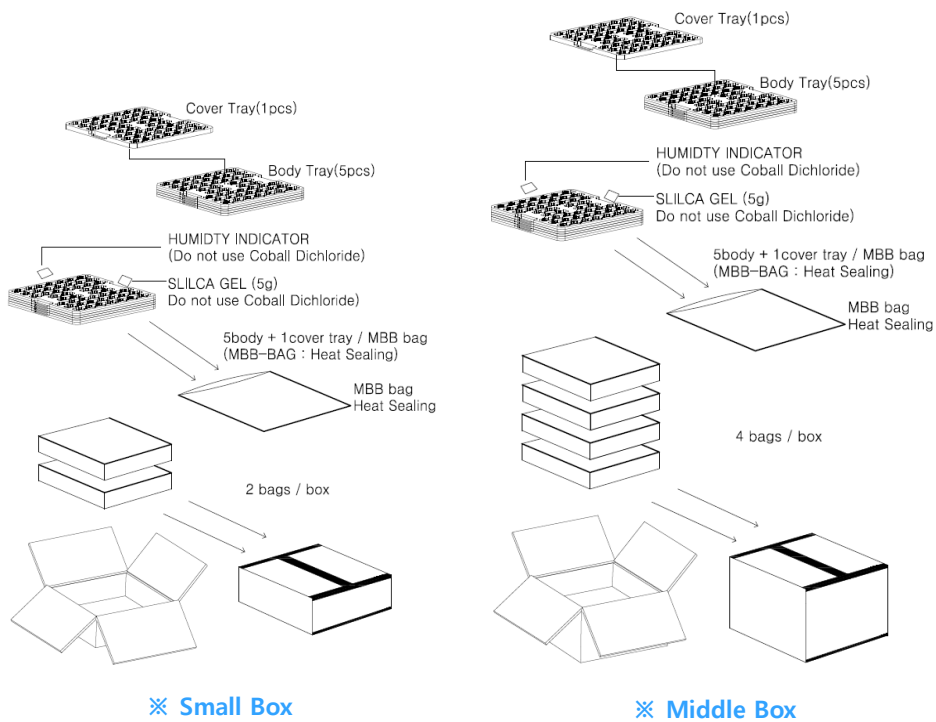
- ① : Production site (S: Giheung, Korea, G: Tianjin, China)
- ② : 7(LED)
- ③ : Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
- ④ : Year (Z: 2015, A: 2016, B: 2017...)
- ⑤ : Month (1~9, A, B, C)
- ⑥⑦⑧⑨ : Day (1~9, A, B~V)
- ⒶⒷⒸ : Product serial number (001 ~ 999)

7. Packing Structure

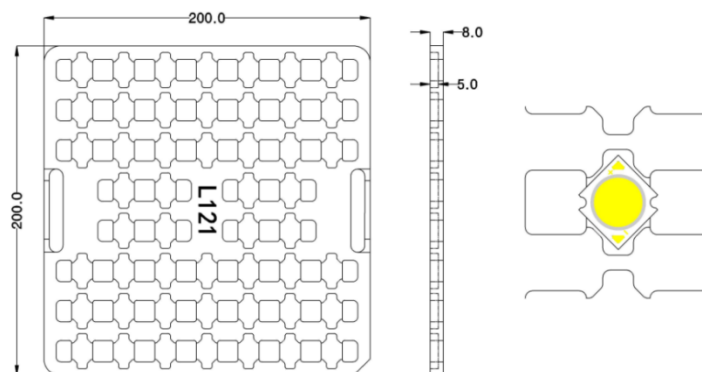
※Model : LC013D

Packing material	Max. quantity in pcs of COB	Dimension(mm)			Tolerance
		Length	Width	Height	
Tray	50	200	200	8	1
Anti-Static Bag	250 (5 trays)	320	270	-	+/- 0.5
Outer Box (Small)	500 (2 bags)	225	225	65	5
Outer Box (Middle)	1000 (4 bags)	225	225	130	5

a) Packing Structure



b) Tray

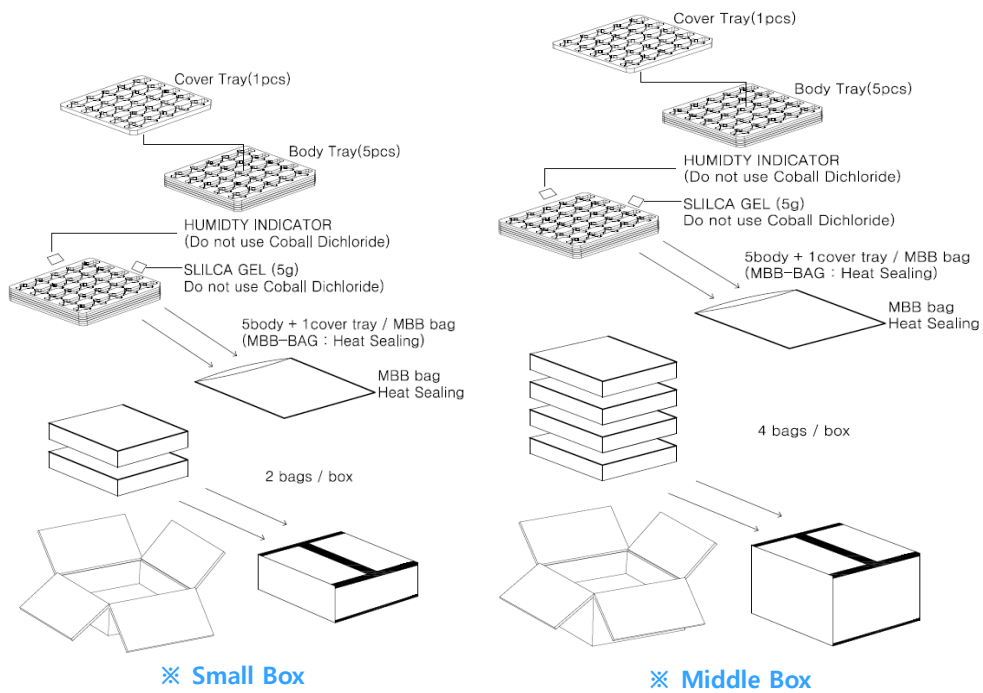


7. Packing Structure

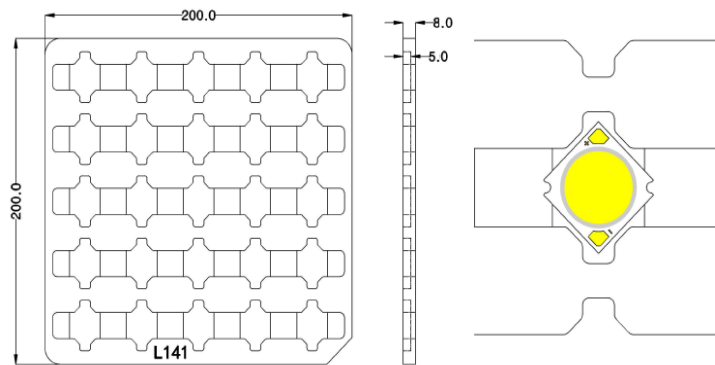
※Model : LC016D, LC019D, LC026D, LC033D

Packing material	Max. quantity in pcs of COB	Dimension(mm)				Tolerance
		Length	Width	Height		
Tray	25	200	200	8	1	
Anti-Static Bag	125 (5 trays)	320	270	-	+/- 0.5	
Outer Box (Small)	250 (2 bags)	225	225	65	5	
Outer Box (Middle)	500 (4 bags)	225	225	130	5	

a) Packing Structure



b) Tray

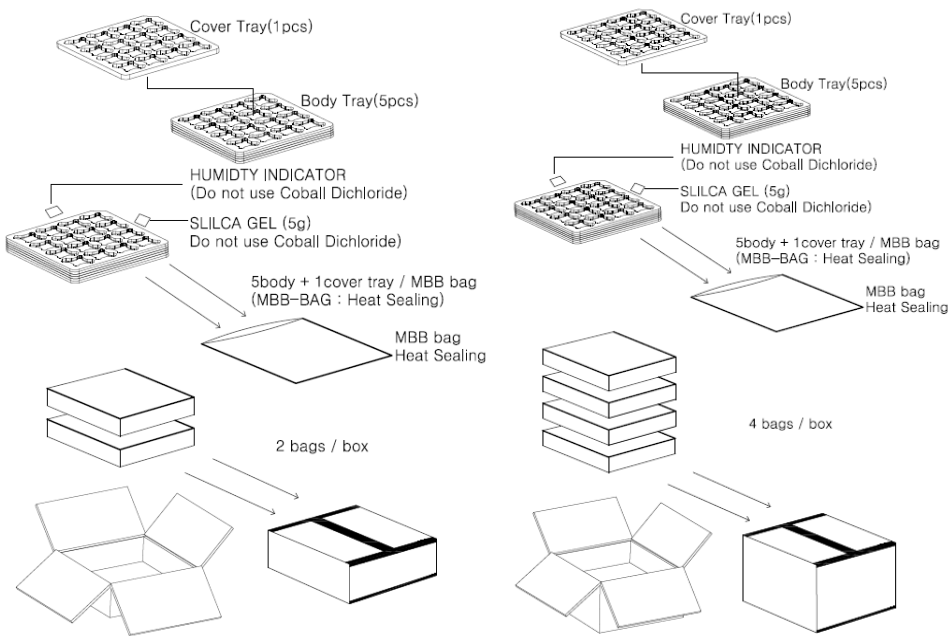


7. Packing Structure

※Model : LC040D

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

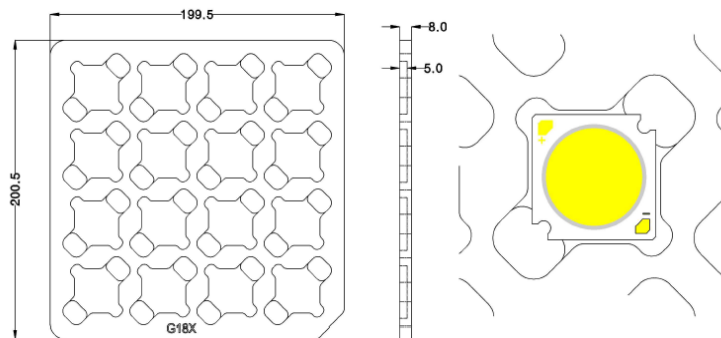
a) Packing Structure



※ Small Box

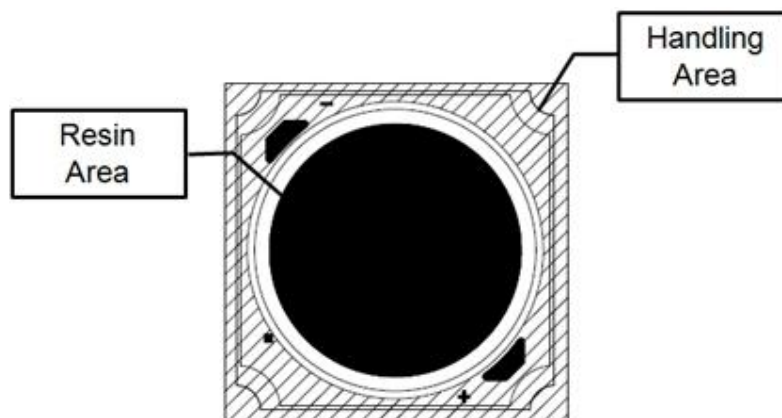
※ Middle Box

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 °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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