

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	-	-
Thermal Resistance (junction to case point)	°C/W	LC013D	-	-	0.85	-
		LC016D	-	-	0.67	-
		LC019D	-	-	0.6	-
		LC026D	-	-	0.47	-
		LC033D	-	-	0.4	-
		LC040D	-	-	0.32	-
Beam Angle	°	All Model	-	-	115	-
Nominal Power (Sorting Current)	W (mA)	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 = Sorting Current)

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

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

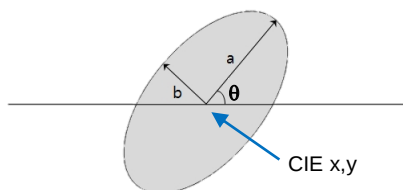
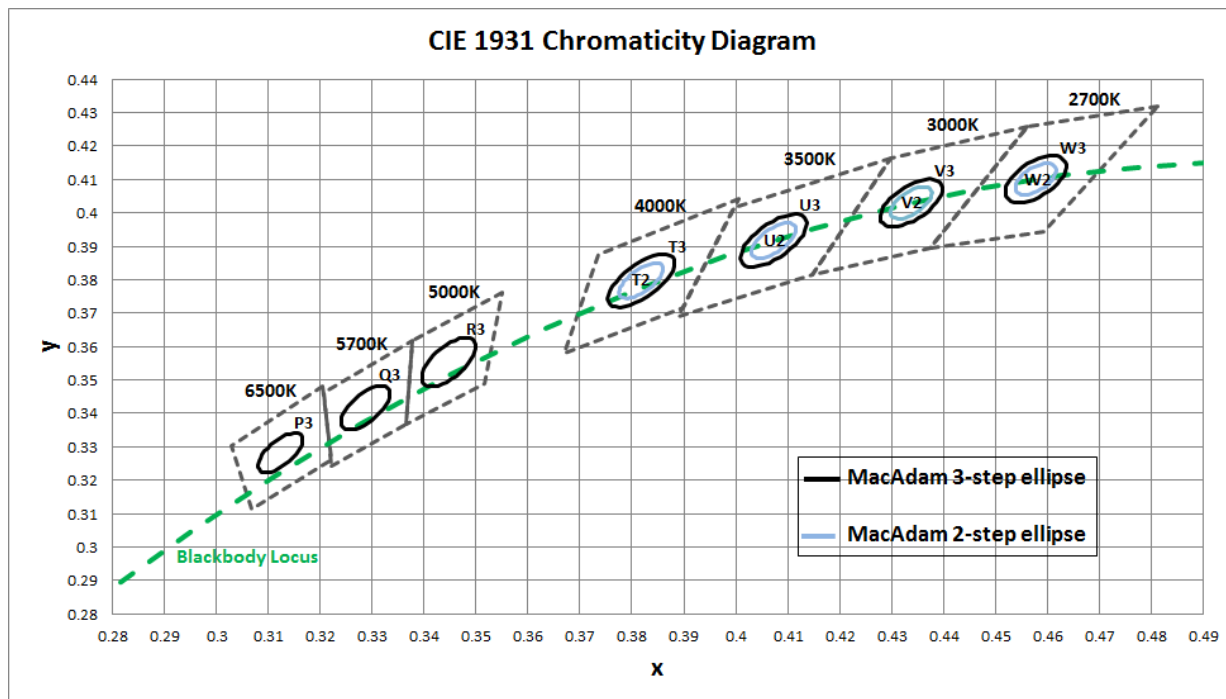
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
S	P	H	W	H	A	H	D	N	G	2	8	Y	Z	V	3	D	2

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	Min. 95 (85 °C)
13 14	Forward Voltage (V)	YZ	31.8~37.5
15	CCT (K)	W V U T	2700 K 3000 K 3500 K 4000 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	SPHWHABDND28YZW2D2	YZ	W2	D2	1161~
		SPHWHABDND28YZW3D2		W3		
	3000	SPHWHABDND28YZV2D2	YZ	V2	D2	1221~
		SPHWHABDND28YZV3D2		V3		
	3500	SPHWHABDND28YZU2D2	YZ	U2	D2	1270~
		SPHWHABDND28YZU3D2		U3		
	4000	SPHWHABDND28YZT2D2	YZ	T2	D2	1310~
		SPHWHABDND28YZT3D2		T3		
LC016D	2700	SPHWHABDNE28YZW2D2	YZ	W2	D2	1496~
		SPHWHABDNE28YZW3D2		W3		
	3000	SPHWHABDNE28YZV2D2	YZ	V2	D2	1572~
		SPHWHABDNE28YZV3D2		V3		
	3500	SPHWHABDNE28YZU2D2	YZ	U2	D2	1636~
		SPHWHABDNE28YZU3D2		U3		
	4000	SPHWHABDNE28YZT2D2	YZ	T2	D2	1687~
		SPHWHABDNE28YZT3D2		T3		
LC019D	2700	SPHWHABDNF28YZW2D2	YZ	W2	D2	1786~
		SPHWHABDNF28YZW3D2		W3		
	3000	SPHWHABDNF28YZV2D2	YZ	V2	D2	1877~
		SPHWHABDNF28YZV3D2		V3		
	3500	SPHWHABDNF28YZU2D2	YZ	U2	D2	1954~
		SPHWHABDNF28YZU3D2		U3		
	4000	SPHWHABDNF28YZT2D2	YZ	T2	D2	2015~
		SPHWHABDNF28YZT3D2		T3		

Model	Nominal CCT (K)	Product Code	V _F Rank	Color Rank	Flux Rank	Flux Range (Φ _v , lm)
LC026D	2700	SPHWHABDNG28YZW2D2	YZ	W2	D2	2346~
		SPHWHABDNG28YZW3D2		W3		
	3000	SPHWHABDNG28YZV2D2	YZ	V2	D2	2466~
		SPHWHABDNG28YZV3D2		V3		
	3500	SPHWHABDNG28YZU2D2	YZ	U2	D2	2566~
		SPHWHABDNG28YZU3D2		U3		
	4000	SPHWHABDNG28YZT2D2	YZ	T2	D2	2646~
		SPHWHABDNG28YZT3D2		T3		
LC033D	2700	SPHWHABDNH28YZW2D2	YZ	W2	D2	2904~
		SPHWHABDNH28YZW3D2		W3		
	3000	SPHWHABDNH28YZV2D2	YZ	V2	D2	3051
		SPHWHABDNH28YZV3D2		V3		
	3500	SPHWHABDNH28YZU2D2	YZ	U2	D2	3176~
		SPHWHABDNH28YZU3D2		U3		
	4000	SPHWHABDNH28YZT2D2	YZ	T2	D2	3275~
		SPHWHABDNH28YZT3D2		T3		
LC040D	2700	SPHWHABDNK28YZW2D2	YZ	W2	D2	3572~
		SPHWHABDNK28YZW3D2		W3		
	3000	SPHWHABDNK28YZV2D2	YZ	V2	D2	3754~
		SPHWHABDNK28YZV3D2		V3		
	3500	SPHWHABDNK28YZU2D2	YZ	U2	D2	3907~
		SPHWHABDNK28YZU3D2		U3		
	4000	SPHWHABDNK28YZT2D2	YZ	T2	D2	4029~
		SPHWHABDNK28YZT3D2		T3		

b) Chromaticity Region & Coordinates (I_F = Sorting Current, T_J = 85 °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

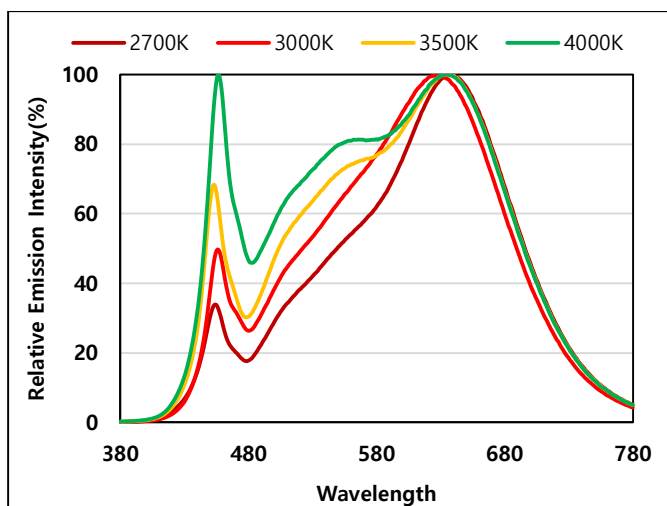
MacAdam Ellipse (T2, T3)					
Step	CIE x	CIE y	θ	a	b
2-step	0.3818	0.3797	53.72	0.0063	0.0027
3-step	0.3818	0.3797	53.72	0.0094	0.0040

Note:

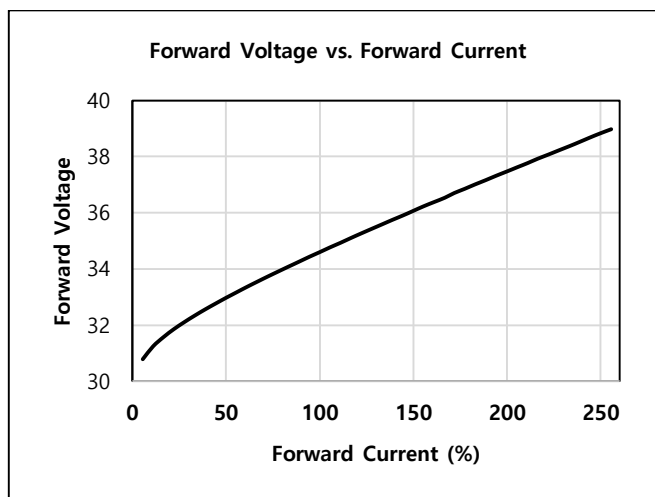
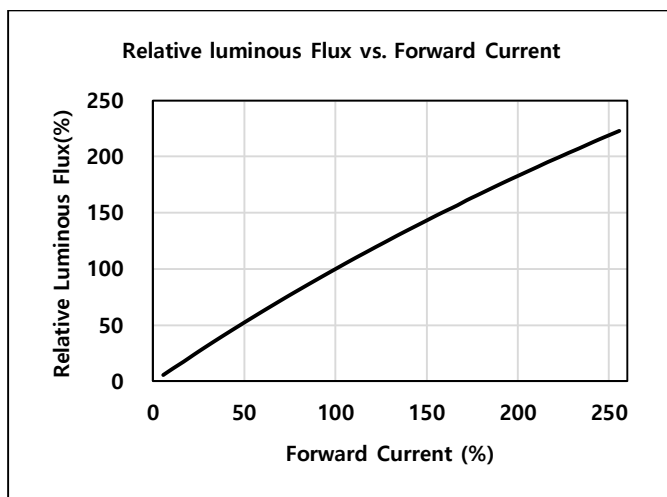
Samsung maintains measurement tolerance of: $C_x, C_y = \pm 0.005$

3. Typical Characteristics Graphs

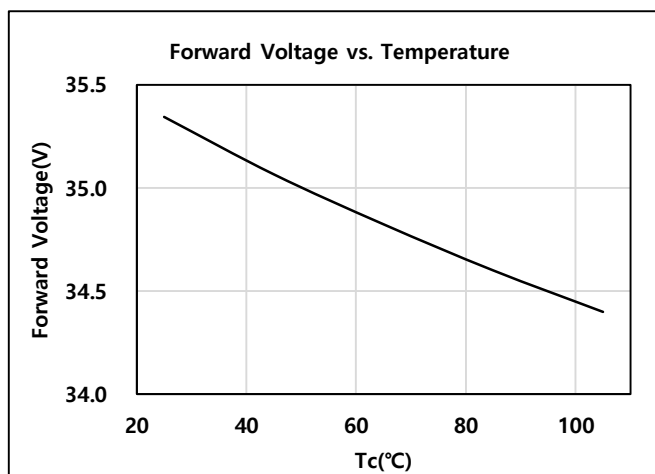
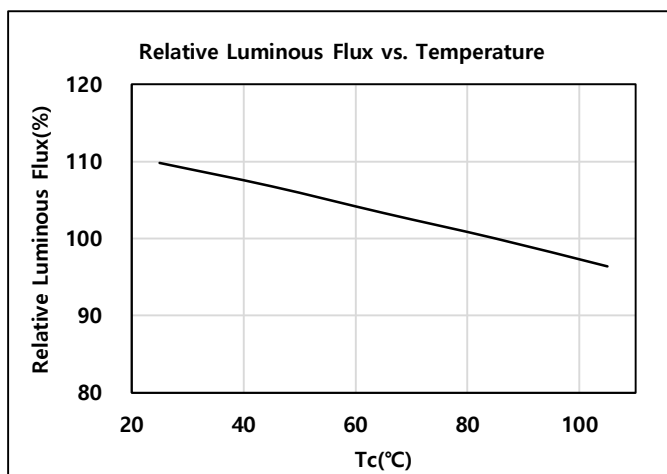
a) Spectrum Distribution (I_F = Sorting Current, $T_J = 85^\circ\text{C}$)



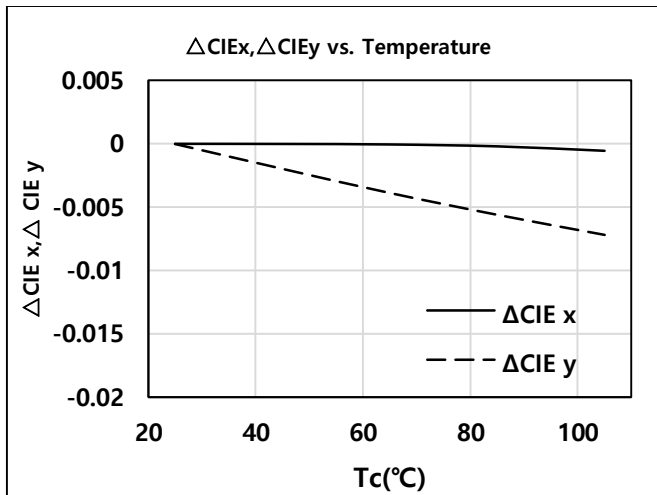
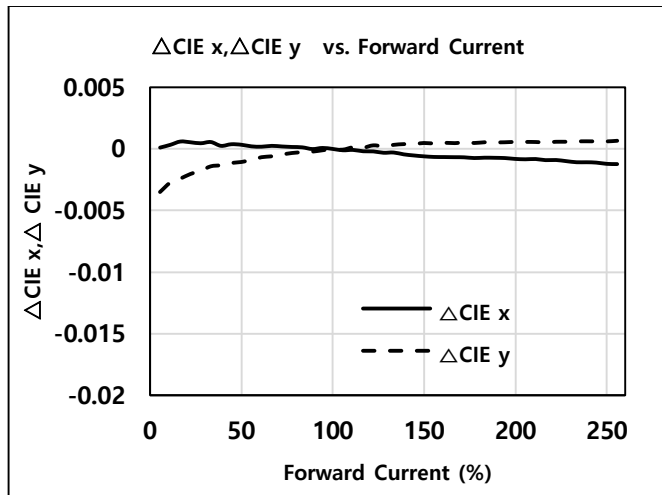
b) Forward Current Characteristics ($T_J = 85^\circ\text{C}$)



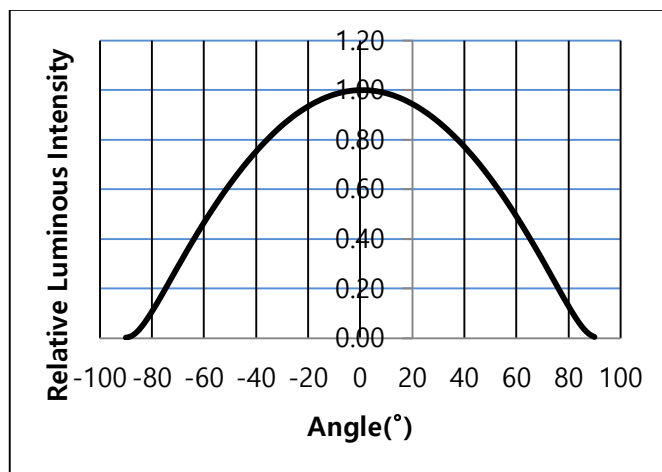
c) Temperature Characteristics (I_F = Sorting Current)



d) Color Shift Characteristics ($T_J = 85^\circ\text{C}$, $I_F = 90\text{mA}$, $\text{CRI} = 80+$)

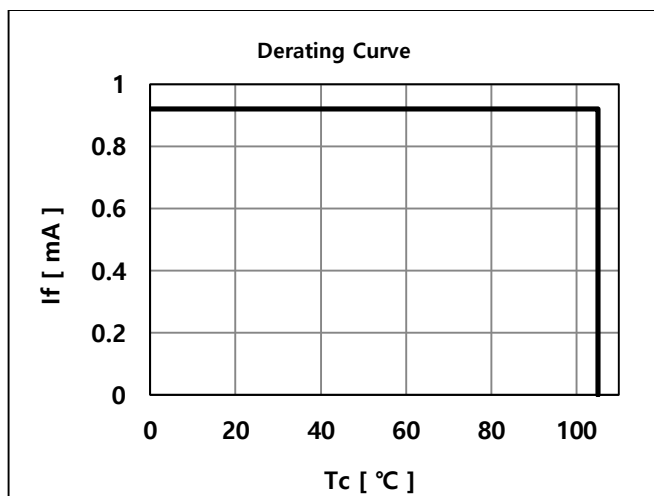


e) Beam Angle Characteristics ($I_F = \text{Sorting Current}$, $T_J = 85^\circ\text{C}$)

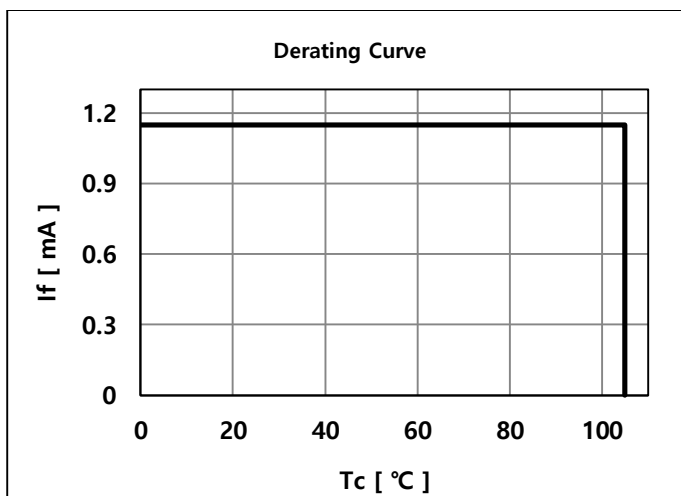


f) Derating Characteristics

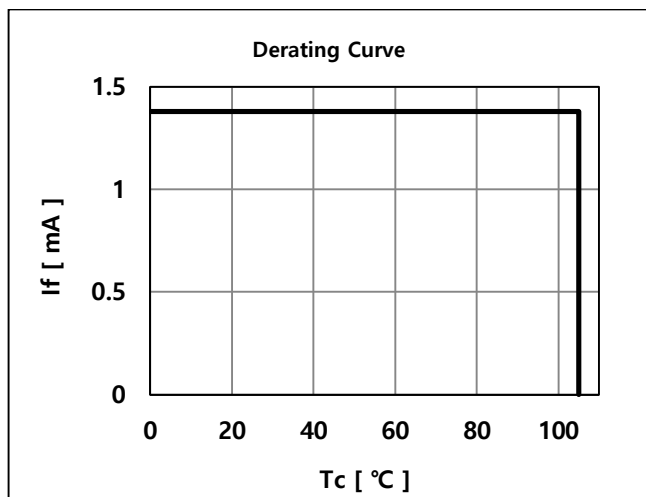
1) LC013D



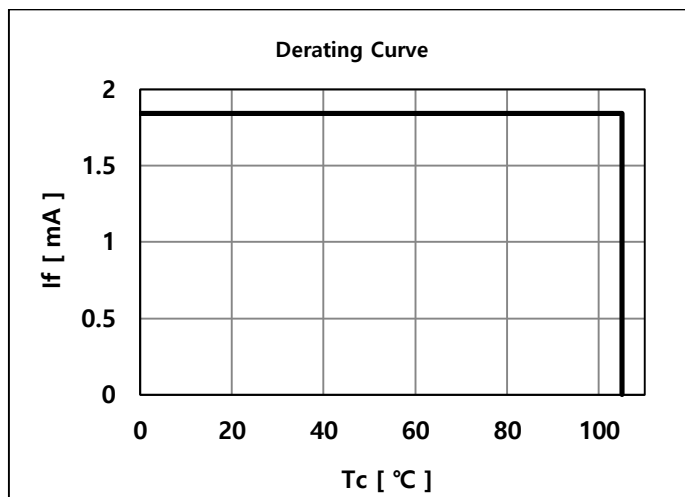
2) LC016D



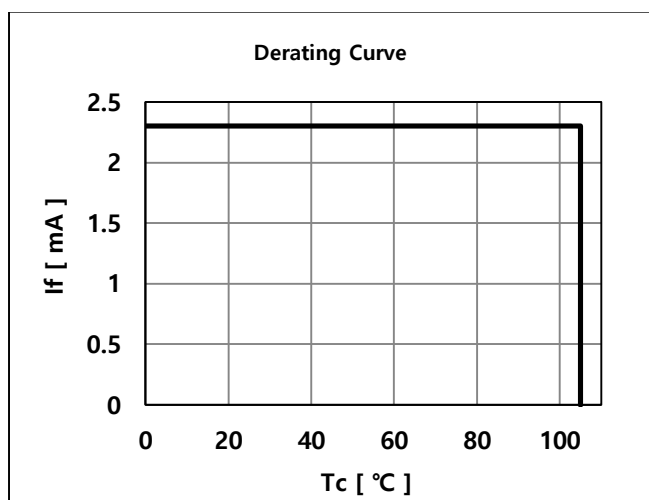
3) LC019D



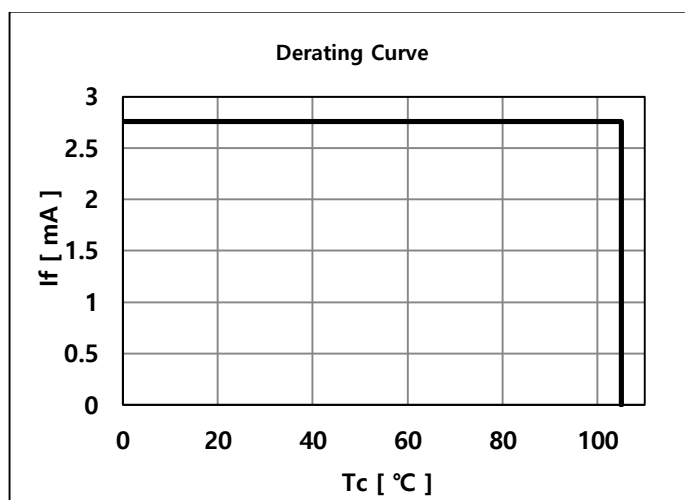
4) LC026D



5) LC033D

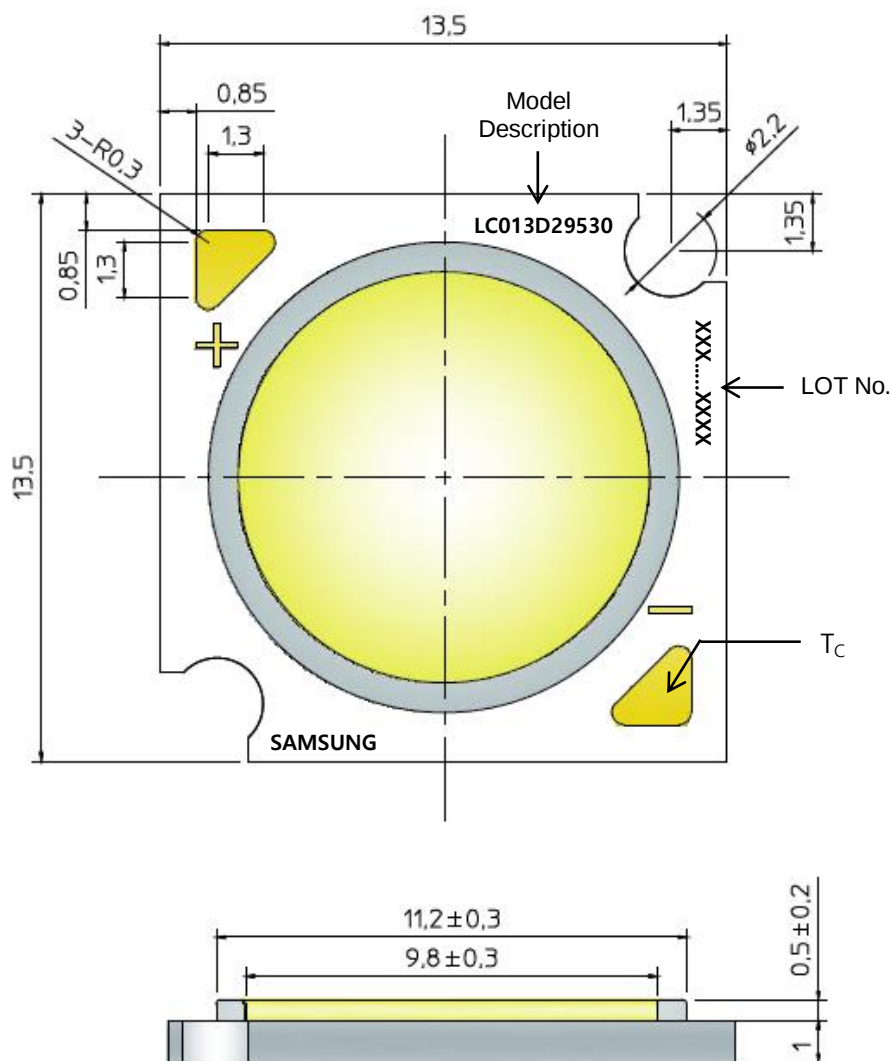


6) LC040D



4. Outline Drawing & Dimension

※ Model : LC013D

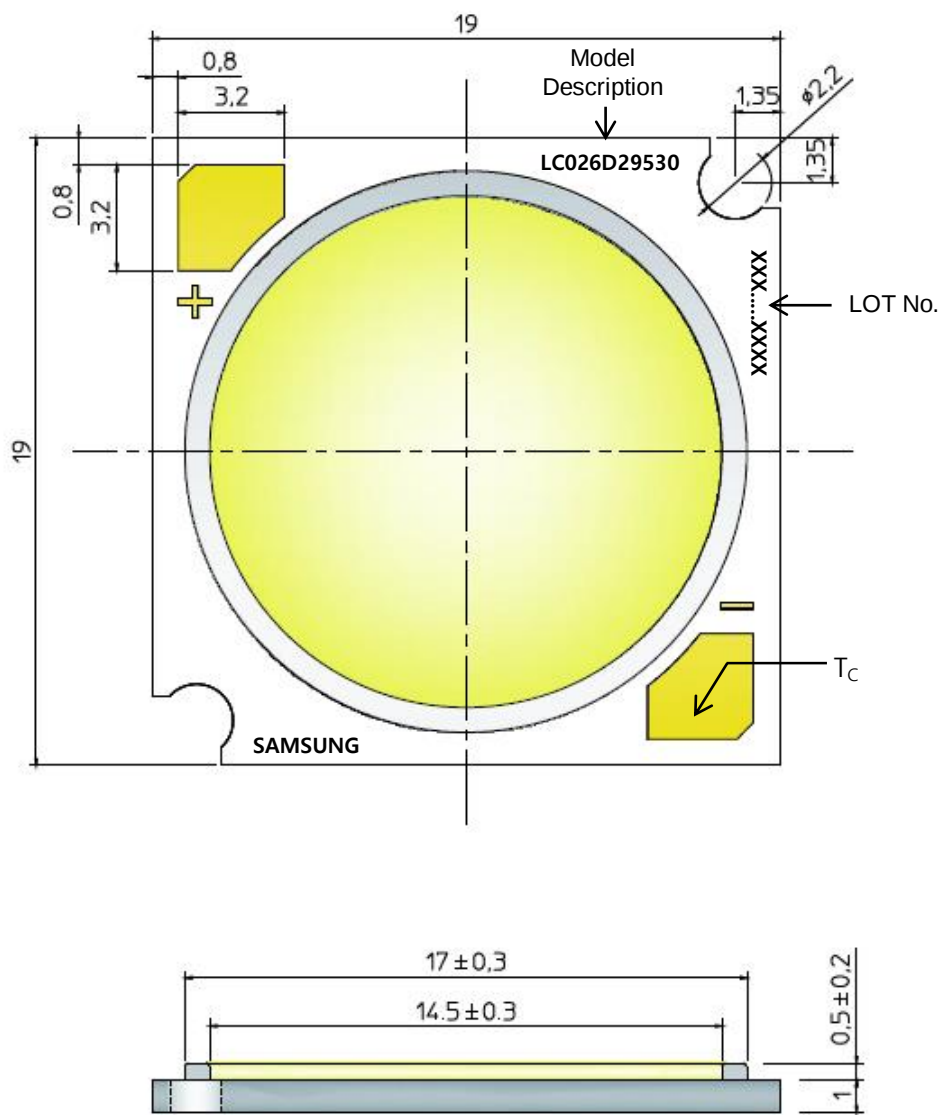


1. Unit: mm
2. Tolerance: ± 0.3 mm

Item	Dimension	Tolerance	Unit
Length	13.5	±0.15	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
(LC013D29530 : 13W, Ra95, 3000K)

※ Model : LC016D, LC019D, LC026D, LC033D

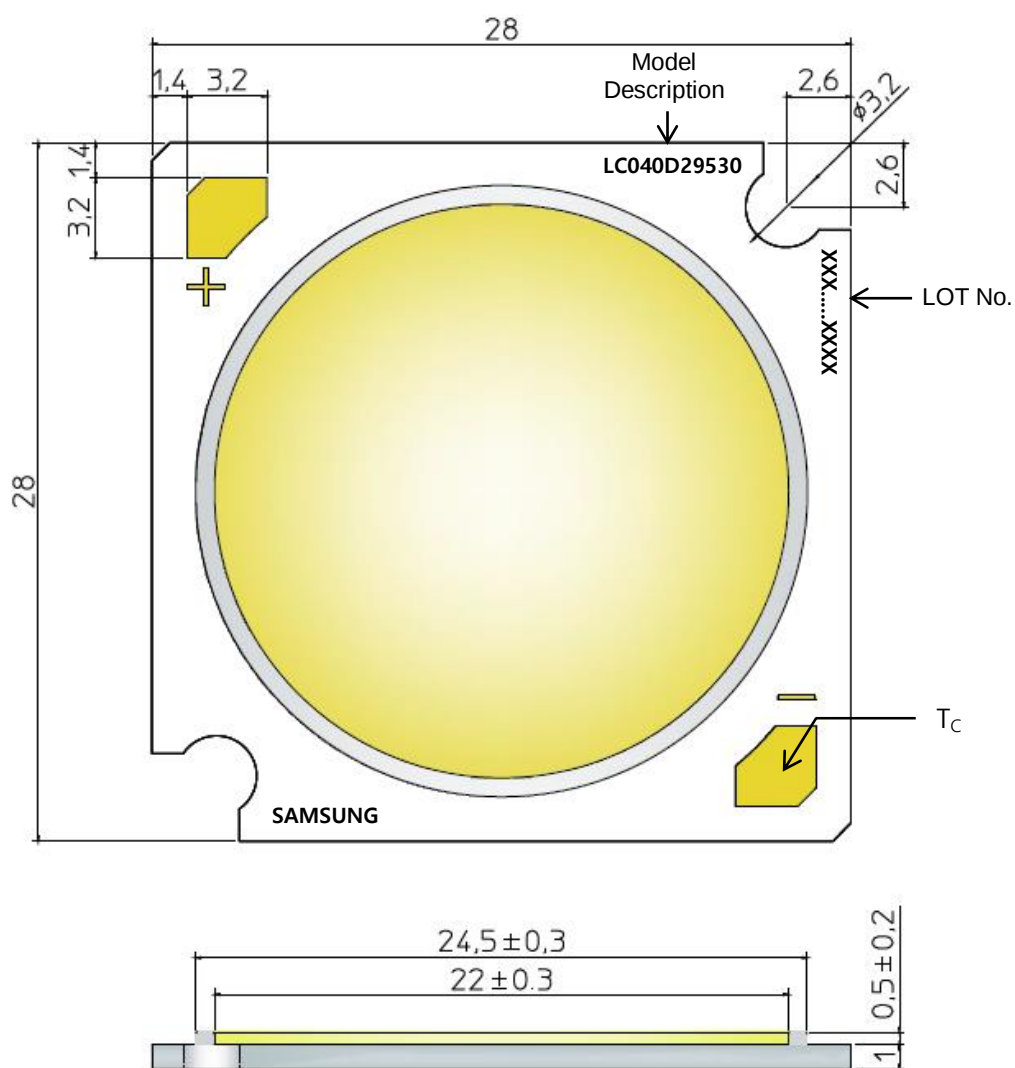


1. Unit: mm
2. Tolerance: ± 0.3 mm

Item	Dimension	Tolerance	Unit
Length	19.0	±0.15	mm
Width	19.0	±0.15	mm
Height	1.50	±0.30	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	±0.15	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
(LC026D29530 : 26W, Ra95, 3000K)

5. Reliability Test Items & Conditions

a) Test Items

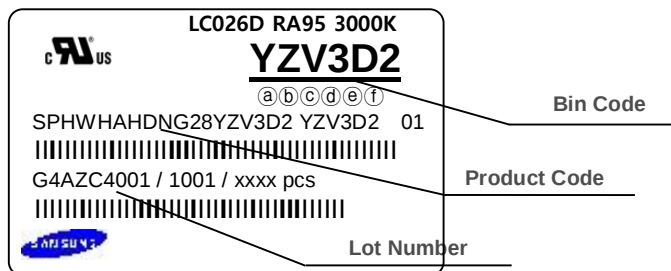
Test Item	Test Condition	Test Hour / Cycle
High Temperature Humidity Life Test	60 °C, 90 % RH,, DC Derating, I_F	1000 h
High Temperature Life Test	85 °C, DC Derating, I_F	1000 h
Low Temperature Life Test	-40 °C, DC, Derating I_F	1000 h
High Temperature Storage	120 °C	1000 h
Low Temperature Storage	-40 °C	1000 h
Temperature Humidity Storage	60 °C, 90% RH	1000h
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%, H ₂ S 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 = 90 mA	L.S.L. * 0.9	U.S.L. * 1.1
Luminous Flux	Φ _v	I _F = 90 mA	L.S.L * 0.7	U.S.L * 1.3

6. Label Structure

a) Label Structure



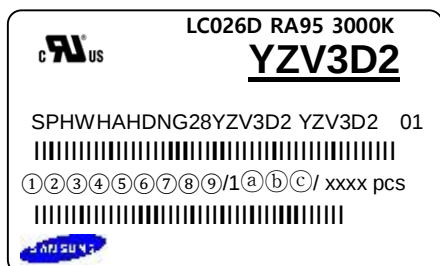
Note: Denoted bin code and product code above is only an example (see description on page 5)

Bin Code:

- ①②: Forward Voltage bin (refer to page 11)
- ③④: Chromaticity bin (refer to page 9-10)
- ⑤⑥: Luminous Flux bin (refer to page 6)

b) Lot Number

The lot number is composed of the following characters:



① ②③④⑤⑥⑦⑧⑨ / 1 ①②③ / xxxx pcs

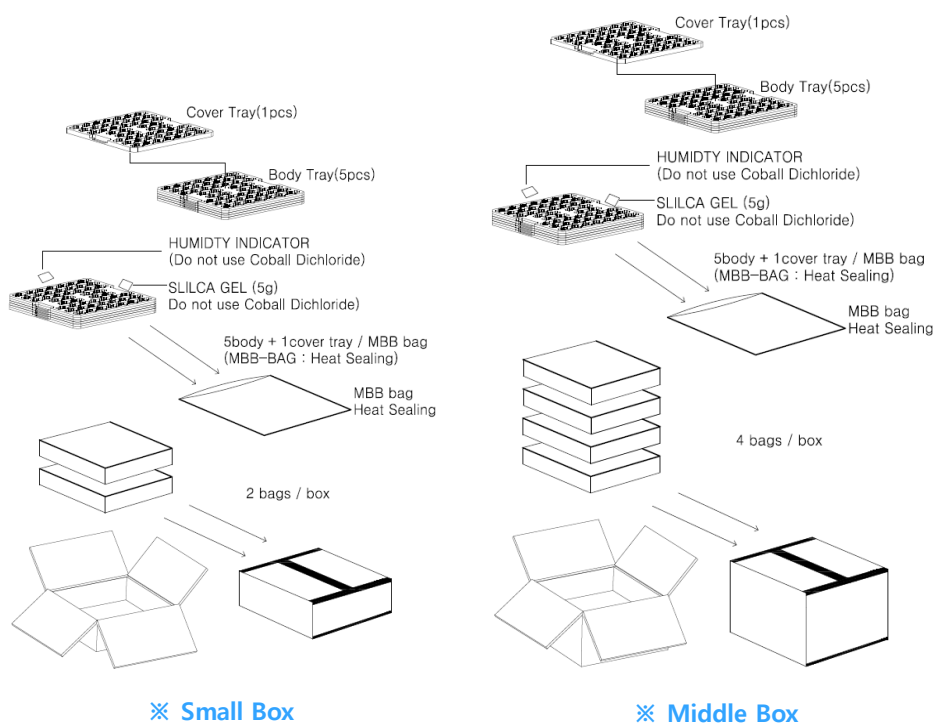
- ① : Production site (S: Giheung, Korea, G: Tianjin, China)
- ② : 7 (LED)
- ③ : Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
- ④ : Year (Z: 2015, A: 2016, B: 2017...)
- ⑤ : Month (1~9, A, B, C)
- ⑥⑦⑧⑨ : Day (1~9, A, B~V)
- ①②③ : Product serial number (001 ~ 999)

7. Packing Structure

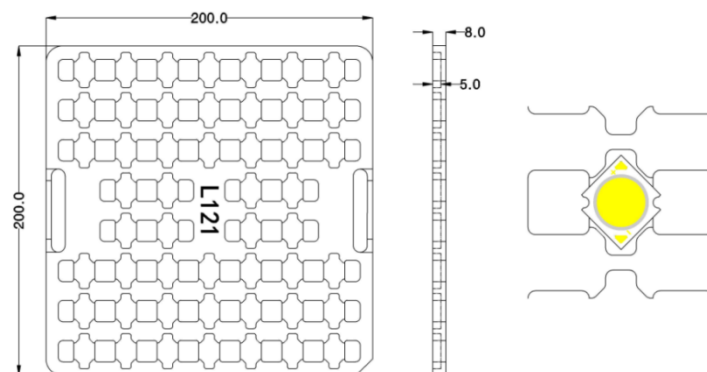
※ Model : LC013D

Packing material	Max. quantity in pcs of COB	Dimension(mm)			
		Length	Width	Height	Tolerance
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

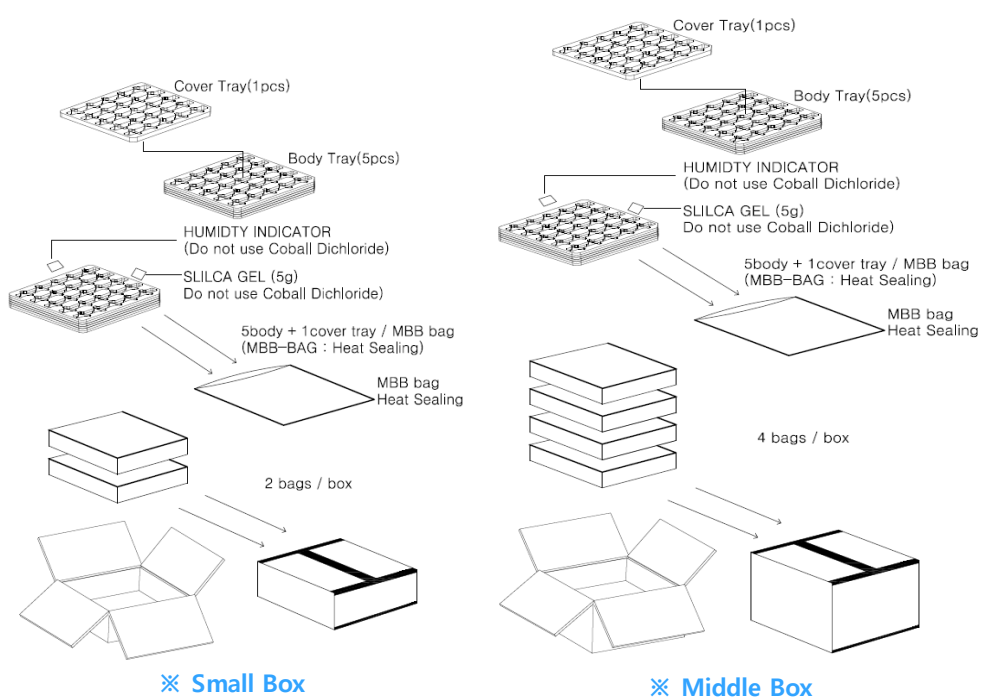


7. Packing Structure

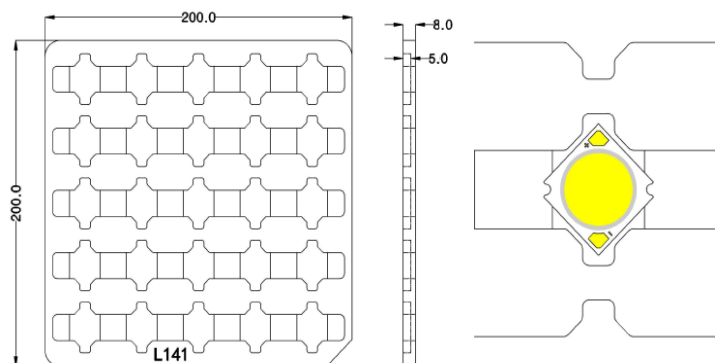
※ Model : LC016D, LC019D, LC026D, LC033D

Packing material	Max. quantity in pcs of COB	Dimension(mm)			
		Length	Width	Height	Tolerance
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

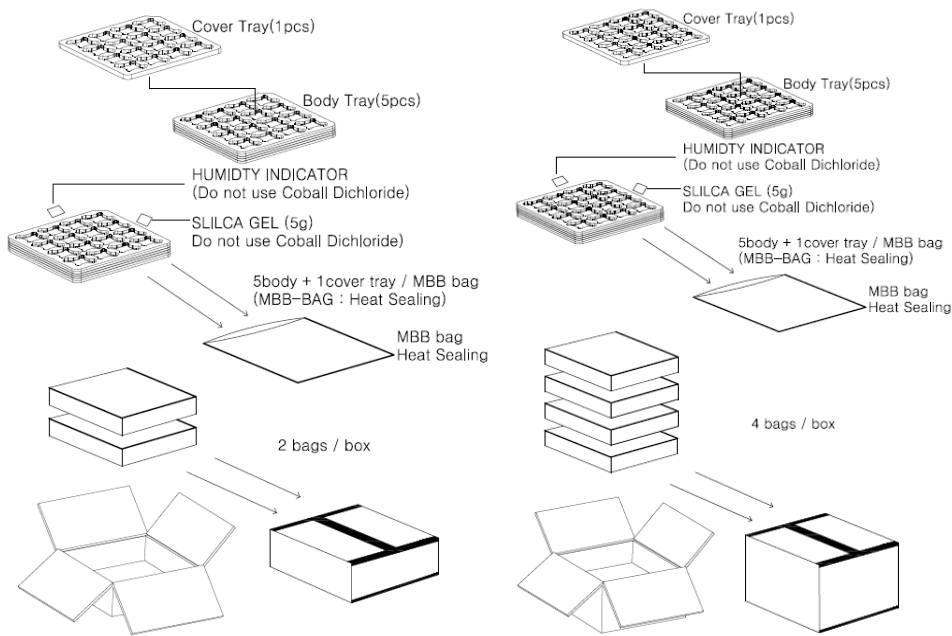


7. Packing Structure

※ 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

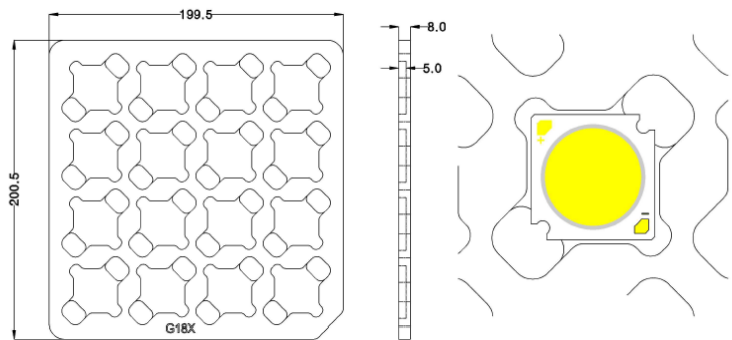
a) Packing Structure



※ Small Box

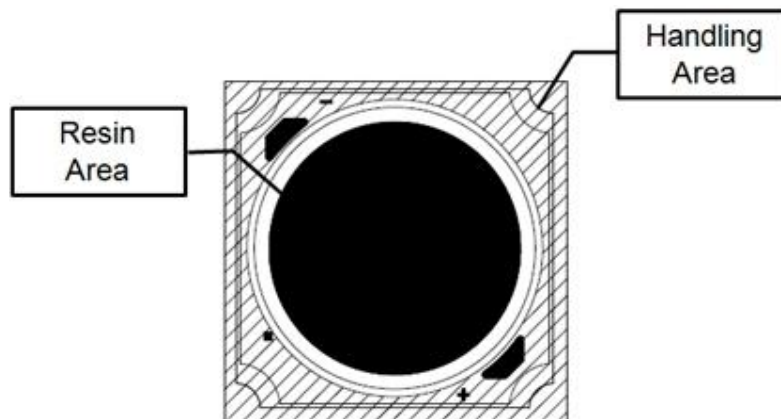
※ Middle Box

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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