

High Voltage LED Series  
Chip on Board

# COB R - Series Fashion\_ Vivid White



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	Model	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 / 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 / 86.0		-
		LC040D	2760 / 103.5		-
ESD (HBM)	-	-	±2	kV	-

**b) Electro-optical Characteristics ( $I_F$  = Sorting Current,  $T_J = 85\text{ °C}$ )**

Item	Unit	Model	Rank	Min.	Typ.	Max.
Forward Voltage ( $V_F$ )	V		YZ	31.8	34.6	37.5
Color Rendering Index ( $R_a$ )	-		7	90	-	-
Thermal Resistance (Junction to CasePoint)	°C/W	LC013D	-	-	0.85	-
		LC016D	-	-	0.67	-
		LC019D	-	-	0.60	-
		LC026D	-	-	0.47	-
		LC033D	-	-	0.4	-
		LC040D	-	-	0.32	-
Beam Angle	°	-	-	-	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 ( $T_J = T_C = T_a = 85\text{ °C}$ )
- 2) Samsung maintains 6 measurement tolerance of: forward voltage =  $\pm 5\%$ , CRI =  $\pm 1$
- 3) Refer to the derating curve, '3. Typical Characteristics Graph' designed within the range.

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

Model	CRI (R <sub>a</sub> ) Min.	Nominal CCT (K)	Flux Rank	Flux@ T <sub>c</sub> = 85 °C (lm)		
				Min.	Typ.	Max.
LC013D	90	3000	D2	1435	1511	-
		3500	D2	1494	1573	-
		4000	D2	1541	1622	-
LC016D	90	3000	D2	1837	1934	-
		3500	D2	1912	2013	-
		4000	D2	1972	2076	-
LC019D	90	3000	D2	2195	2310	-
		3500	D2	2284	2404	-
		4000	D2	2355	2479	-
LC026D	90	3000	D2	2917	3071	-
		3500	D2	3036	3196	-
		4000	D2	3131	3296	-
LC033D	90	3000	D2	3589	3778	-
		3500	D2	3735	3932	-
		4000	D2	3852	4055	-
LC040D	90	3000	D2	4428	4662	-
		3500	D2	4591	4833	-
		4000	D2	4745	4994	-

#### 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 =  $\pm 1$

## 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	D	2	7	Y	Z	V	N	D	2

Digit	PKG Information	Code	Specification
1 2 3	Samsung Package High Power	<b>SPH</b>	
4 5	Color	<b>WH</b>	White
6	Product Version	<b>A</b>	
7 8	Form Factor	<b>HD</b>	COB
9	Lens Type	<b>N</b>	No lens
10	Wattage or Model	<b>D</b> <b>E</b> <b>F</b> <b>G</b> <b>H</b> <b>K</b>	LC013D LC016D LC019D LC026D LC033D LC040D
11	Internal Code	2	
12	CRI & Sorting Temperature	7	Vivid white, Min. 90 (85°C)
13 14	Forward Voltage (V)	YZ	31.8~37.5
15	CCT (K)	V U T	3000K 3500K 4000K
16	MacAdam Step	M N	Color Bin for Vivid color product(Mac2) Color Bin for Vivid color product(Mac3)
17 18	Luminous Flux (Lm)	D2	COB D-series Gen.2 level

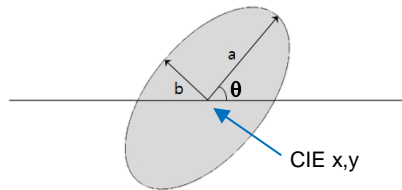
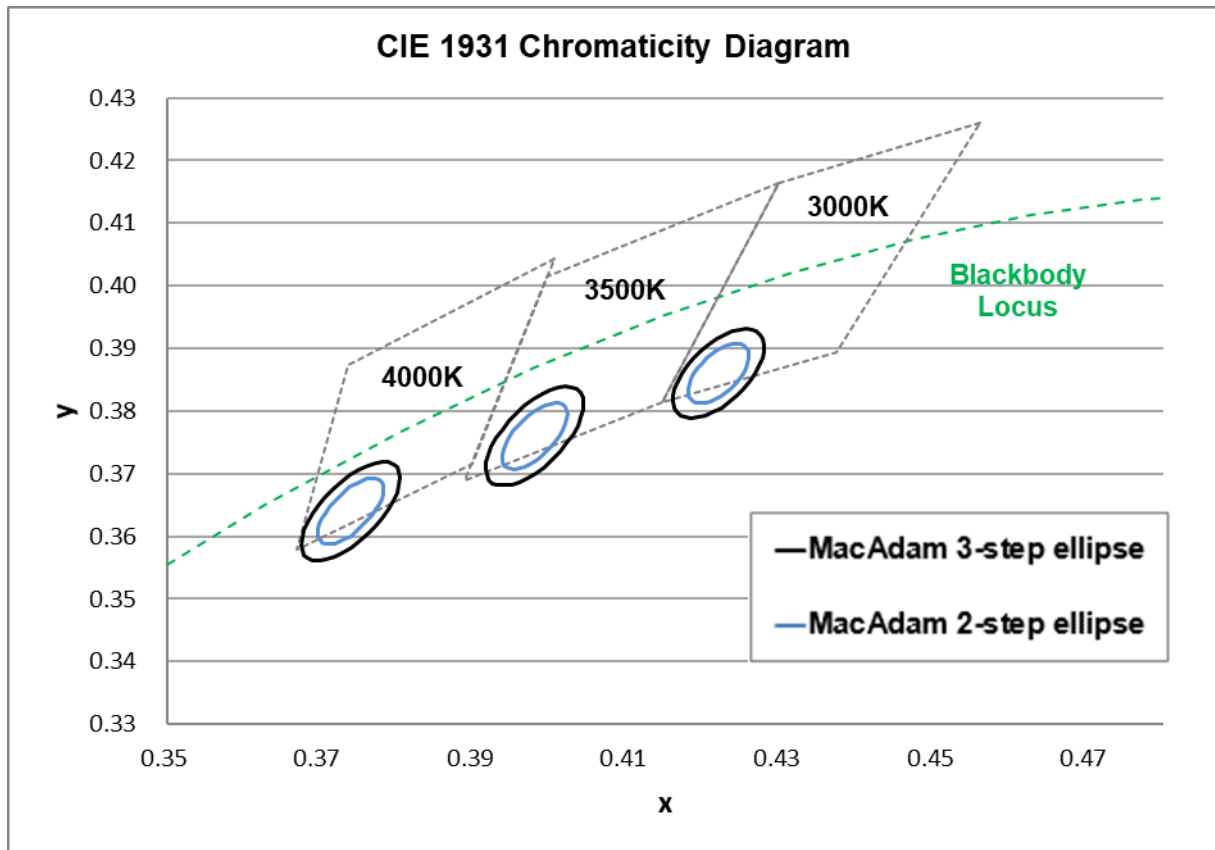
a) Binning Structure ( $I_F$  = Sorting Current,  $T_J$  = 85 °C)

Model	CRI ( $R_a$ ) Min.	Nominal CCT(K)	Product Code	$V_f$ Rank	Color Rank	Flux Rank	Flux Range ( $\Phi_v$ , lm)
LC013D	90	3000	SPHWHAHNDND27YZVMD2	YZ	VM	D2	1435 ~
			SPHWHAHNDND27YZVND2		VN		
		3500	SPHWHAHNDND27YZUMD2	YZ	UM	D2	1494 ~
			SPHWHAHNDND27YZUND2		UN		
		4000	SPHWHAHNDND27YZTMD2	YZ	TM	D2	1541 ~
			SPHWHAHNDND27YZTND2		TN		
LC016D	90	3000	SPHWHAHDNE27YZVMD2	YZ	VM	D2	1837 ~
			SPHWHAHDNE27YZVND2		VN		
		3500	SPHWHAHDNE27YZUMD2	YZ	UM	D2	1912 ~
			SPHWHAHDNE27YZUND2		UN		
		4000	SPHWHAHDNE27YZTMD2	YZ	TM	D2	1972 ~
			SPHWHAHDNE27YZTND2		TN		
LC019D	90	3000	SPHWHAHDNF27YZVMD2	YZ	VM	D2	2195 ~
			SPHWHAHDNF27YZVND2		VN		
		3500	SPHWHAHDNF27YZUMD2	YZ	UM	D2	2284 ~
			SPHWHAHDNF27YZUND2		UN		
		4000	SPHWHAHDNF27YZTMD2	YZ	TM	D2	2355 ~
			SPHWHAHDNF27YZTND2		TN		
LC026D	90	3000	SPHWHAHDNG27YZVMD2	YZ	VM	D2	2917 ~
			SPHWHAHDNG27YZVND2		VN		
		3500	SPHWHAHDNG27YZUMD2	YZ	UM	D2	3036 ~
			SPHWHAHDNG27YZUND2		UN		
		4000	SPHWHAHDNG27YZTMD2	YZ	TM	D2	3131 ~
			SPHWHAHDNG27YZTND2		TN		

LC033D	90	3000	SPHWAHDNH27YZVMD2	YZ	VM	D2	3589 ~
			SPHWAHDNH27YZVND2		VN		
		3500	SPHWAHDNH27YZUMD2	YZ	UM	D2	3735 ~
			SPHWAHDNH27YZUND2		UN		
		4000	SPHWAHDNH27YZTMD2	YZ	TM	D2	3852 ~
			SPHWAHDNH27YZTND2		TN		
LC040D	90	3000	SPHWAHDNK27YZVMD2	YZ	VM	D2	4428 ~
			SPHWAHDNK27YZVND2		VN		
		3500	SPHWAHDNK27YZUMD2	YZ	UM	D2	4591 ~
			SPHWAHDNK27YZUND2		UN		
		4000	SPHWAHDNK27YZTMD2	YZ	TM	D2	4745 ~
			SPHWAHDNK27YZTND2		TN		



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



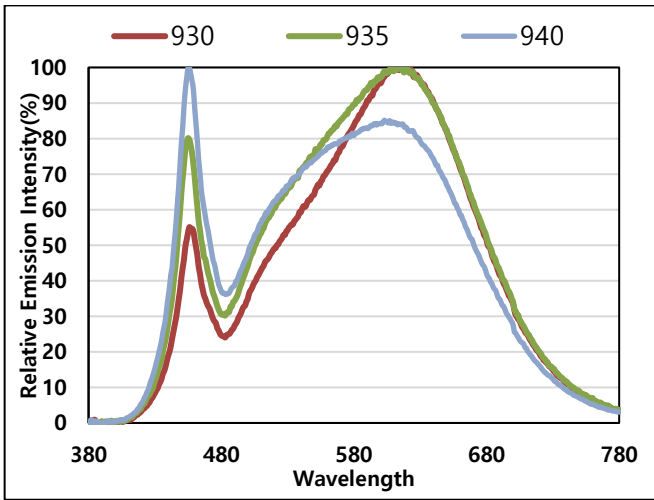
MacAdam Ellipse (VM, VN)					
Step	CIE x	CIE y	$\theta$	a	b
2-step	0.4220	0.3860	53.22	0.0056	0.0027
3-step	0.4220	0.3860	53.22	0.0083	0.0041

MacAdam Ellipse (UN)					
Step	CIE x	CIE y	$\theta$	a	b
2-step	0.3980	0.3760	54.00	0.0062	0.0028
3-step	0.3980	0.3760	54.00	0.0093	0.0041

MacAdam Ellipse (TN)					
Step	CIE x	CIE y	$\theta$	a	b
2-step	0.3740	0.3640	53.72	0.0063	0.0027
3-step	0.3740	0.3640	53.72	0.0094	0.0040

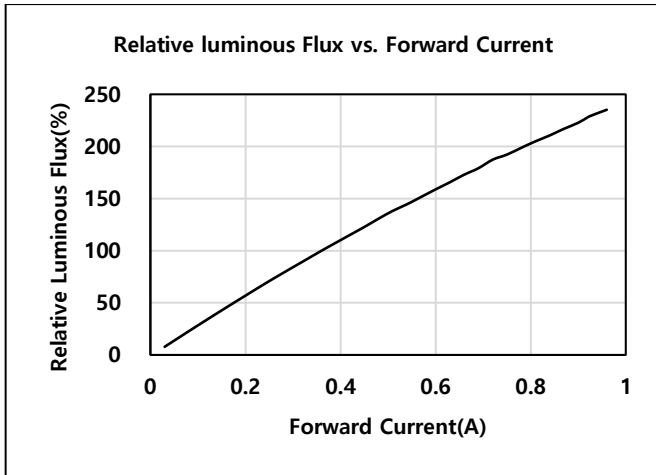
### 3. Typical Characteristics Graphs

a) Spectrum Distribution ( $I_F$  = Sorting Current,  $T_J$  = 85 °C)

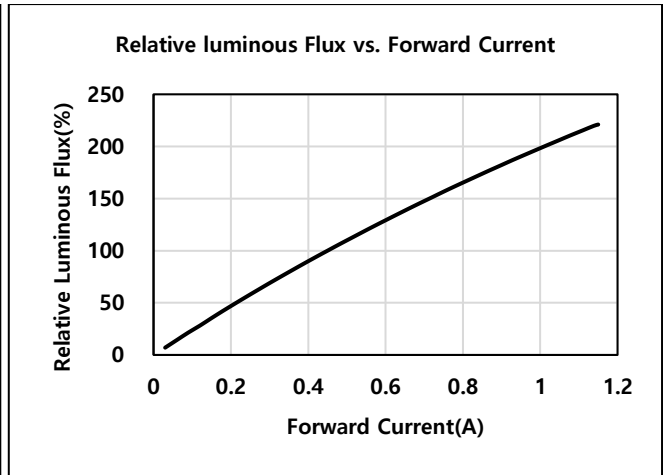


b) Forward Current Characteristics ( $T_J = 85\text{ }^\circ\text{C}$ )

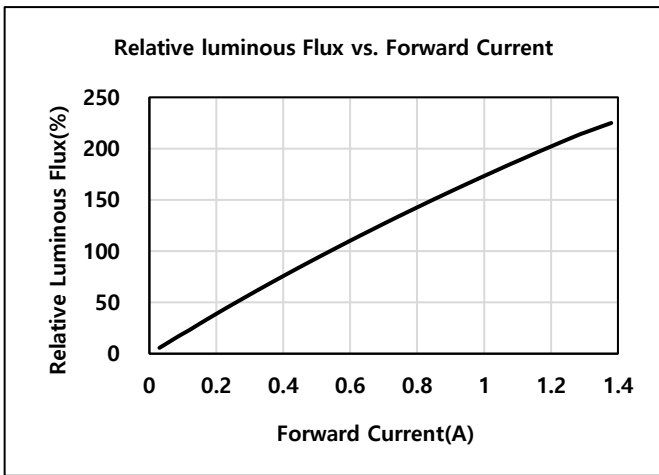
LC013D



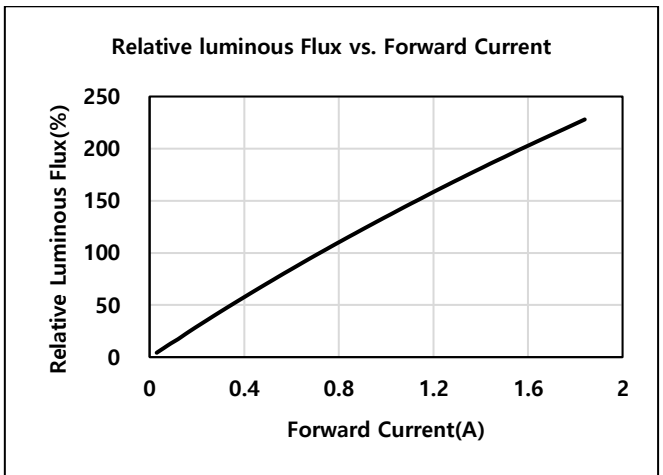
LC016D



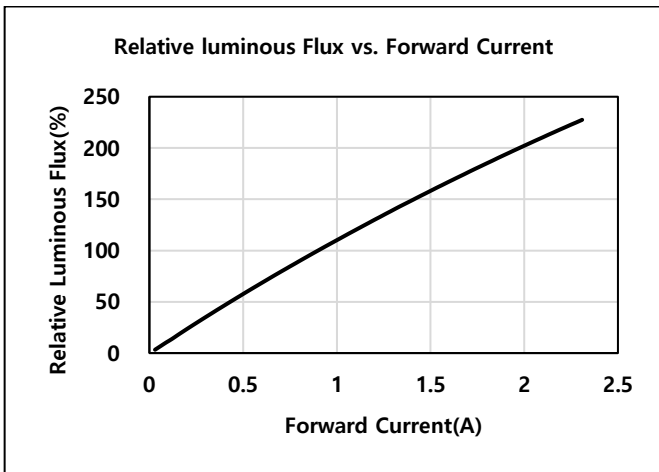
LC019D



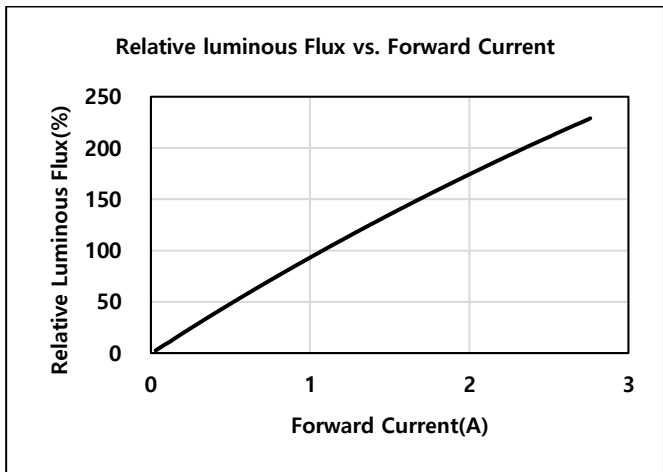
LC026D



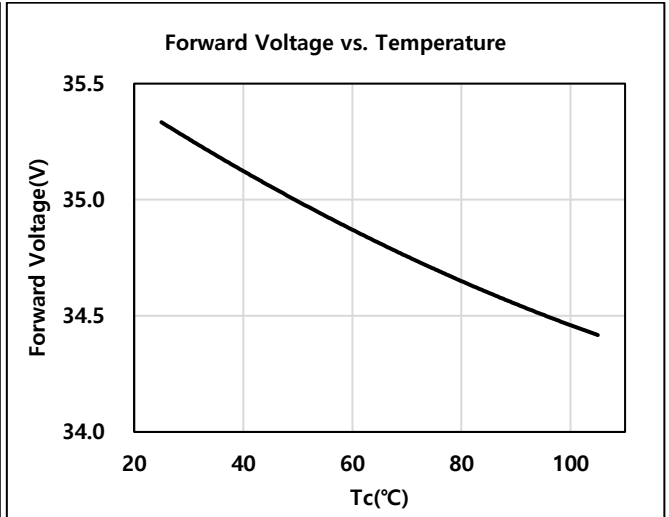
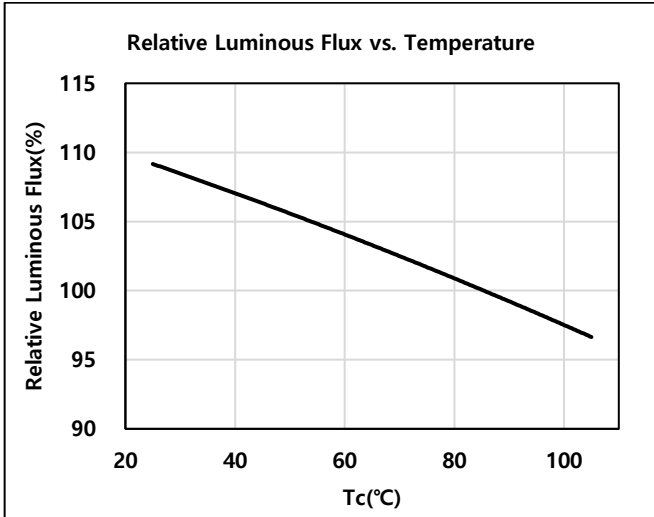
LC033D



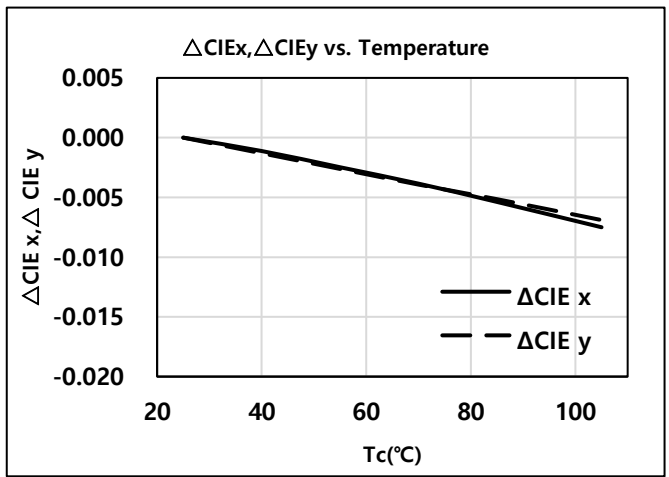
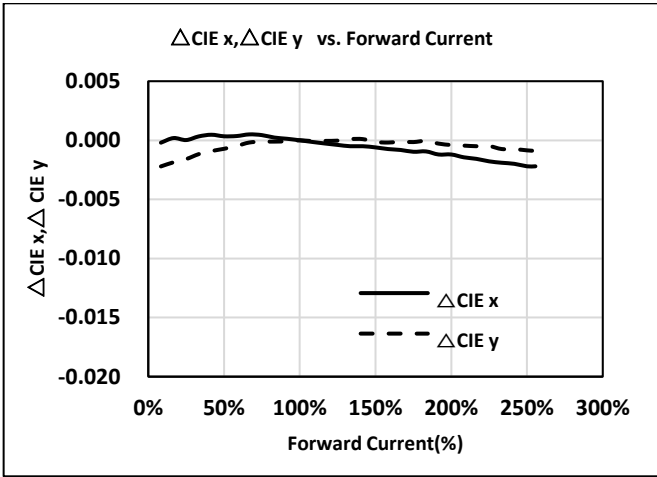
LC040D



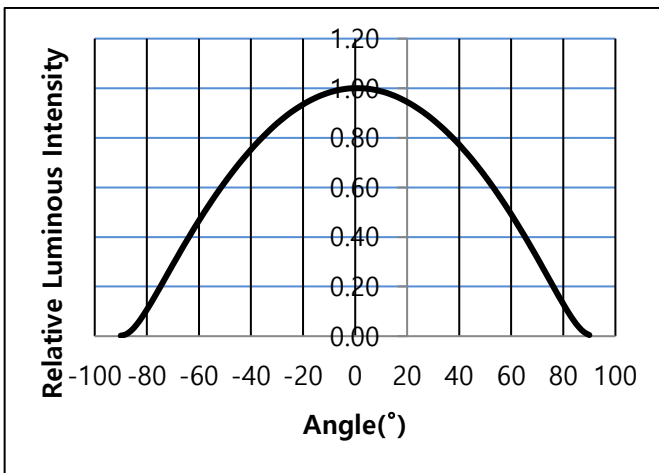
c) Temperature Characteristics ( $I_F = \text{Sorting Current}$ )



d) Color Shift Characteristics ( $T_J = 85\text{ °C}, I_F = \text{Sorting Current}$ )

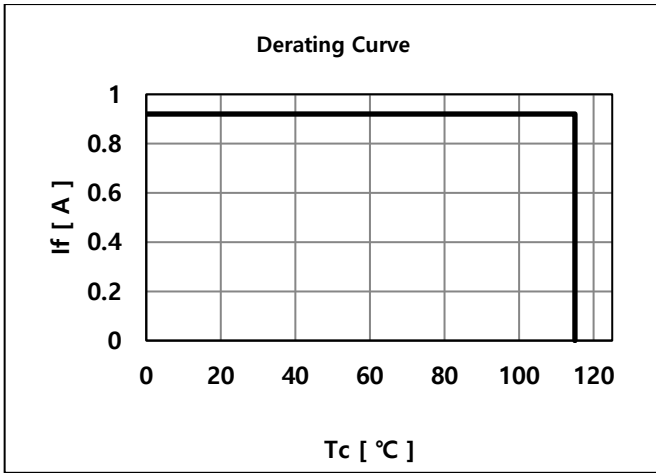


e) Beam Angle Characteristics ( $I_F = \text{Sorting Current}, T_J = 85\text{ °C}$ )

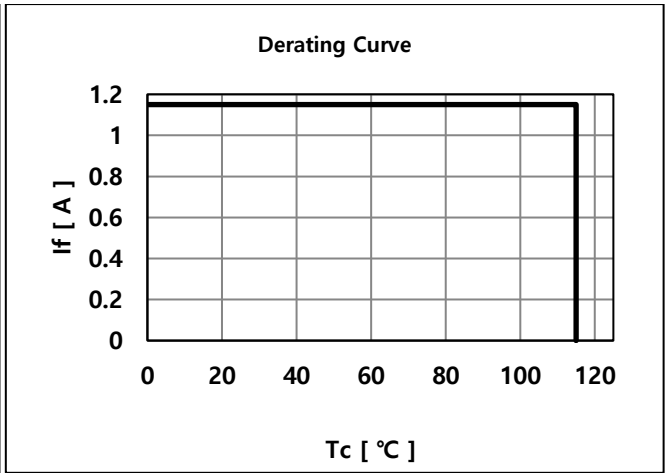


f) Derating Characteristics

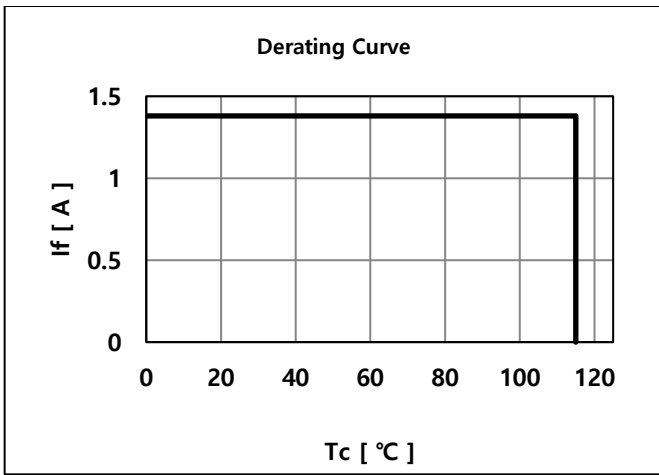
LC013D



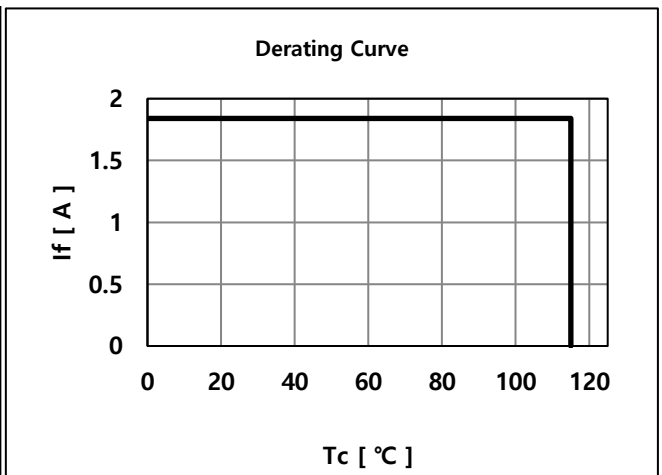
LC016D



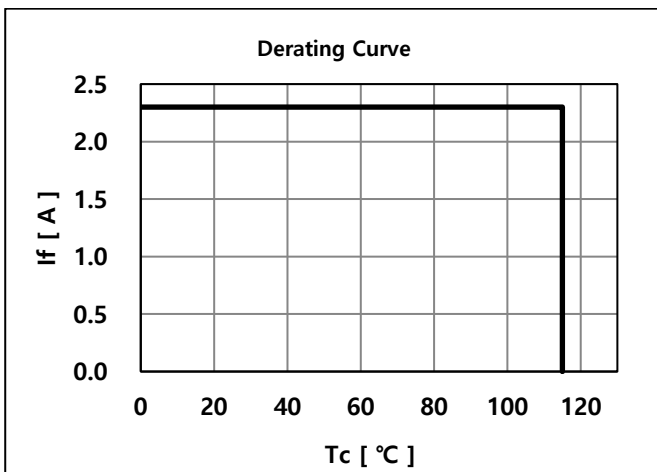
LC019D



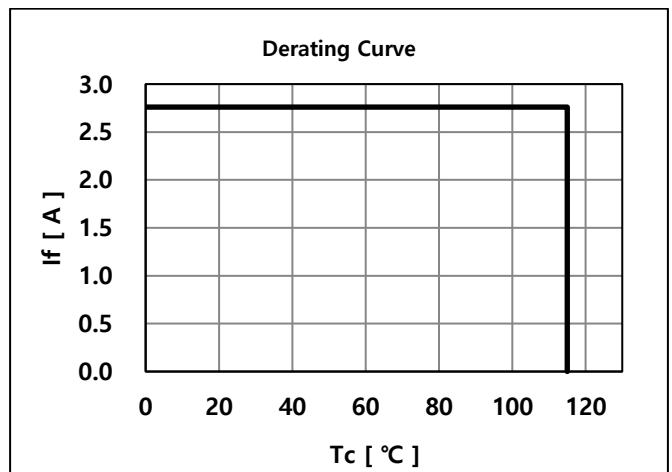
LC026D



LC033D

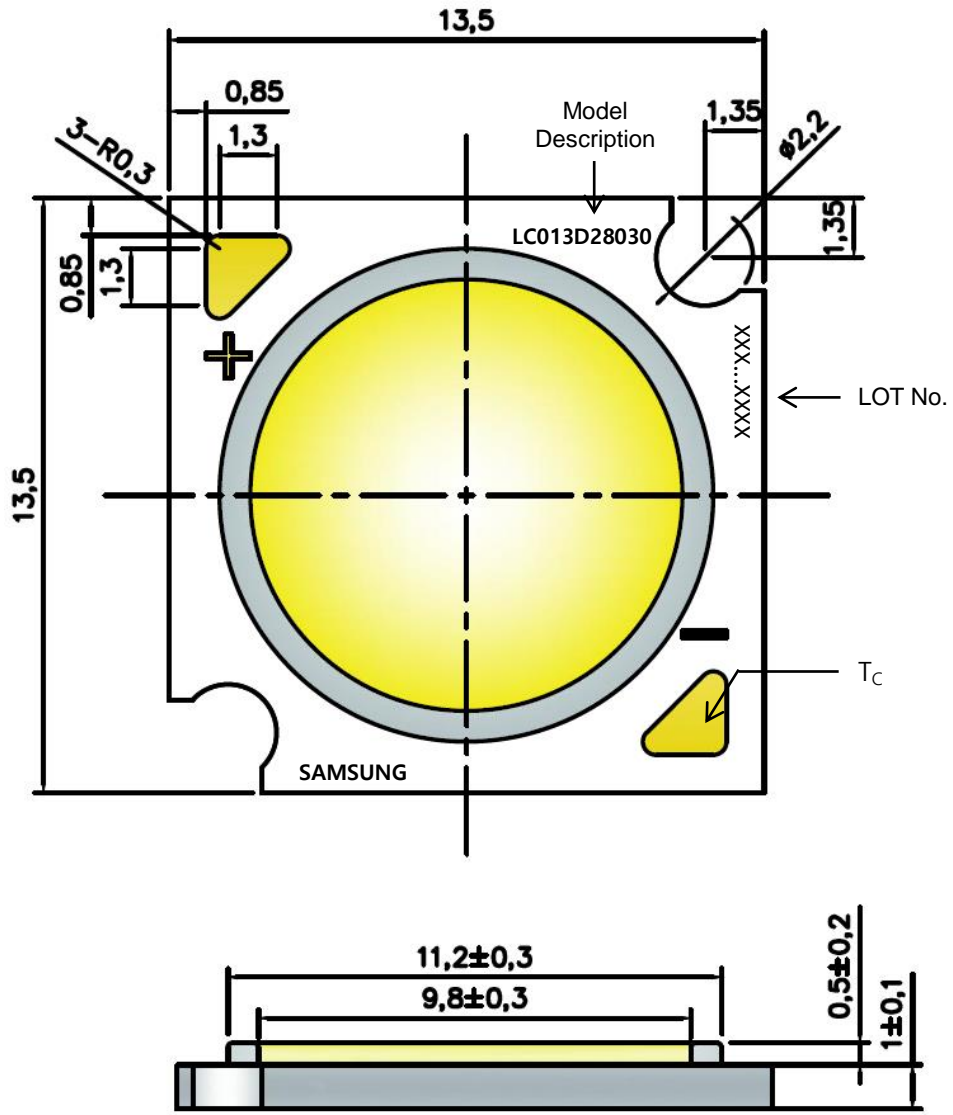


LC040D



4. Outline Drawing & Dimension

※ Model : LC013D

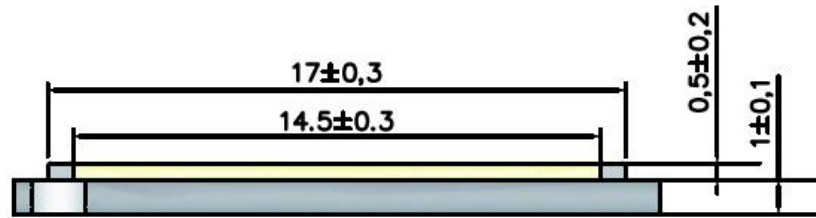
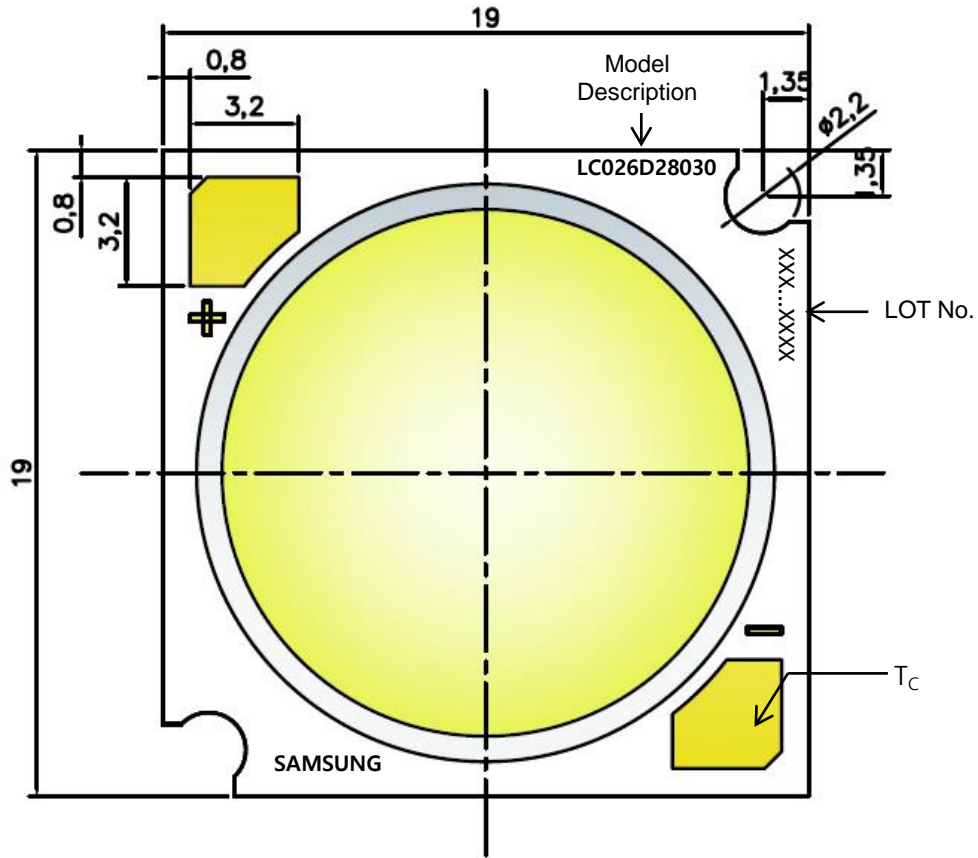


- 1. Unit: mm
- 2. Tolerance: ± 0.3 mm

Item	Dimension	Tolerance	Unit
Length	13.5	±0.20	mm
Width	13.5	±0.20	mm
Height	Dam	0.5	±0.20 mm
	Substrate	1	±0.10 mm
	From the bottom of the substrate to the LES	2	Max mm
LES Diameter	Light Emitting Surface	9.8	±0.30 mm

Note: Denoted product information above is only an example (LC013D28030 :LC013D, Gen3, Ra80, 3000K)

※ Model : LC016D, LC019D, LC026D, LC033D

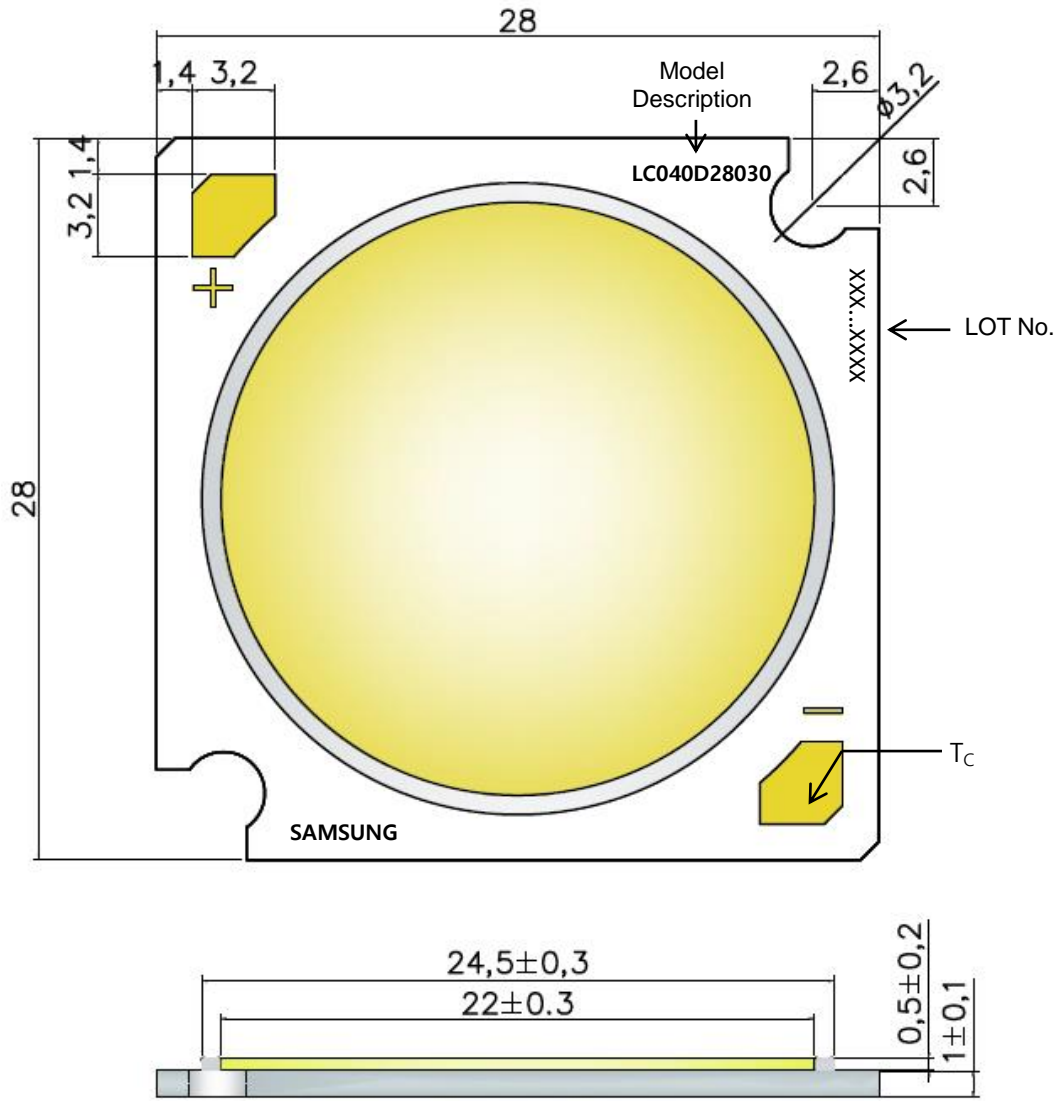


- 1. Unit: mm
- 2. Tolerance: ± 0.3 mm

Item	Dimension	Tolerance	Unit
Length	19.0	±0.20	mm
Width	19.0	±0.20	mm
Height	Dam	0.5	±0.20 mm
	Substrate	1.0	±0.10 mm
	From the bottom of the substrate to the LES	2.0	Max mm
LES Diameter	Light Emitting Surface	14.5	±0.30 mm

Note: Denoted product information above is only an example  
 ( LC026D28030 : LC026D, Gen3, CRI80+, 3000K )

※ Model : LC040D



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

Item	Dimension	Tolerance	Unit
Length	28.0	±0.20	mm
Width	28.0	±0.20	mm
Height	Dam	0.5	±0.20 mm
	Substrate	1.0	±0.10 mm
	From the bottom of the substrate to the LES	2.0	Max mm
LES Diameter	Light Emitting Surface	22.0	±0.30 mm

Note: Denoted product information above is only an example  
 ( LC040D28030 : LC040D, Gen2, CRI80+, 3000K )



## 5. Reliability Test Items & Conditions

### a) Test Items

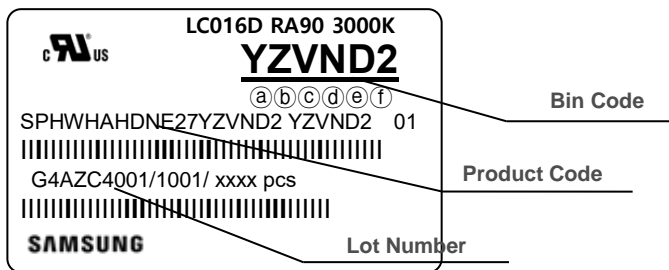
Test Item	Test Condition	Test Hour / Cycle
High Temperature Humidity Life Test	60 °C, 90 % RH,, DC Derating, I <sub>F</sub>	1000 h
High Temperature Life Test	85 °C, DC Derating, I <sub>F</sub>	1000 h
Low Temperature Life Test	-40 °C, DC, Derating I <sub>F</sub>	1000 h
High Temperature Storage	120 °C	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 <sub>F</sub> = max	100 cycles
ESD (HBM)	R <sub>1</sub> : 10 MΩ R <sub>2</sub> : 1.5 kΩ C: 100 pF V: ±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	1500g, 0.5 ms each of the 6 surfaces (3 axis x 2 sides)	5 times
Sulfur Resistance	25 °C, 75%, H <sub>2</sub> S 15 ppm	504h

### b) Criteria for Judging the Damage

Item	Symbol	Test Condition (T <sub>c</sub> = 25 °C)	Limit	
			Min.	Max.
Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = Sorting Current	L.S.L. * 0.9	U.S.L. * 1.1
Luminous Flux	Φ <sub>v</sub>	I <sub>F</sub> = Sorting Current	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

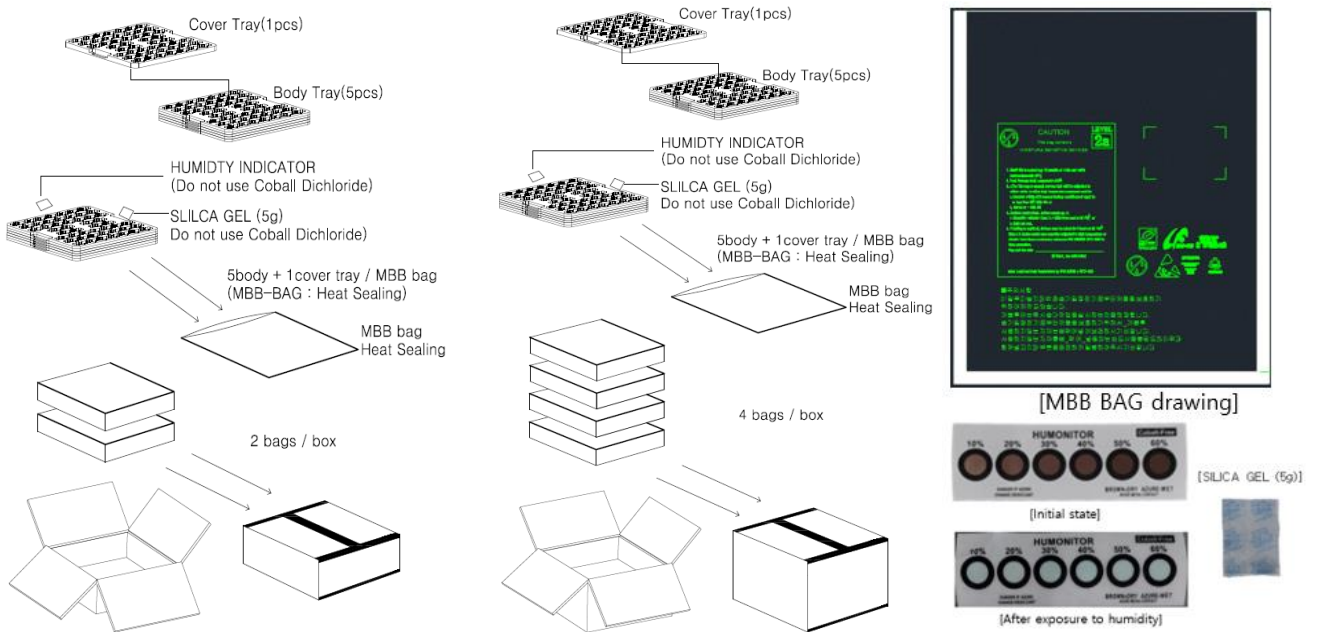
- ① : Production site (S: Giheung, Korea, G: Tianjin, China)
- ② : 4(LED)
- ③ : Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
- ④ : Year (Z: 2015, A: 2016, B: 2017...)
- ⑤ : Month (1~9, A, B, C)
- ⑥⑦⑧⑨ : Day (1~9, A, B~V)
- ⒶⒷⒸ : Product serial number (001 ~ 999)

## 7. Packing Structure

※ LC013D

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

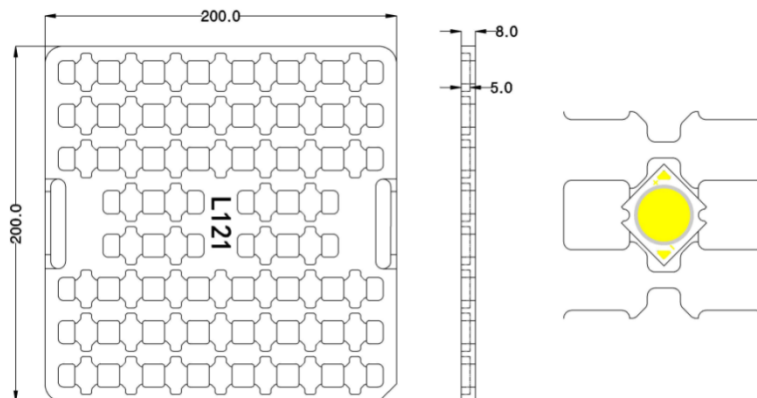
### a) Packing Structure



※ Small Box

※ Middle Box

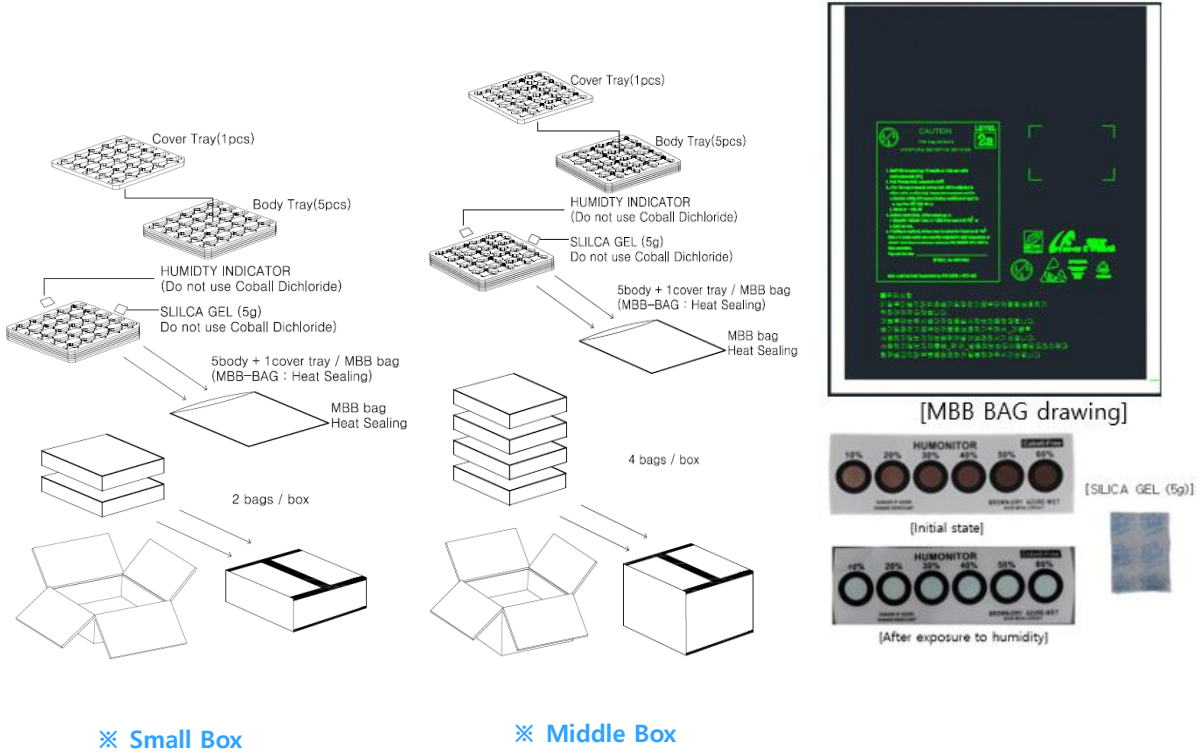
### b) Tray



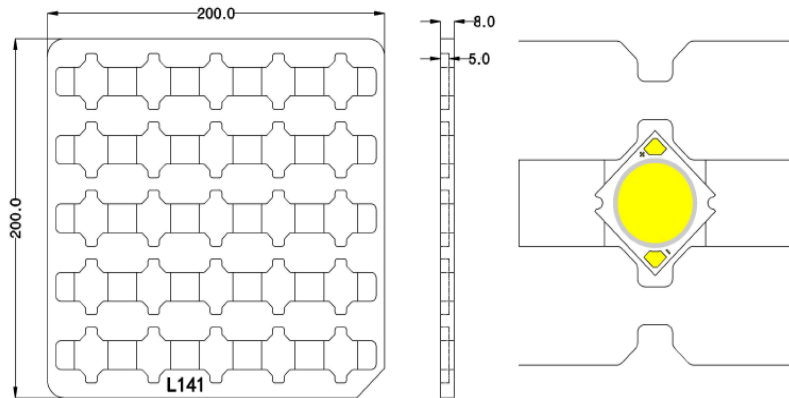
※ LC016D, LC026D, LC033D

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



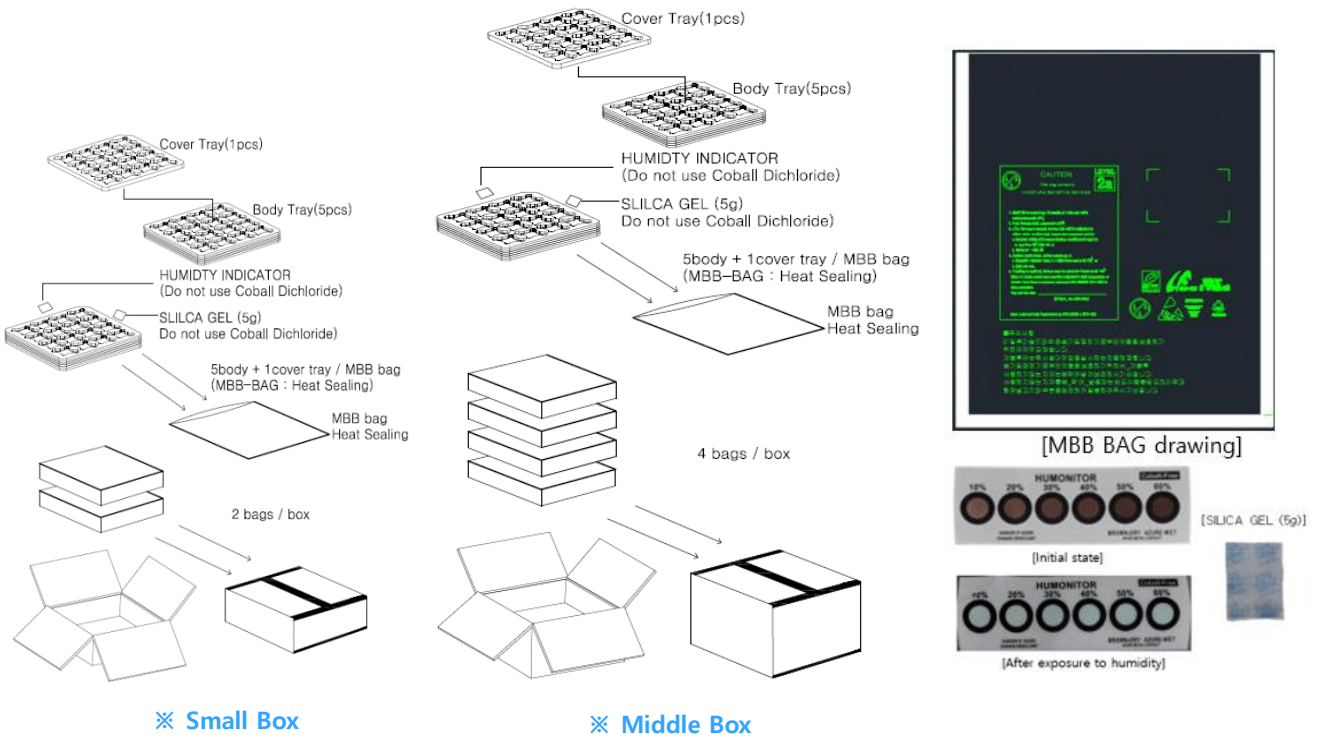
b) Tray



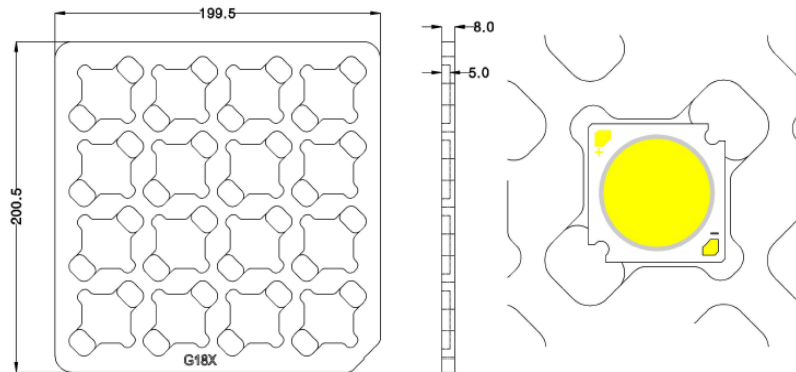
※ LC040D

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

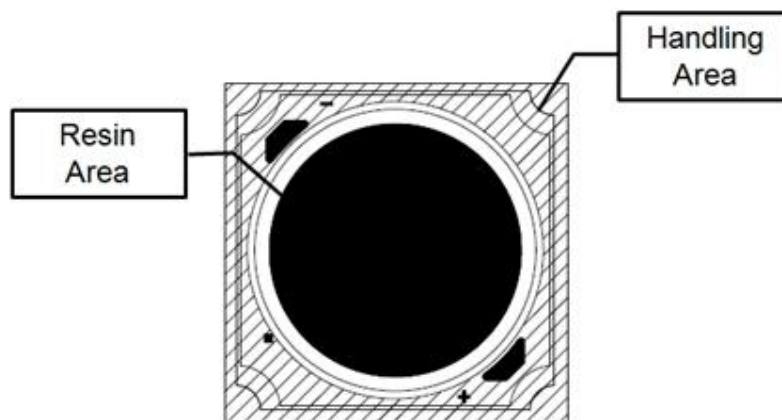


b) Tray



## 8. Precautions in Handling & Use

- 1) This device should not be used in any type of fluid such as water, oil, organic solvent, etc. Some solvent-based cleaning agent may damage the silicone resins used in the device.
- 2) LEDs must be stored in a clean environment. 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 (wiring), 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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