

High Voltage LED Series  
Chip on Board

# COB R - Series Vegetable



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

## Table of Contents

1.	Characteristics	-----	3
2.	Product Code Information	-----	5
3.	Typical Characteristics Graphs	-----	8
4.	Outline Drawing & Dimension	-----	11
5.	Reliability Test Items & Conditions	-----	13
6.	Label Structure	-----	14
7.	Packing structure	-----	15
8.	Precautions in Handling & Use	-----	17

## 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	$T_J$		130	°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		-
		LC033D	2300 / 86		-
ESD (HBM)	-		±2	kV	-

### b) Electro-optical Characteristics ( $I_f$ = Sorting Current, $T_J = 65$ °C)

Item	Unit	Model	Rank	Min.	Typ.	Max.
Forward Voltage ( $V_f$ )	V		YZ	31.8	34.6	37.5
Thermal Resistance (junction to chip case)	°C/W	LC013D	-	-	1.53	-
		LC016D	-	-	1.21	-
		LC019D	-	-	1.08	-
		LC026D	-	-	0.85	-
		LC033D	-	-	0.72	-
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)	-

#### Notes:

- 1) The COB is tested in pulsed condition at rated test current (10 ms pulse width) and rated temperature ( $T_J = T_C = T_a = 65$  °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<sub>F</sub> = Sorting Current)**

Model	Nominal CCT (K)	Flux Rank	T <sub>c</sub> = 65 °C (lm)		
			Min.	Typ.	Max.
LC013D	Vegetable	D2	1128	1188	-
LC016D	Vegetable	D2	1467	1544	-
LC019D	Vegetable	D2	1744	1835	-
LC026D	Vegetable	D2	2279	2399	-
LC033D	Vegetable	D2	2820	2969	-

**Notes:**

- 1) The COB is tested in pulsed operating condition at rated test current (10 ms pulse width) and rated temperature (T<sub>j</sub> = T<sub>c</sub> = 65 °C).
- 2) Samsung maintains measurement tolerance of: Luminous flux = ±7 %, CRI = ±1

## 2. Product Code Information

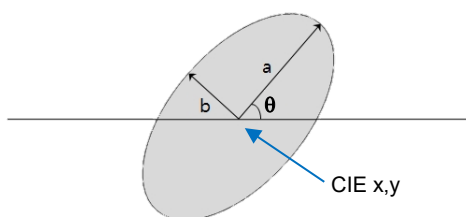
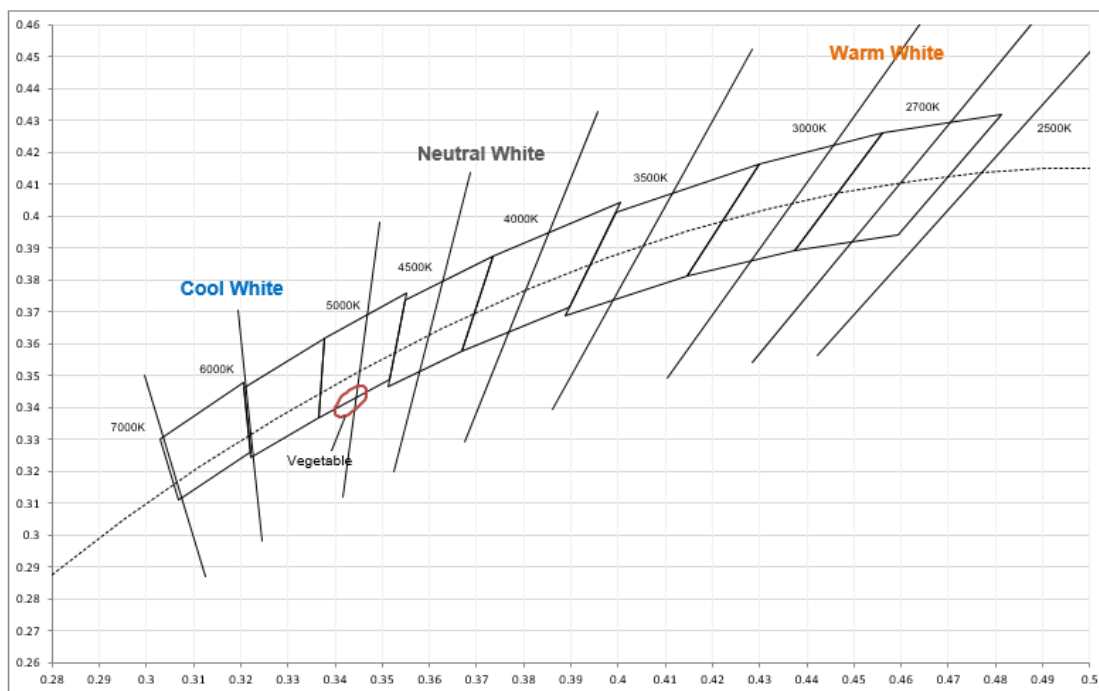
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S	P	H	W	H	A	H	D	N	G	2	V	Y	Z	U	S	D	2

Digit	PKG Information	Code	Specification
1 2 3	Samsung Package High Power	<b>SPH</b>	
4 5	Color	<b>WH</b>	White color
6	Product Version	<b>A</b>	
7 8	Form Factor	<b>HD</b>	COB
9	Lens Type	<b>N</b>	No lens
10	Internal Code	<b>D</b> <b>E</b> <b>F</b> <b>G</b> <b>H</b>	LC013 LC016 LC019 LC026 LC033
11	Internal Code	<b>2</b>	
12	CRI & Sorting Temperature	<b>V</b>	VIVID 65 °C
13 14	Forward Voltage (V)	<b>YZ</b>	31.8~37.5
15	CCT (K)	<b>R</b>	Vegetable
16	MacAdam	<b>S</b>	Color Bin for Samsung Special Color
17 18	Luminous Flux	<b>D2</b>	COB D-series Gen.2 level

a) Binning Structure ( $I_F$ = Sorting Current,  $T_J$  =65 °C)

Model	Nominal CCT (K)	Product Code	$V_F$ Rank	Color Rank	Flux Rank	Flux Range ( $\Phi_v$ , lm)
LC013D	Vegetable	SPHWHAHNDND2VYZRSD2	YZ	RS	D2	1128~
LC016D	Vegetable	SPHWHAHNDNE2VYZRSD2	YZ	RS	D2	1467~
LC019D	Vegetable	SPHWHAHDNF2VYZRSD2	YZ	RS	D2	1744~
LC026D	Vegetable	SPHWHAHDNG2VYZRSD2	YZ	RS	D2	2279~
LC033D	Vegetable	SPHWHAHDNH2VYZRSD2	YZ	RS	D2	2820~

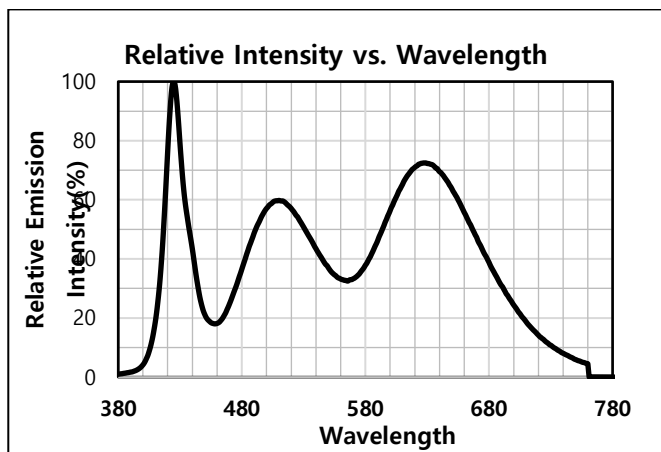
b) Chromaticity Region & Coordinates ( $I_F$  = Sorting Current,  $T_J$  = 65 °C)



MacAdam Ellipse (Vegetable)					
Step	CIE x	CIE y	$\theta$	a	b
2-step	0.3433	0.3421	59.62	0.0055	0.0024

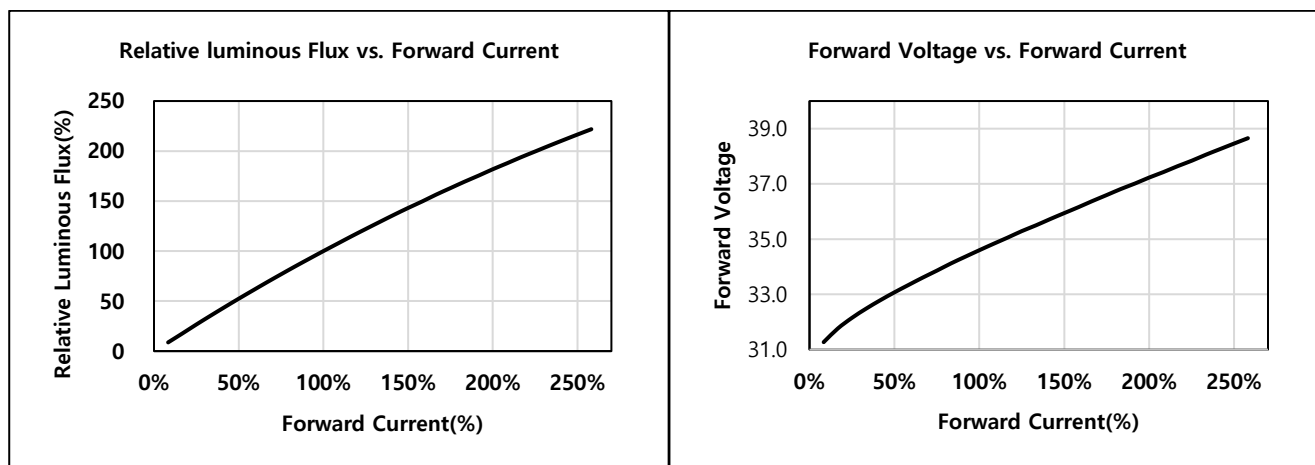
### 3. Typical Characteristics Graphs

#### a) Spectrum Distribution ( $I_f$ = Sorting Current, $T_J = 65\text{ }^\circ\text{C}$ )



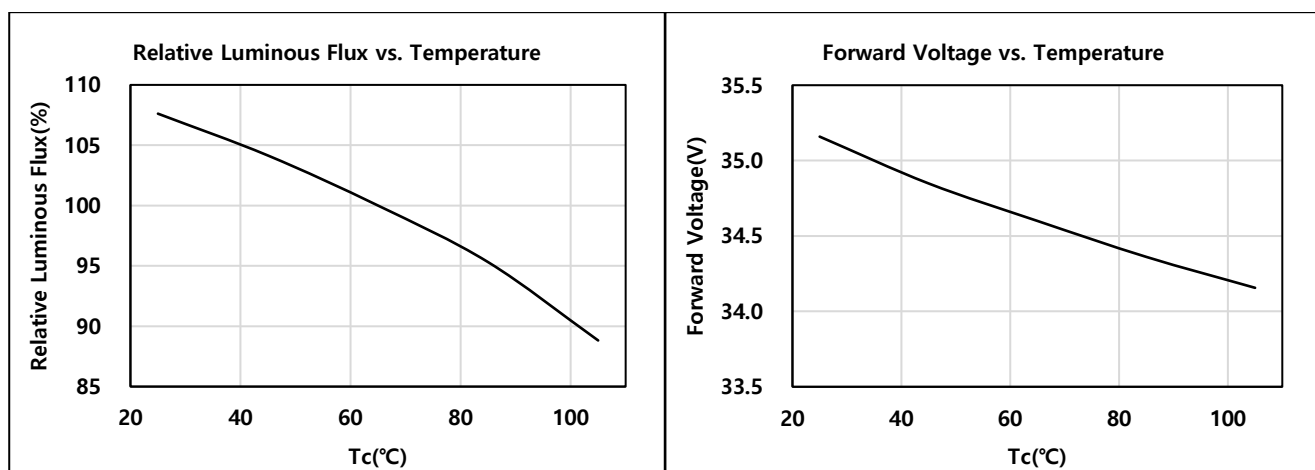
#### b) Forward Current Characteristics ( $T_J = 65\text{ }^\circ\text{C}$ )

##### Vegetable



#### b) Temperature Characteristics ( $I_f$ = Sorting Current)

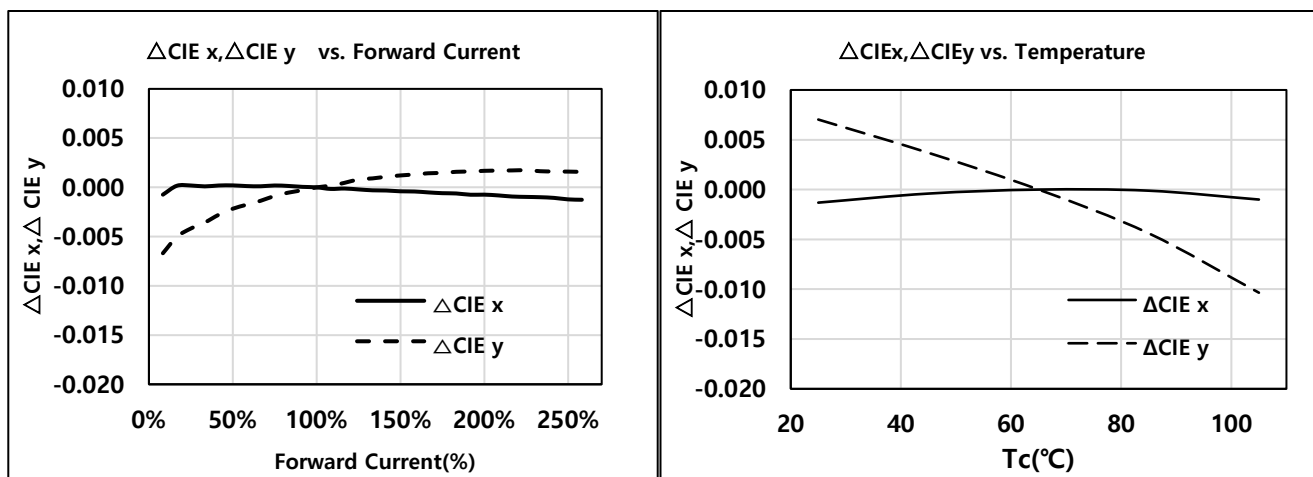
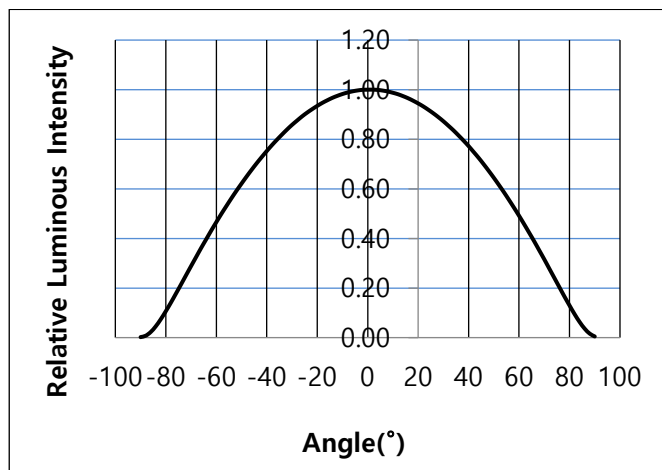
##### Vegetable



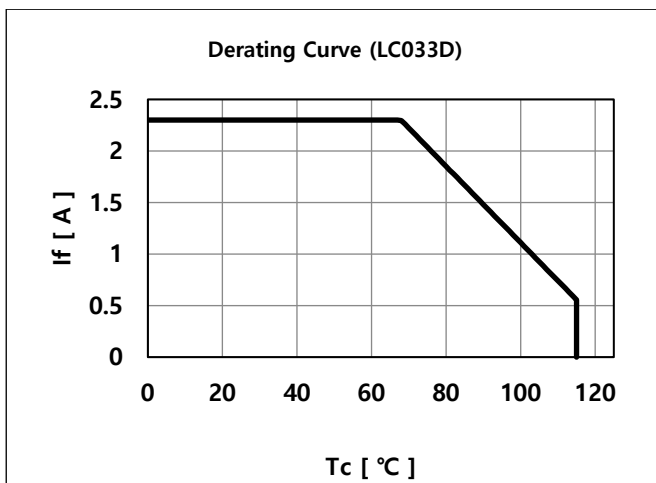
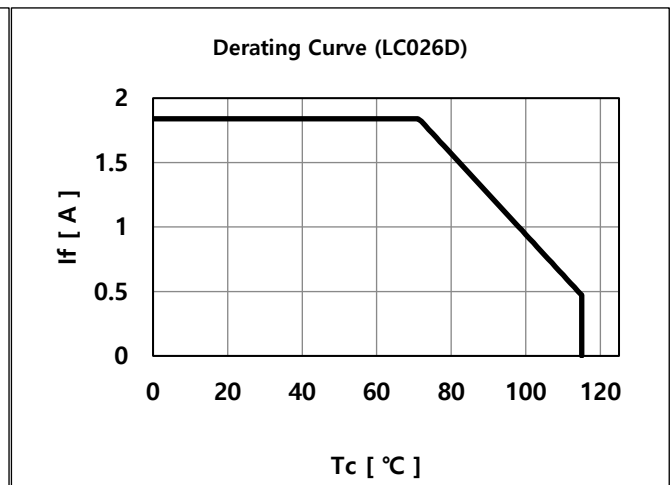
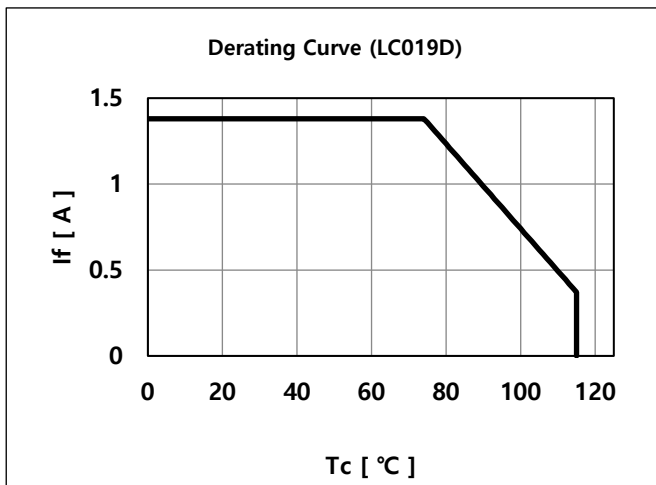
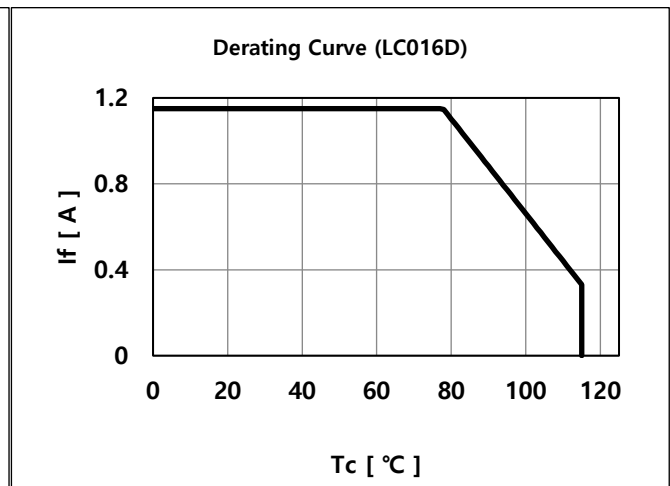
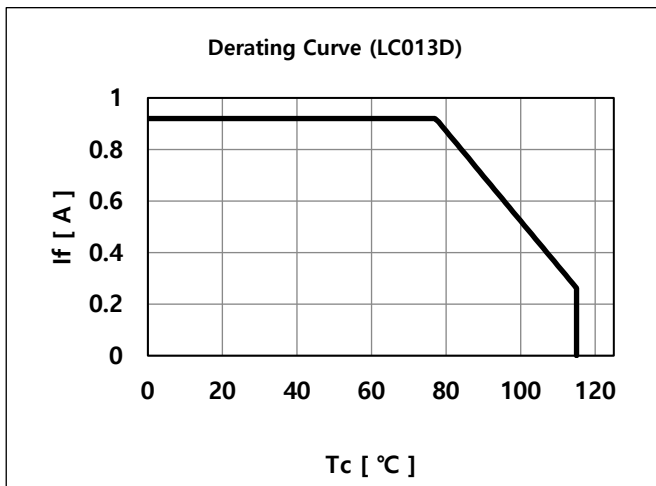
#### c) Color Shift Characteristics ( $I_f$ = Sorting Current, $T_J = 65\text{ }^\circ\text{C}$ )



## Vegetable

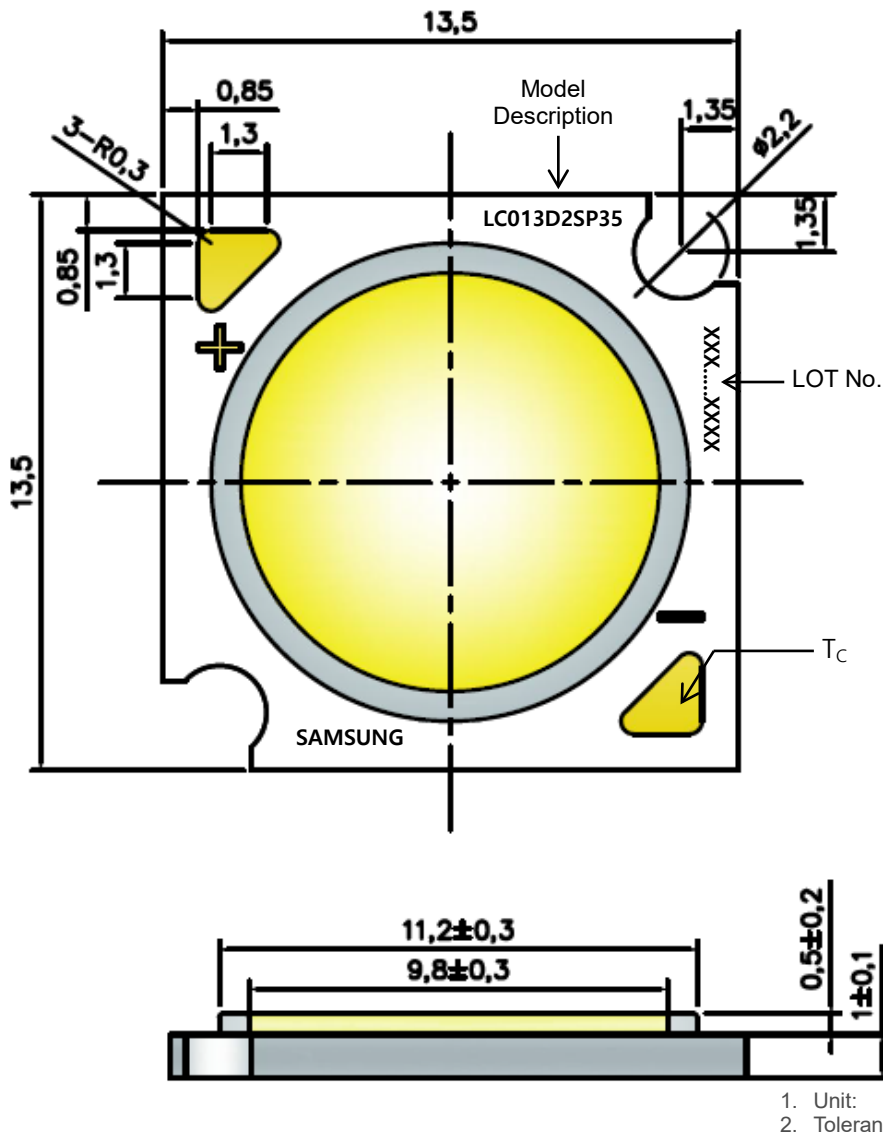
d) Beam Angle Characteristics ( $I_F$  = Sorting Current,  $T_J$  = 65 °C)

## f) Derating Characteristics



4. Outline Drawing & Dimension

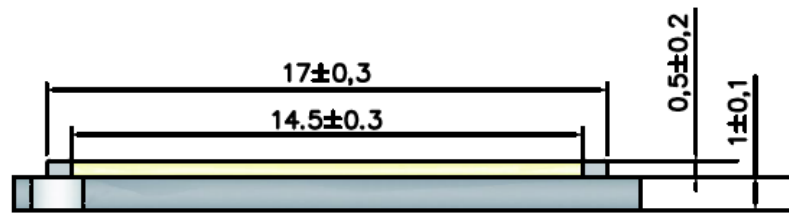
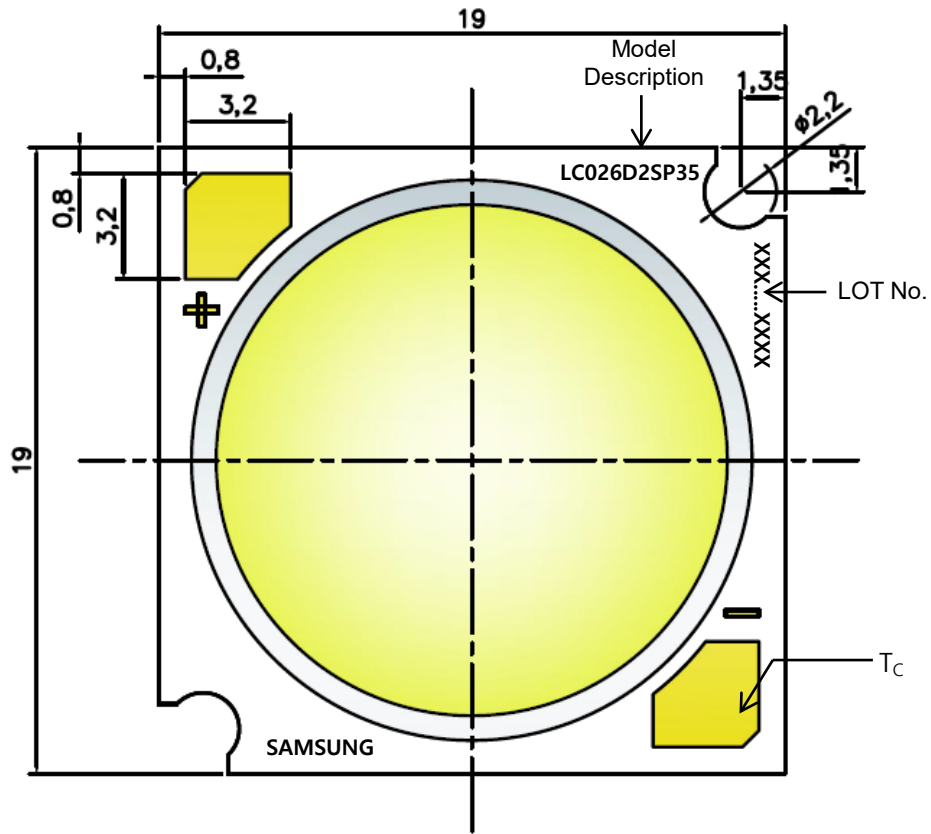
1) LCo13D



Item	Dimension	Tolerance	Unit	
Length	13.5	±0.15	mm	
Width	13.5	±0.15	mm	
Height	Dam	0.5	±0.20	mm
	Substrate	1.0	±0.10	mm
LES Diameter	Light Emitting Surface	9.8	±0.30	mm

Note: Denoted product information above is only an example  
 (LC013D2SP35 :13W, Special Color, Fashion)

2) LCo16D, LCo19D, LCo26D, LCo33D



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	Dam	0.5	±0.20
	Substrate	1.0	±0.10
LES Diameter	Light Emitting Surface	14.5	±0.30

Note: Denoted product information above is only an example  
(LC026D2SP35 : 26W, Special Color, Fashion)

## 5. Reliability Test Items & Conditions

### a) Test Items

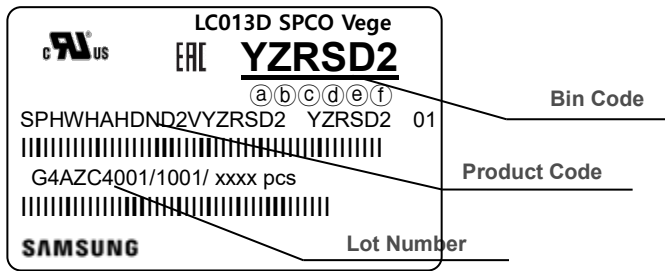
Test Item	Test Condition	Test Hour / Cycle
High Temperature Life Test	85 °C, DC Derating, $I_F$	1000 h
Low Temperature Life Test	-40 °C, DC, Derating $I_F$	1000 h
High Temperature Storage	120 °C	1000 h
Low Temperature Storage	-40 °C	1000 h
TemperatureCycle On/Off Test	-40 °C/ 85 °C each 20 min, 30 min transfer power on/off each 5 min, DC Derating, $I_F = \text{max}$	100 cycles
ESD (HBM)	R <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%, H2S 15 ppm	504h

### b) Criteria for Judging the Damage

Item	Symbol	Test Condition ( $T_c = 25\text{ °C}$ )	Limit	
			Min.	Max.
Forward Voltage	$V_F$	$I_F = \text{Sorting Current}$	L.S.L. * 0.9	U.S.L. * 1.1
Luminous Flux	$\Phi_v$	$I_F = \text{Sorting Current}$	L.S.L. * 0.7	U.S.L. * 1.3

## 6. Label Structure

### a) Label Structure



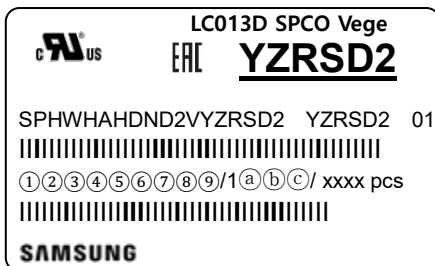
Note: Denoted bincode and product code above is only an example (see description on page 5)

Bin Code:

- ⒶⒷ: Forward Voltagebin (refer to page 3)
- ⒸⒹ: Chromaticitybin (refer to page 6)
- ⒺⒻ: Luminous Fluxbin (refer to page 4)

### b) Lot Number

The lot number is composed of the following characters:



① ③④⑤⑥⑦⑧⑨ / 1ⒶⒷⒸ / xxxx pcs

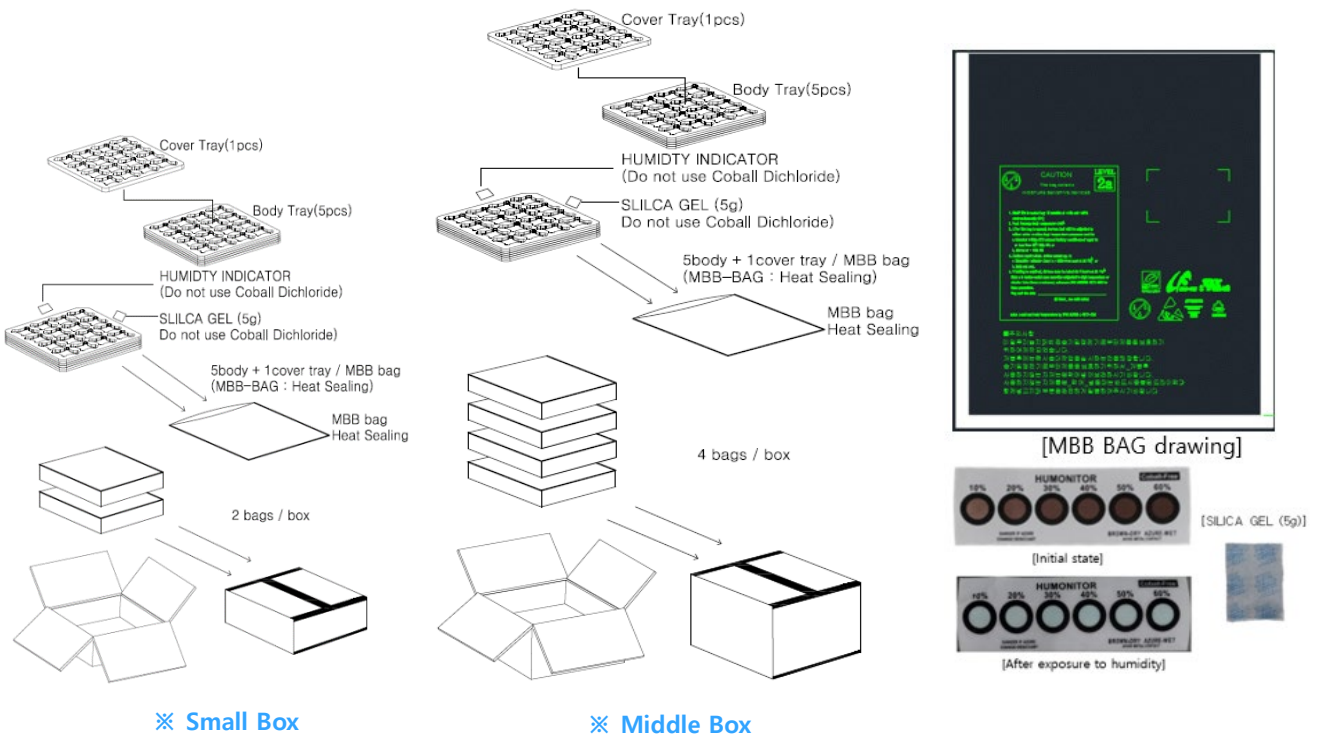
- ① : Production site (S: Giheung, Korea, G: Tianjin, China)
- ② : 4(LED)
- ③ : Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
- ④ : Year (Z: 2015, A: 2016, B: 2017...)
- ⑤ : Month (1~9, A, B, C)
- ⑥⑦⑧⑨ : Day (1~9, A, B~V)
- ⒶⒷⒸ : Product serial number (001 ~ 999)

## 7. Packing Structure

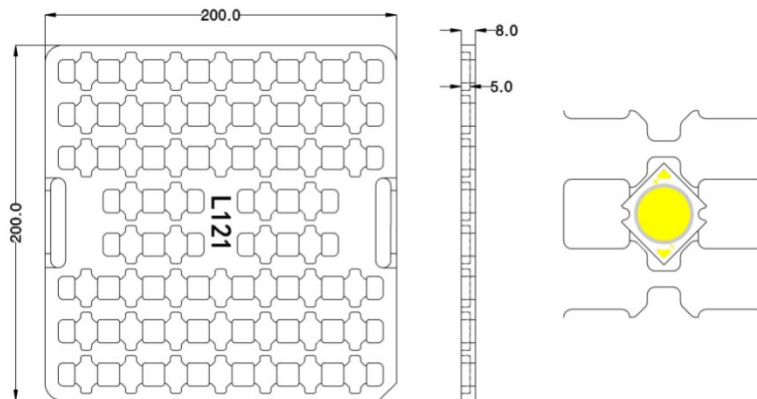
### 1) LC013D

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



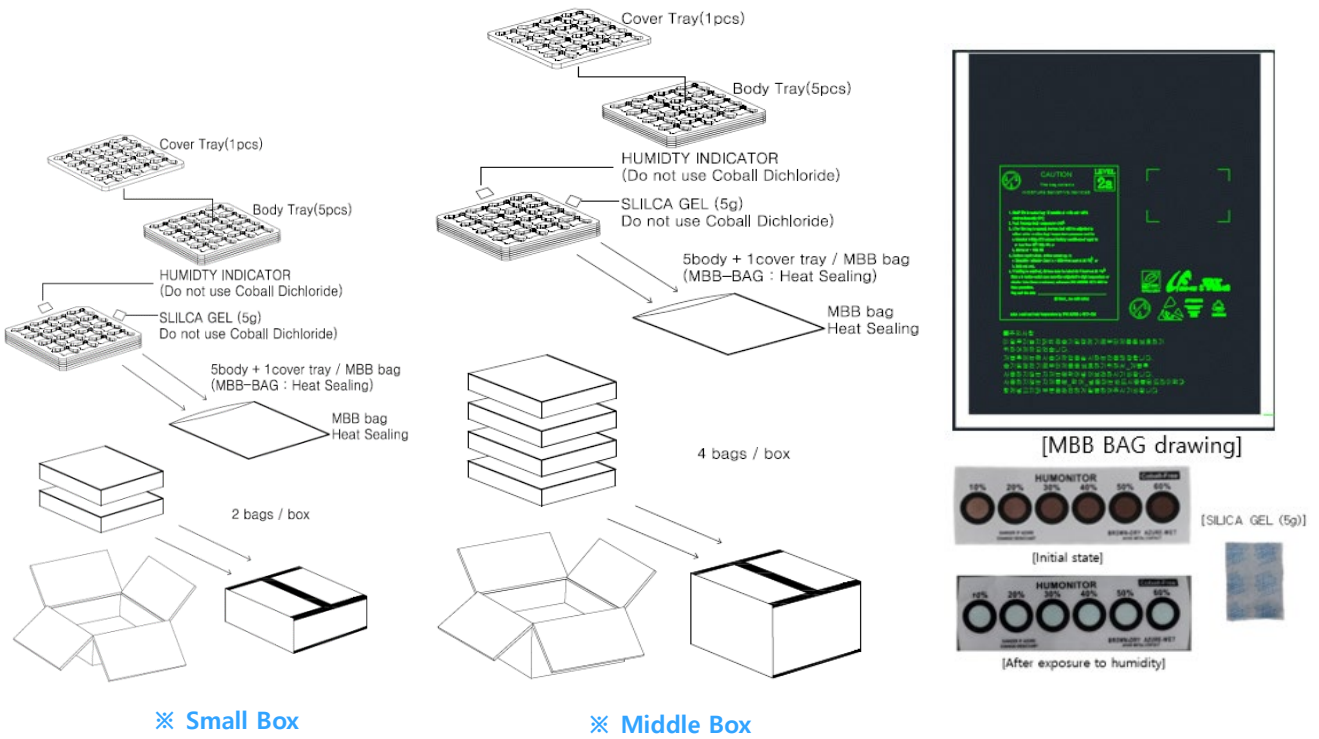
#### b) Tray



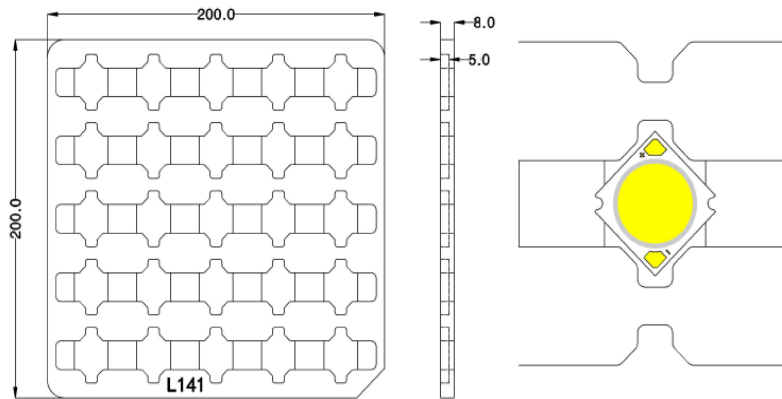
2) LC016D, LC019D, LC026D, LC033D

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

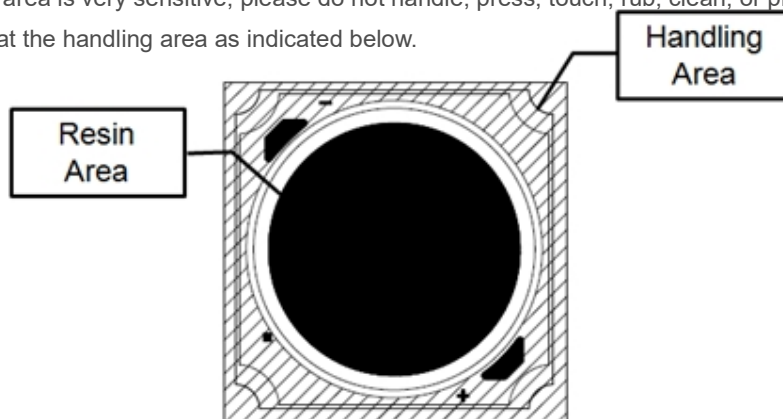




## 8. Precautions in Handling & Use

- 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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