

High Voltage LED Series
Chip on Board

COB D-series Gen4 High CRI



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 / 33.7	mA / W	-
		LC016D	1150 / 42.1		-
		LC019D	1380 / 50.5		-
		LC026D	1840 / 67.3		-
		LC033D	2300 / 84.2		-
		LC040D	2760 / 101.0		-
ESD (HBM)	-	-	±2	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	YZ	30.6	33.6	36.6
Color Rendering Index (R _a)	-	All Model	-	95	-	-
Thermal Resistance (junction to case point)	°C/W	LC013D	-	-	0.81	-
		LC016D	-	-	0.64	-
		LC019D	-	-	0.57	-
		LC026D	-	-	0.45	-
		LC033D	-	-	0.38	-
		LC040D	-	-	0.30	-
Beam Angle	°	All Model	-	-	115	-
Nominal Power (Sorting Current)	W (mA)	LC013D	-	-	12.1 / 360	-
		LC016D	-	-	15.1 / 450	-
		LC019D	-	-	18.1 / 540	-
		LC026D	-	-	24.2 / 720	-
		LC033D	-	-	30.2 / 900	-
		LC040D	-	-	36.3 / 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	D4	1197	1274	-
	3000	D4	1282	1364	-
	3500	D4	1347	1433	-
	4000	D4	1408	1498	-
	5000	D4	1490	1586	-
LC016D	2700	D4	1542	1640	-
	3000	D4	1651	1756	-
	3500	D4	1723	1833	-
	4000	D4	1813	1929	-
	5000	D4	1950	2075	-
LC019D	2700	D4	1840	1958	-
	3000	D4	1971	2097	-
	3500	D4	2057	2188	-
	4000	D4	2166	2304	-
	5000	D4	2328	2477	-
LC026D	2700	D4	2418	2572	-
	3000	D4	2589	2755	-
	3500	D4	2702	2875	-
	4000	D4	2845	3026	-
	5000	D4	3059	3254	-
LC033D	2700	D4	2992	3183	-
	3000	D4	3204	3408	-
	3500	D4	3344	3558	-
	4000	D4	3520	3744	-
	5000	D4	3785	4026	-
LC040D	2700	D4	3680	3915	-
	3000	D4	3942	4194	-
	3500	D4	4205	4474	-
	4000	D4	4331	4607	-
	5000	D4	4825	5133	-

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	4

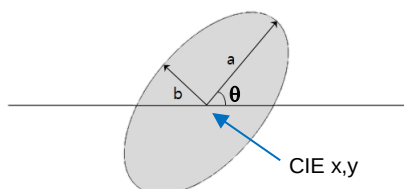
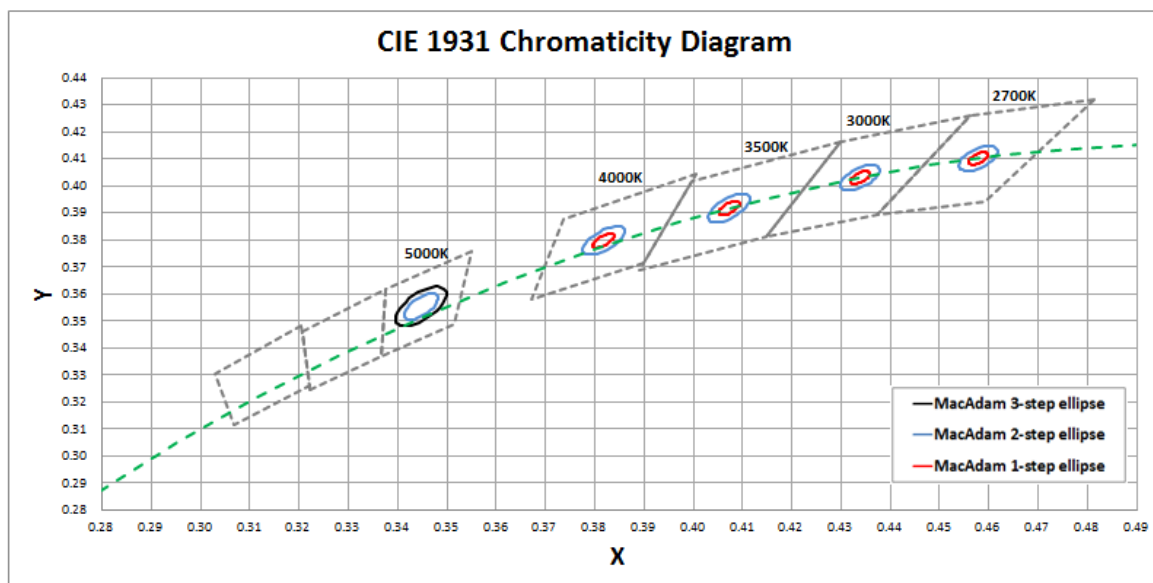
Digit	PKG Information	Code	Specification
1 2 3	Samsung Package High Power	SPH	
4 5	Color	WH	Warm White (T/U/V/W Ranks)
6	Product Version	A	
7 8	Form Factor	HD	COB
9	Lens Type	N	No lens
10	Wattage or Model	D E F G H K	LC013D LC016D LC019D LC026D LC033D LC040D
11	Internal Code	2	
12	CRI & Sorting Temperature	8	Typ. 95 (85 °C)
13 14	Forward Voltage (V)	YZ	30.6~36.6
15	CCT (K)	W V U T R	2700 K 3000 K 3500 K 4000 K 5000 K
16	MacAdam	1 2 3	MacAdam 1-step MacAdam 2-step MacAdam 3-step
17 18	Luminous Flux	D4	COB D-series Gen.4 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	SPHWAHDND28YZW1D4	YZ	W1	D4	1197 ~
		SPHWAHDND28YZW2D4		W2		
	3000	SPHWAHDND28YZV1D4	YZ	V1	D4	1282 ~
		SPHWAHDND28YZV2D4		V2		
	3500	SPHWAHDND28YZU1D4	YZ	U1	D4	1347 ~
		SPHWAHDND28YZU2D4		U2		
	4000	SPHWAHDND28YZT1D4	YZ	T1	D4	1408 ~
		SPHWAHDND28YZT2D4		T2		
	5000	SPHWAHDND28YZR2D4	YZ	R2	D4	1490 ~
		SPHWAHDND28YZR3D4		R3		
LC016D	2700	SPHWAHDNE28YZW1D4	YZ	W1	D4	1542 ~
		SPHWAHDNE28YZW2D4		W2		
	3000	SPHWAHDNE28YZV1D4	YZ	V1	D4	1651 ~
		SPHWAHDNE28YZV2D4		V2		
	3500	SPHWAHDNE28YZU1D4	YZ	U1	D4	1723 ~
		SPHWAHDNE28YZU2D4		U2		
	4000	SPHWAHDNE28YZT1D4	YZ	T1	D4	1813 ~
		SPHWAHDNE28YZT2D4		T2		
	5000	SPHWAHDNE28YZR2D4	YZ	R2	D4	1950 ~
		SPHWAHDNE28YZR3D4		R3		
LC019D	2700	SPHWAHDNF28YZW1D4	YZ	W1	D4	1840 ~
		SPHWAHDNF28YZW2D4		W2		
	3000	SPHWAHDNF28YZV1D4	YZ	V1	D4	1971 ~
		SPHWAHDNF28YZV2D4		V2		
	3500	SPHWAHDNF28YZU1D4	YZ	U1	D4	2057 ~
		SPHWAHDNF28YZU2D4		U2		
	4000	SPHWAHDNF28YZT1D4	YZ	T1	D4	2166 ~
		SPHWAHDNF28YZT2D4		T2		
	5000	SPHWAHDNF28YZR2D4	YZ	R2	D4	2328 ~
		SPHWAHDNF28YZR3D4		R3		

Model	Nominal CCT (K)	Product Code	V _F Rank	Color Rank	Flux Rank	Flux Range (Φ _v , lm)
LC026D	2700	SPHWAHDNG28YZW1D4	YZ	W1	D4	2418 ~
		SPHWAHDNG28YZW2D4		W2		
	3000	SPHWAHDNG28YZV1D4	YZ	V1	D4	2589 ~
		SPHWAHDNG28YZV2D4		V2		
	3500	SPHWAHDNG28YZU1D4	YZ	U1	D4	2702 ~
		SPHWAHDNG28YZU2D4		U2		
	4000	SPHWAHDNG28YZT1D4	YZ	T1	D4	2845 ~
		SPHWAHDNG28YZT2D4		T2		
	5000	SPHWAHDNG28YZR2D4	YZ	R2	D4	3059 ~
		SPHWAHDNG28YZR3D4		R3		
LC033D	2700	SPHWAHDNH28YZW1D4	YZ	W1	D4	2992 ~
		SPHWAHDNH28YZW2D4		W2		
	3000	SPHWAHDNH28YZV1D4	YZ	V1	D4	3204 ~
		SPHWAHDNH28YZV2D4		V2		
	3500	SPHWAHDNH28YZU1D4	YZ	U1	D4	3344 ~
		SPHWAHDNH28YZU2D4		U2		
	4000	SPHWAHDNH28YZT1D4	YZ	T1	D4	3520 ~
		SPHWAHDNH28YZT2D4		T2		
	5000	SPHWAHDNH28YZR2D4	YZ	R2	D4	3785 ~
		SPHWAHDNH28YZR3D4		R3		
LC040D	2700	SPHWAHDNK28YZW1D4	YZ	W1	D4	3680 ~
		SPHWAHDNK28YZW2D4		W2		
	3000	SPHWAHDNK28YZV1D4	YZ	V1	D4	3942 ~
		SPHWAHDNK28YZV2D4		V2		
	3500	SPHWAHDNK28YZU1D4	YZ	U1	D4	4205 ~
		SPHWAHDNK28YZU2D4		U2		
	4000	SPHWAHDNK28YZT1D4	YZ	T1	D4	4331 ~
		SPHWAHDNK28YZT2D4		T2		
	5000	SPHWAHDNK28YZR2D4	YZ	R2	D4	4825 ~
		SPHWAHDNK28YZR3D4		R3		

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



MacAdam Ellipse (W1, W2)					
Step	CIE x	CIE y	θ	a	b
1-step	0.4578	0.4101	53.70	0.0027	0.0014
2-step	0.4578	0.4101	53.70	0.0054	0.0028

MacAdam Ellipse (V1, V2)					
Step	CIE x	CIE y	θ	a	b
1-step	0.4338	0.4030	53.22	0.0028	0.0014
2-step	0.4338	0.4030	53.22	0.0056	0.0027

MacAdam Ellipse (U1, U2)					
Step	CIE x	CIE y	θ	a	b
1-step	0.4073	0.3917	54.00	0.0031	0.0014
2-step	0.4073	0.3917	54.00	0.0062	0.0028

MacAdam Ellipse (T1, T2)					
Step	CIE x	CIE y	θ	a	b
1-step	0.3818	0.3797	53.72	0.0031	0.0013
2-step	0.3818	0.3797	53.72	0.0063	0.0027

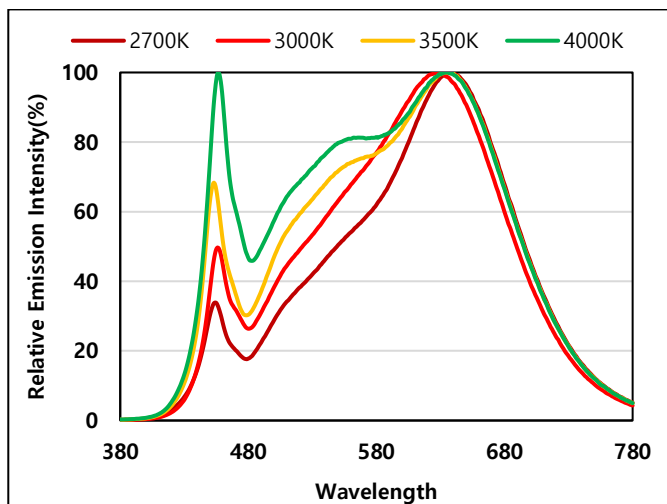
MacAdam Ellipse (R2, R3)					
Step	CIE x	CIE y	θ	a	b
2-step	0.3447	0.3553	59.62	0.0055	0.0024
3-step	0.3447	0.3553	59.62	0.0082	0.0035

Note:

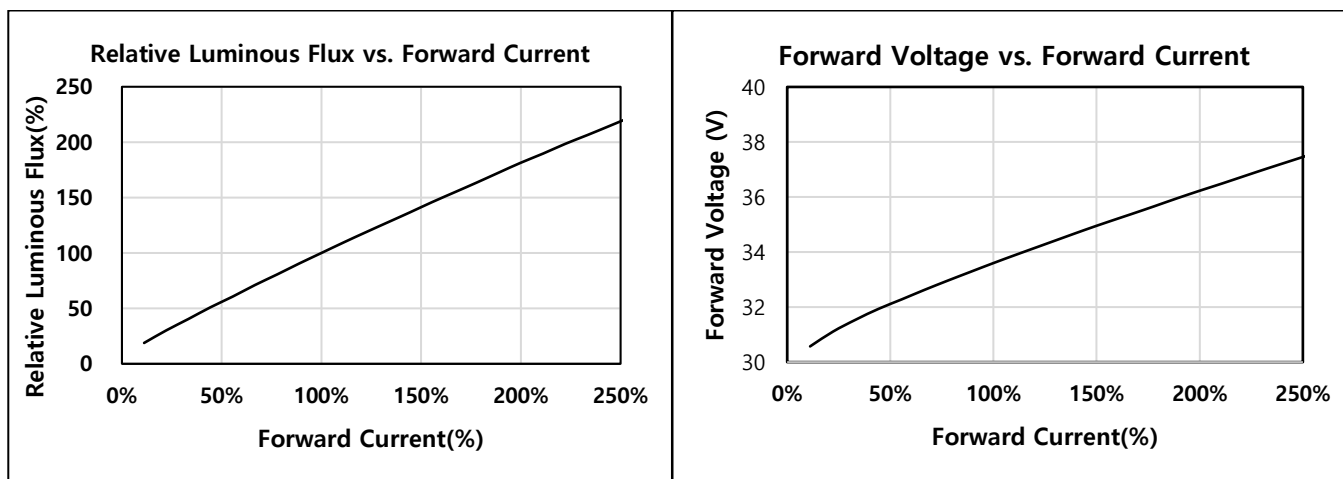
Samsung maintains measurement tolerance of: $C_x, C_y = \pm 0.005$

3. Typical Characteristics Graphs

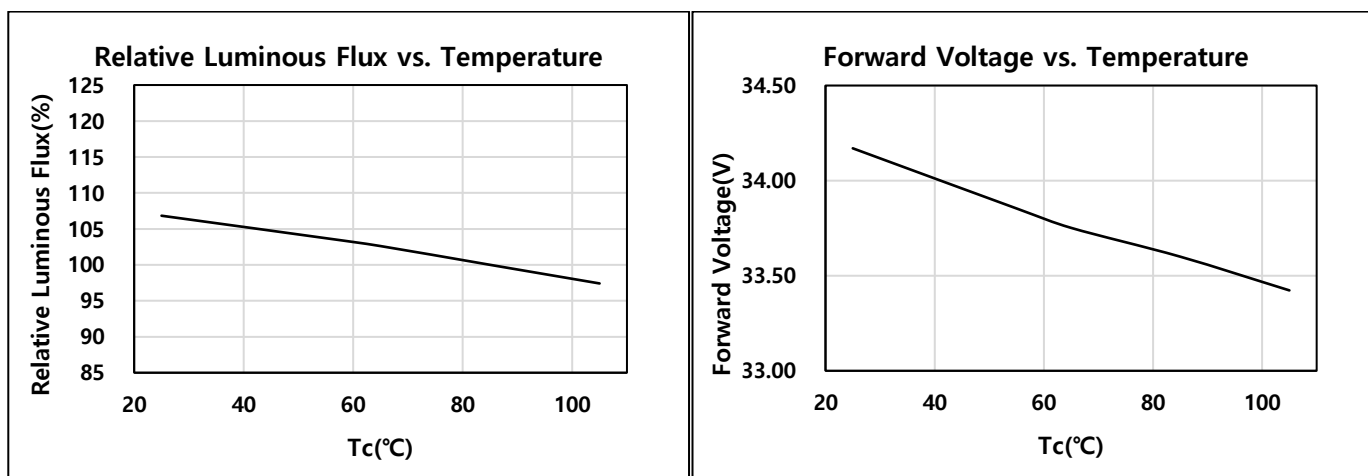
a) Spectrum Distribution (I_F = Sorting Current, $T_J = 85^\circ\text{C}$)



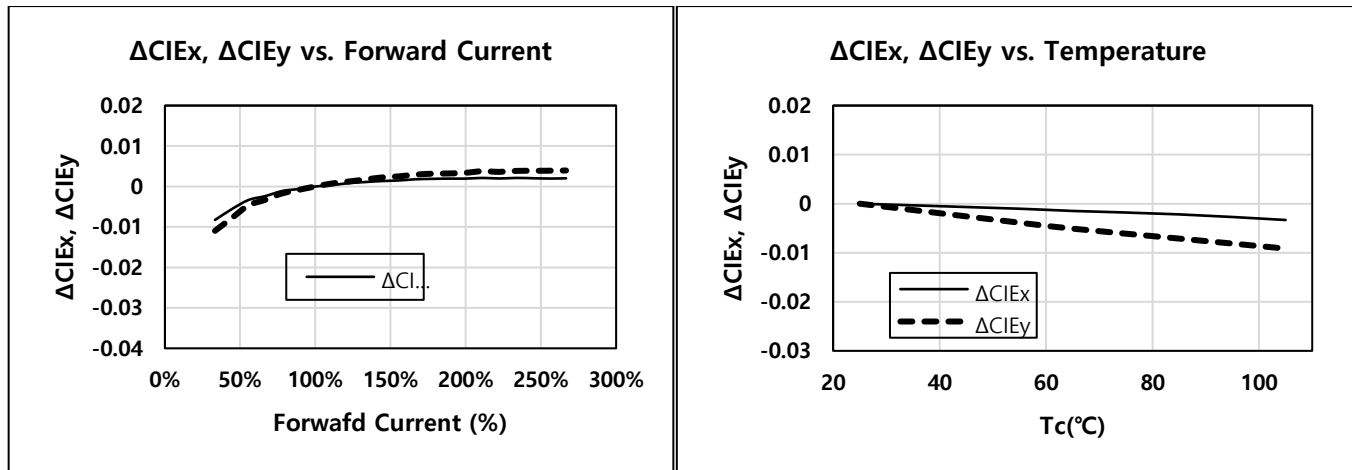
b) Forward Current Characteristics ($T_J = 85^\circ\text{C}$)



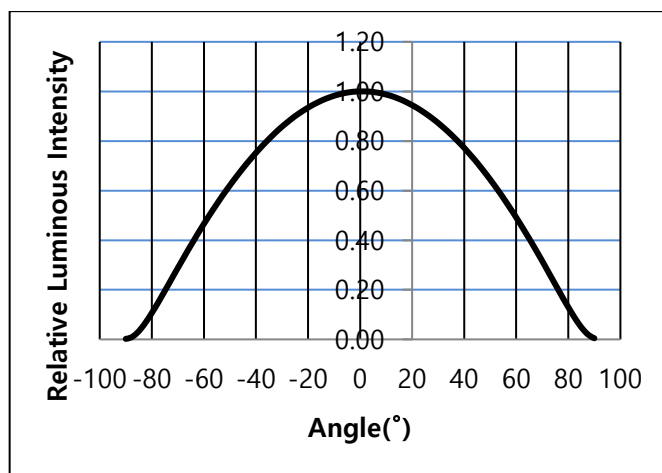
c) Temperature Characteristics (I_F = Sorting Current)



d) Color Shift Characteristics ($T_J = 85^\circ\text{C}$, $I_F = \text{Sorting Current}$, $\text{CRI} = 95+$)

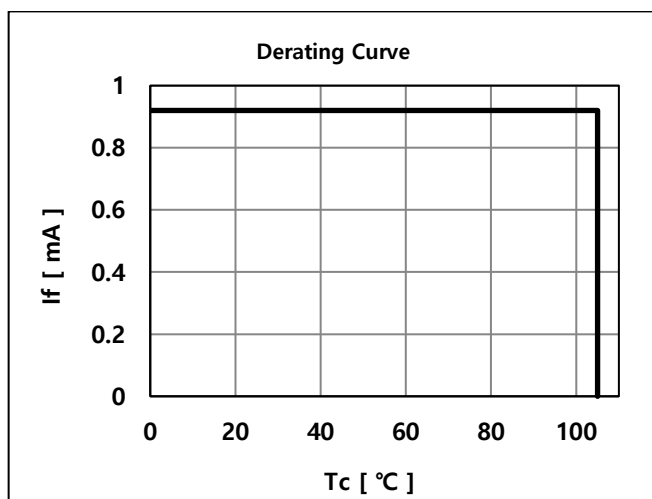


e) Beam Angle Characteristics ($I_F = \text{Sorting Current}$, $T_J = 85^\circ\text{C}$)

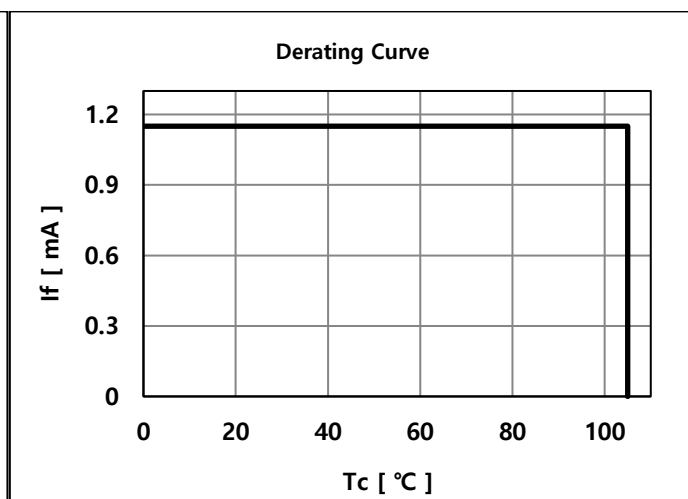


f) Derating Characteristics

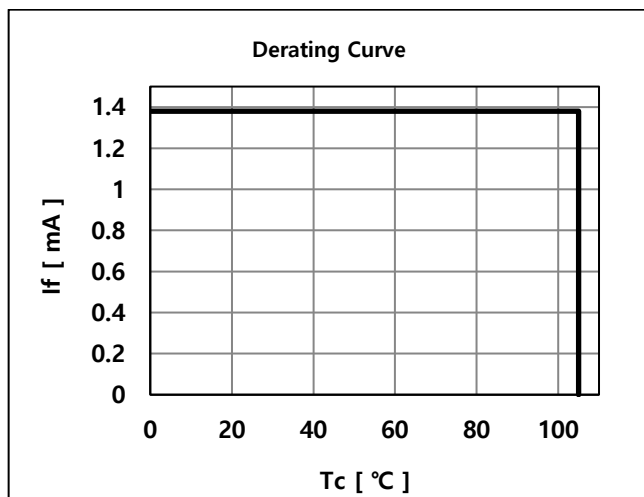
1) LC013D



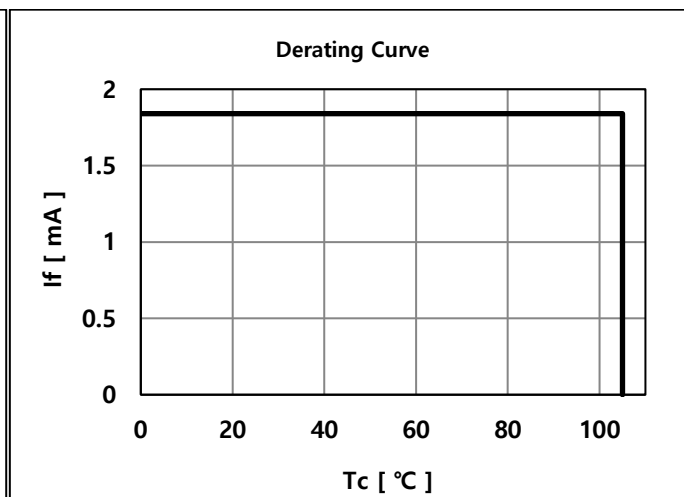
2) LC016D



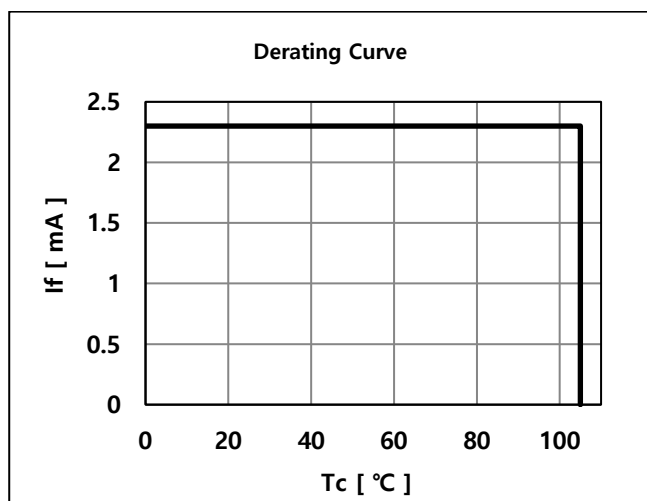
3) LC019D



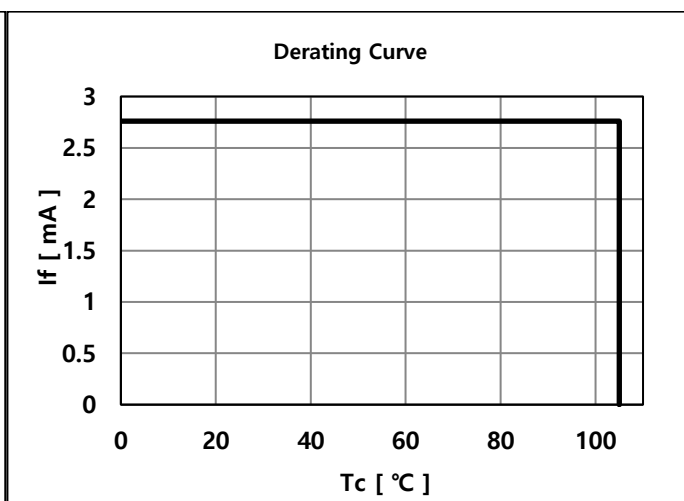
4) LC026D



5) LC033D

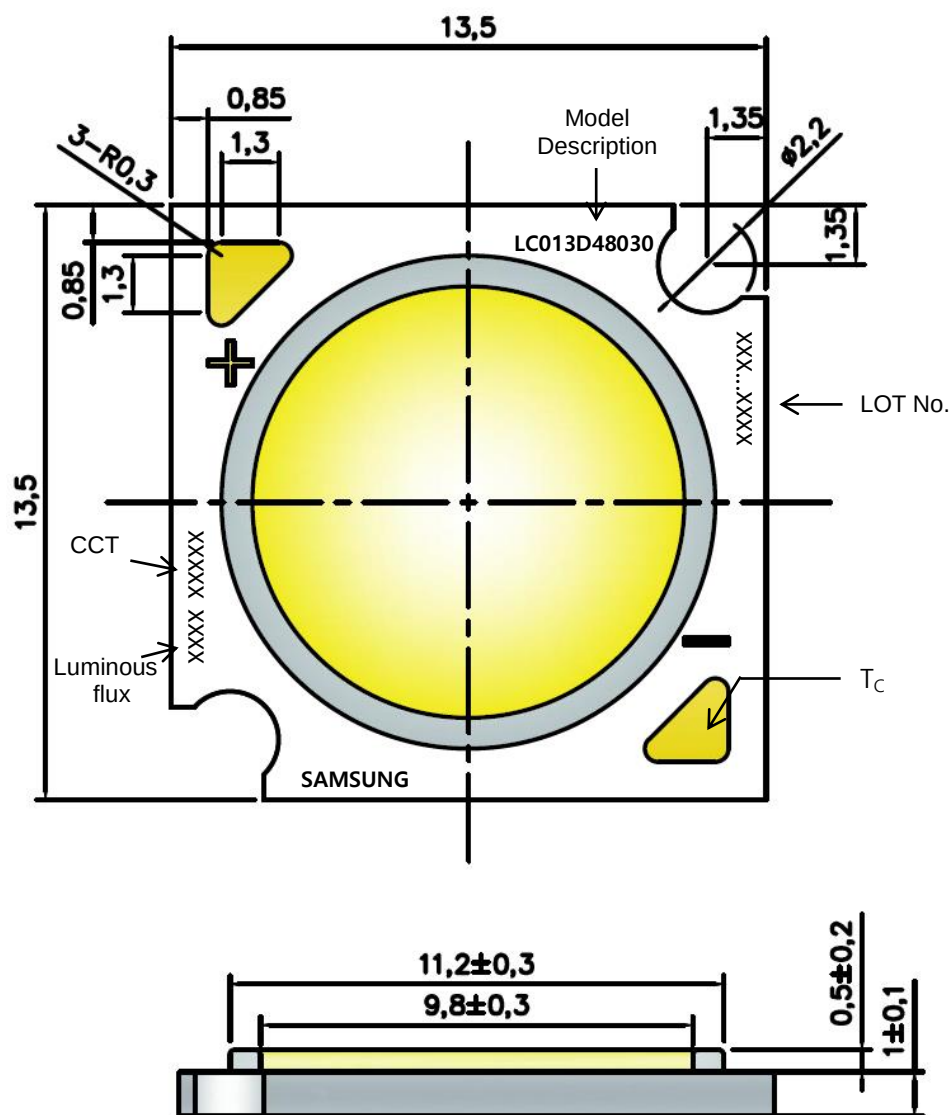


6) LC040D



4. Outline Drawing & Dimension

※ Model : LC003D, LC006D, LC009D, LC013D

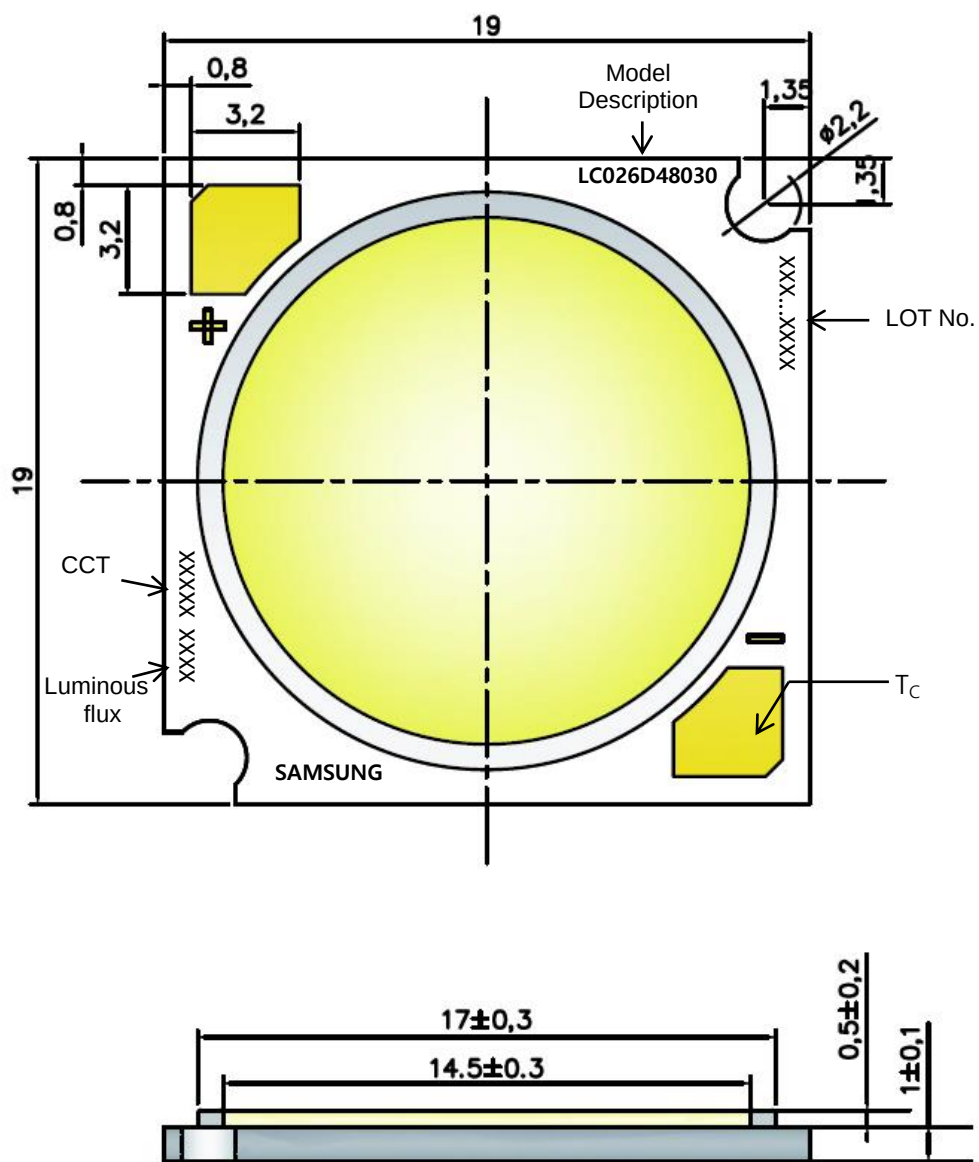


1. Unit: mm
2. Tolerance: ± 0.3 mm

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

Note: Denoted product information above is only an example
(LC013D48030 :LC013D, Gen4, Ra80, 3000K)

※ Model : LC016D, LC019D, LC026D, LC033D

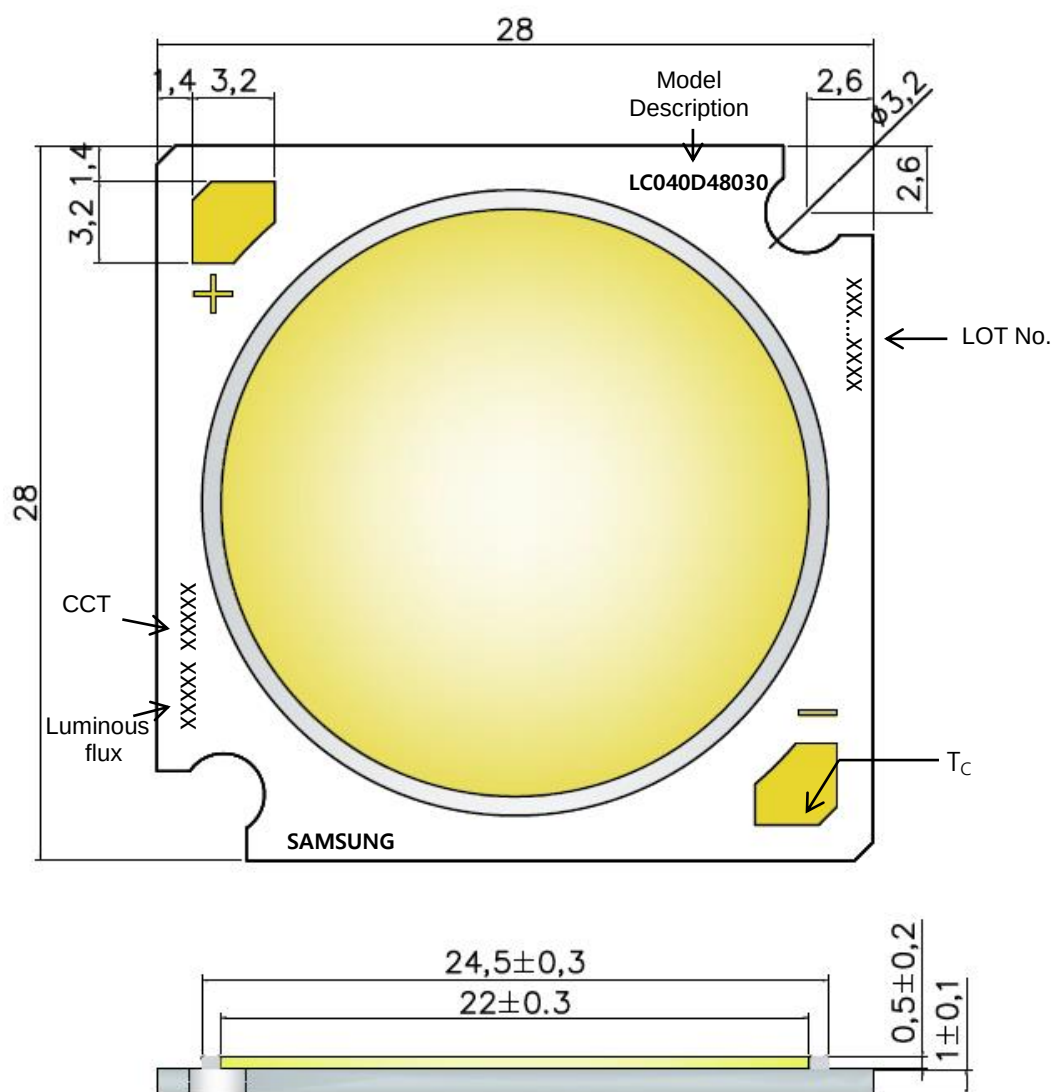


1. Unit: mm
2. Tolerance: ± 0.3 mm

Item	Dimension	Tolerance	Unit
Length	19.0	± 0.15	mm
Width	19.0	± 0.15	mm
Height	Dam	± 0.15	mm
	Substrate	± 0.10	mm
LES Diameter	Light Emitting Surface	± 0.30	mm

Note: Denoted product information above is only an example
(LC026D48030 : LC026D, Gen4, CRI80+, 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	Dam	0.7	±0.15	mm
	Substrate	1.0	±0.10	mm
LES Diameter	Light Emitting Surface	22.0	±0.30	mm

Note: Denoted product information above is only an example
(LC040D48030 : LC040D, Gen4, 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_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 = max	100 cycles
ESD (HBM)	R ₁ : 10 MΩ R ₂ : 1.5 kΩ C: 100 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



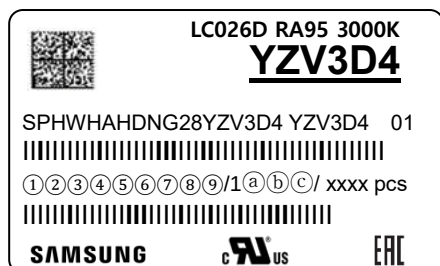
Note: Denoted bincode and product code above is only an example (see description on page 5)

Bin Code:

- ⒶⒷ: Forward Voltage bin (refer to page11)
- ⒸⒹ: 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

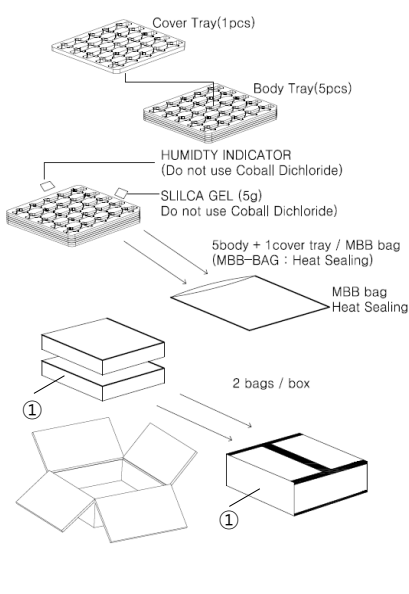
- ① : Production site (S: Giheung, Korea, G: Tianjin, China)
- ② : 4(LED)
- ③ : Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
- ④ : Year (F: 2021, G: 2022, H: 2022...)
- ⑤ : Month (1~9, A, B, C)
- ⑥⑦⑧⑨ : Day (1~9, A, B~V)
- ⒶⒷⒸ : Product serial number (001 ~ 999)

7. Packing Structure

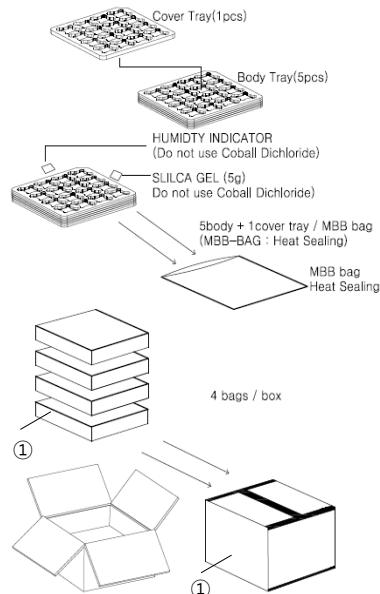
※ Model : LC013D

Packing material	Max. quantity in pcs of COB	Dimension(mm)			
		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

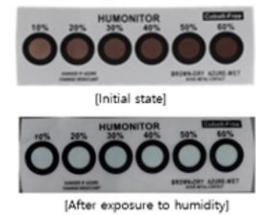
a) Packing Structure



※ Small Box



※ Middle Box



[SILICA GEL (5g)]

① Side Label

LC013D RA95 3000K
YZV3D4

SPHWAHDND28YZV3D4 YZV3D4 01

|||||

G4AZC4001/1001/ xxx pcs

|||||

SAMSUNG

(1P) Supplier Part Number : SPHWAHDND28YZV3D4



(33P) Bin Code / YZV3D4



(1T) Lot Number / 1001



(Q) Quantity : XXX



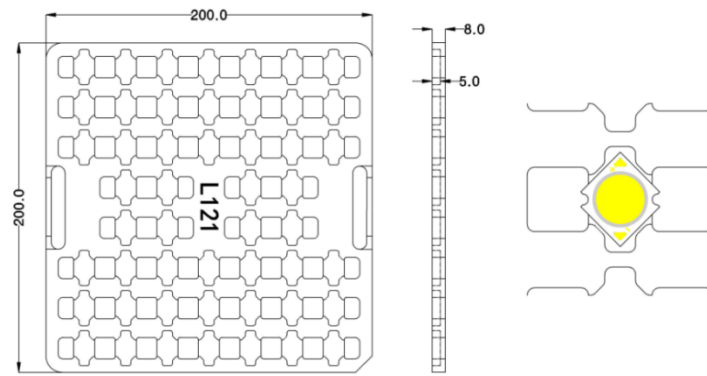
(100) Data Code : 2109



(4L) Country of Origin : CN



b) Tray

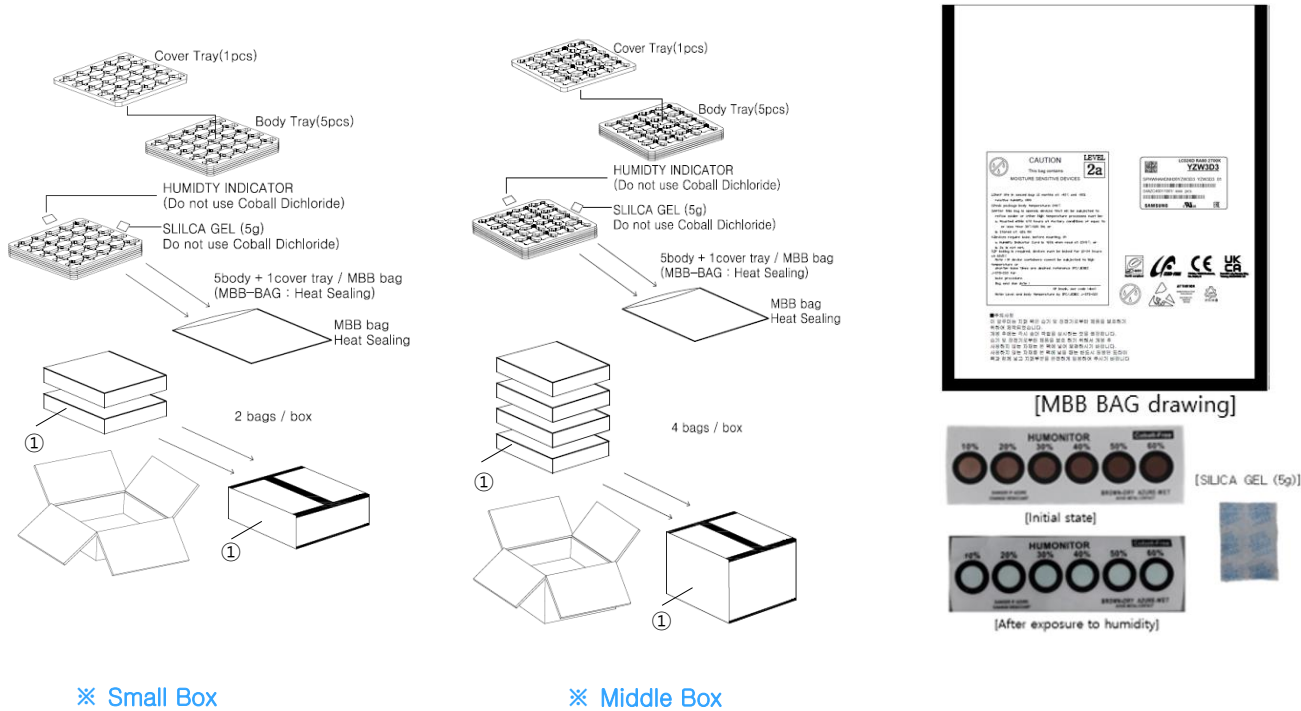


※ Model : LC016D, LC019D, LC026D, LC033D

a) Packing Structure

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



※ Small Box

※ Middle Box

① Side Label



LC026D RA95 3000K
YZV3D4

SPHWAHDNG28YZV3D4 YZV3D4 01
G4AZC4001/1001/ xxx pcs

SAMSUNG  **ERC**

(1P) Supplier Part Number : SPHWAHDNG28YZV3D4


(33P) Bin Code / YZV3D4

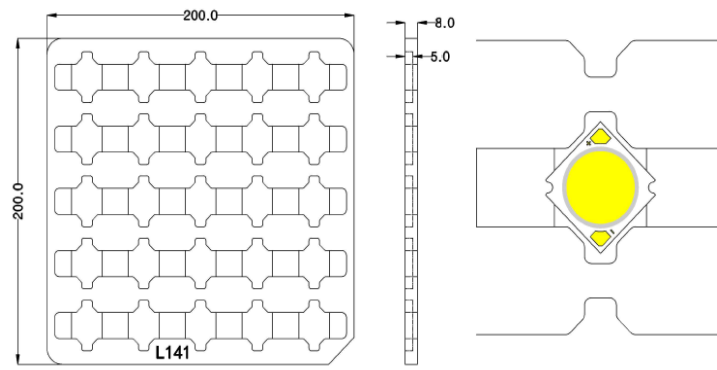

(1T) Lot Number / 1001


(Q) Quantity : XXX


(100) Data Code : 2109


(4L) Country of Origin : CN

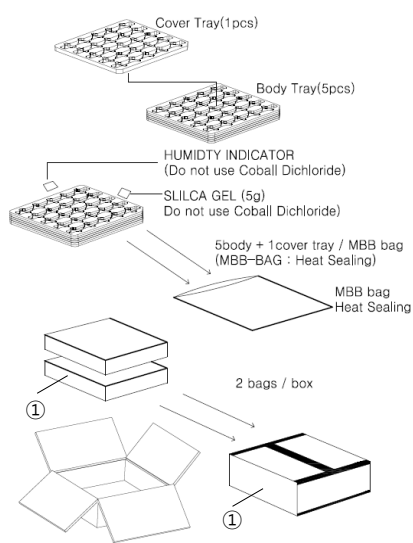

b) Tray



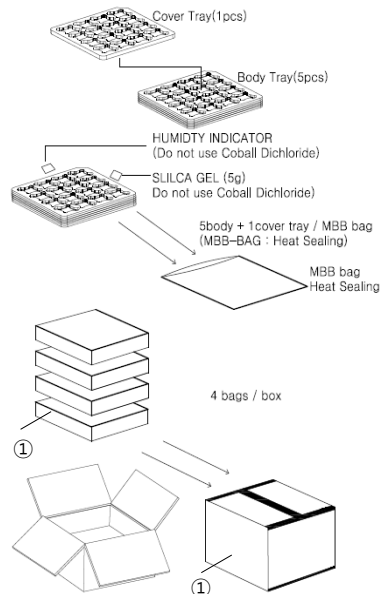
※ Model : LC040D

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



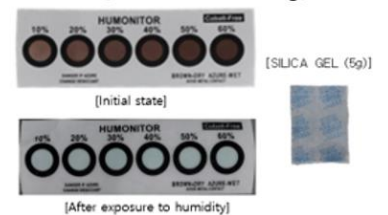
※ Small Box



※ Middle Box



[MBB BAG drawing]



[SILICA GEL (5g)]

① Side Label



LC040D RA95 3000K
YZV3D4

SPHWAHDNK28YZV3D4 YZV3D4 01
G4AZC4001/1001/ xxx pcs

SAMSUNG  

(1P) Supplier Part Number : SPHWAHDNK28YZV3D4



(33P) Bin Code / YZV3D4



(1T) Lot Number / 1001



(Q) Quantity : XXX



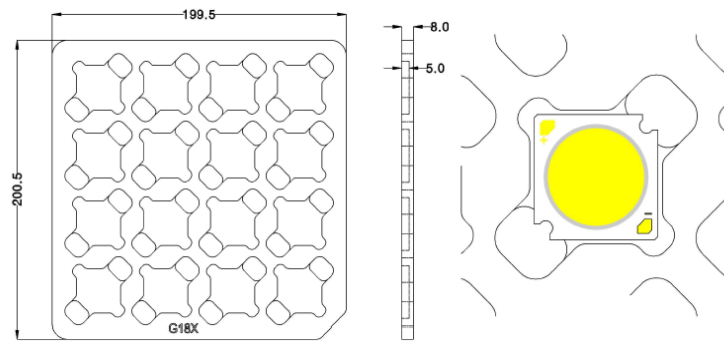
(100) Data Code : 2109



(4L) Country of Origin : CN

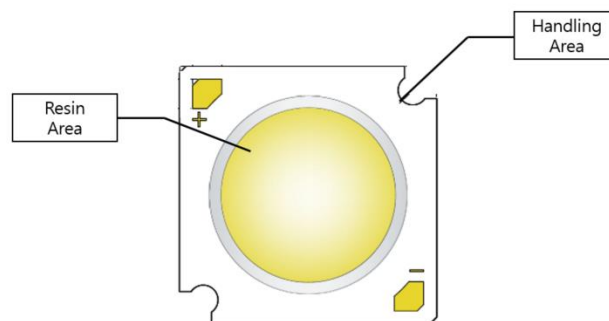


b) Tray



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, 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.
- 12) The LED from Samsung uses an Aluminum MCPCB with Ag thin layer and its surface color may change to black (or dark colored) when it is exposed to sulfur (S), chlorine (Cl) or other halogen compound. Sulfurization of Al-MCPCB may cause intensity degradation, change of chromaticity coordinates and, in extreme cases, open circuit. It requires caution. Due to possible sulfurization of Al-MCPCB, LED should not be used and stored together with oxidizing substances made of materials such as rubber, plain paper, lead solder cream, etc.



Legal and additional information.

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Samsung provides limited warranty for its LED products, the full text of which is available at <https://www.samsung.com/led/support/warranties>.

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