

High Voltage LED Series
Chip on Board

COB R-series G4 S90 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
- Indoor 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	-	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, $T_J = 85\text{ }^{\circ}\text{C}$)

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/R_9)	-	All model	7	90 / 50	-	
Beam Angle	$^{\circ}$	-	-	-	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	-
Thermal Resistance (Junction to chip case)	$^{\circ}\text{C/W}$	LC013D	-	-	0.81	-
		LC016D	-	-	0.64	-
		LC019D	-	-	0.57	-
		LC026D	-	-	0.45	-
		LC033D	-	-	0.38	-
		LC040D	-	-	0.30	-

Notes:

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

c) Luminous Flux Characteristics (I_F = Sorting Current)

Model	CRI (R_a)	Nominal	Flux	Flux@ $T_J = 85\text{ }^{\circ}\text{C}$ (lm)		
	Min.	CCT (K)	Rank	Min.	Typ.	Max.
LC013D	90	3000	D4	1766	1879	-
		3500	D4	1799	1914	-
		4000	D4	1834	1951	-
LC016D	90	3000	D4	2273	2418	-
		3500	D4	2328	2477	-
		4000	D4	2398	2552	-
LC019D	90	3000	D4	2727	2901	-
		3500	D4	2778	2956	-
		4000	D4	2851	3033	-
LC026D	90	3000	D4	3657	3890	-
		3500	D4	3701	3938	-
		4000	D4	3747	3987	-
LC033D	90	3000	D4	4471	4757	-
		3500	D4	4545	4835	-
		4000	D4	4601	4894	-
LC040D	90	3000	D4	5479	5829	-
		3500	D4	5674	6036	-
		4000	D4	5784	6153	-

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

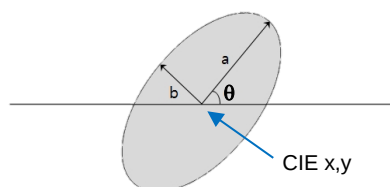
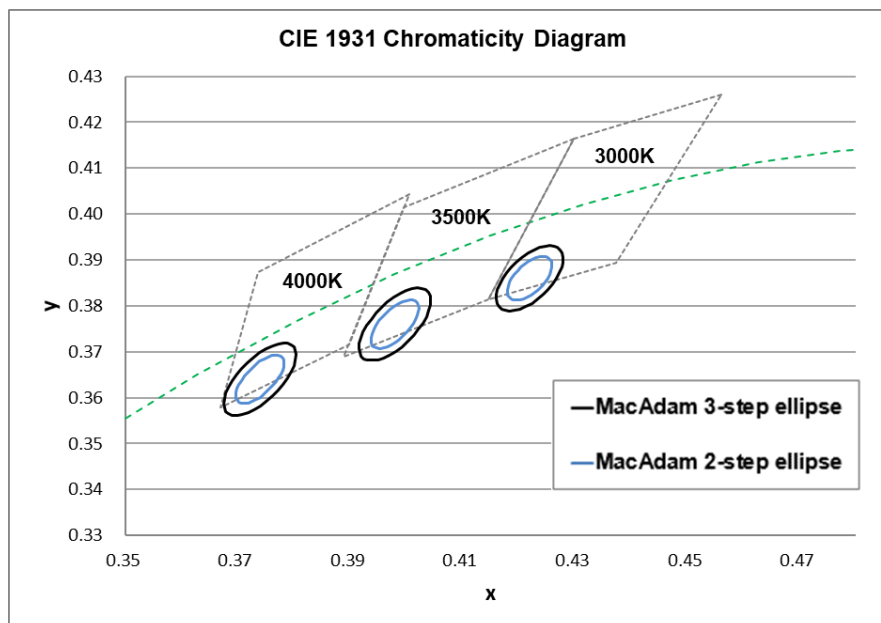
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
S	P	H	W	H	S	H	D	N	G	2	V	Y	Z	V	N	D	4

Digit	PKG Information	Code	Specification
1 2 3	Samsung Package High Power	SPH	
4 5	Color	WH	White
6	Product Version	S	S90
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	V	Vivid white, Min. 90 (85°C)
13 14	Forward Voltage (V)	YZ	30.6~36.6
15	CCT (K)	V U T	3000K 3500K 4000K
16	MacAdam Step	M N	MacAdam 2-step MacAdam 3-step
17 18	Luminous Flux (Lm)	D4	COB D-series Gen.4 level

a) Binning Structure (Sorting Current, $T_J = 85^\circ\text{C}$)

Model	CRI(R _a)	Nominal CCT(K)	Product Code	V _F Rank	Color Rank	Flux Rank	Flux Range (Φ _v , lm)
LC013D	90	3000	SPHWHSHDND2VYZVMD4	YZ	VM	D4	1766 ~
			SPHWHSHDND2VYZVND4		VN		
		3500	SPHWHSHDND2VYZUMD4	YZ	UM	D4	1799 ~
			SPHWHSHDND2VYZUND4		UN		
		4000	SPHWHSHDND2VYZTMD4	YZ	TM	D4	1834 ~
			SPHWHSHDND2VYZTND4		TN		
LC016D	90	3000	SPHWHSHDNE2VYZVMD4	YZ	VM	D4	2273 ~
			SPHWHSHDNE2VYZVND4		VN		
		3500	SPHWHSHDNE2VYZUMD4	YZ	UM	D4	2328 ~
			SPHWHSHDNE2VYZUND4		UN		
		4000	SPHWHSHDNE2VYZTMD4	YZ	TM	D4	2398 ~
			SPHWHSHDNE2VYZTND4		TN		
LC019D	90	3000	SPHWHSHDNF2VYZVMD4	YZ	VM	D4	2727 ~
			SPHWHSHDNF2VYZVND4		VN		
		3500	SPHWHSHDNF2VYZUMD4	YZ	UM	D4	2778 ~
			SPHWHSHDNF2VYZUND4		UN		
		4000	SPHWHSHDNF2VYZR2D4	YZ	TM	D4	2851 ~
			SPHWHSHDNF2VYZT2D4		TN		

Model	CRI(R _a)	Nominal CCT(K)	Product Code	V _F Rank	Color Rank	Flux Rank	Flux Range (Φ _v , lm)
LC026D	90	3000	SPHWHSHDNG2VYZVMD4	YZ	VM	D4	3657 ~
			SPHWHSHDNG2VYZVND4		VN		
		3500	SPHWHSHDNG2VYZUMD4	YZ	UM	D4	3701 ~
			SPHWHSHDNG2VYZUND4		UN		
		4000	SPHWHSHDNG2VYZTMD4	YZ	TM	D4	3747 ~
			SPHWHSHDNG2VYZTND4		TN		
LC033D	90	3000	SPHWHSHDNH2VYZVMD4	YZ	VM	D4	4471 ~
			SPHWHSHDNH2VYZVND4		VN		
		3500	SPHWHSHDNH2VYZUMD4	YZ	UM	D4	4545 ~
			SPHWHSHDNH2VYZUND4		UN		
		4000	SPHWHSHDNH2VYZTMD4	YZ	TM	D4	4601 ~
			SPHWHSHDNH2VYZTND4		TN		
LC040D	90	3000	SPHWHSHDNK2VYZVMD4	YZ	VM	D4	5479 ~
			SPHWHSHDNK2VYZVND4		VN		
		3500	SPHWHSHDNK2VYZUMD4	YZ	UM	D4	5674 ~
			SPHWHSHDNK2VYZUND4		UN		
		4000	SPHWHSHDNK2VYZTMD4	YZ	TM	D4	5784 ~
			SPHWHSHDNK2VYZTND4		TN		

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


MacAdam Ellipse (VM, VN)					
Step	CIE x	CIE y	θ	a	b
2-step	0.4220	0.3860	53.2	0.0056	0.0027
3-step	0.4220	0.3860	53.2	0.0083	0.0041

MacAdam Ellipse (UM, UN)					
Step	CIE x	CIE y	θ	a	b
2-step	0.3980	0.3760	54.0	0.0062	0.0028
3-step	0.3980	0.3760	54.0	0.0093	0.0041

MacAdam Ellipse (TM, TN)					
Step	CIE x	CIE y	θ	a	b
2-step	0.3740	0.3640	53.7	0.0063	0.0027
3-step	0.3740	0.3640	53.7	0.0094	0.0040

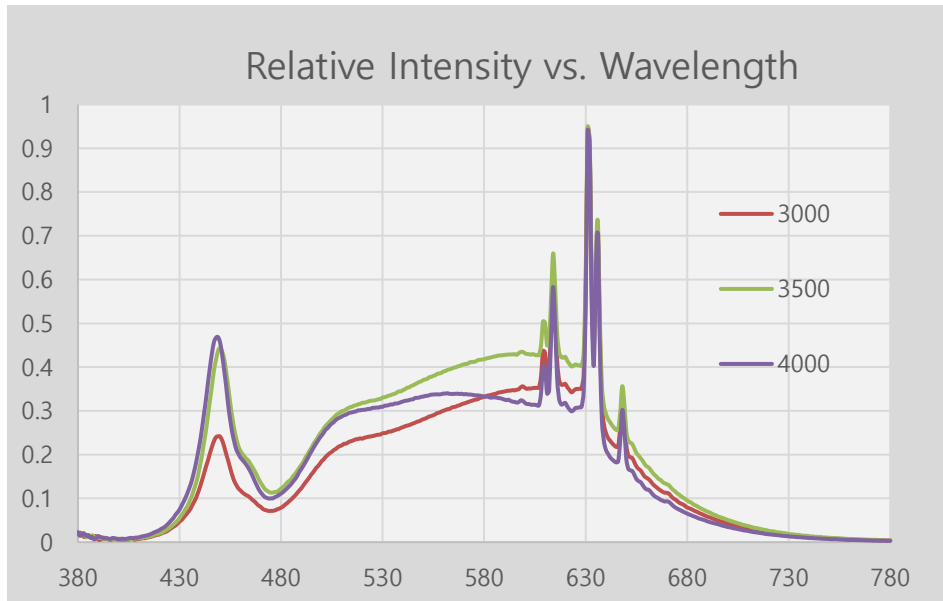
Note:

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

3. Typical Characteristics Graphs

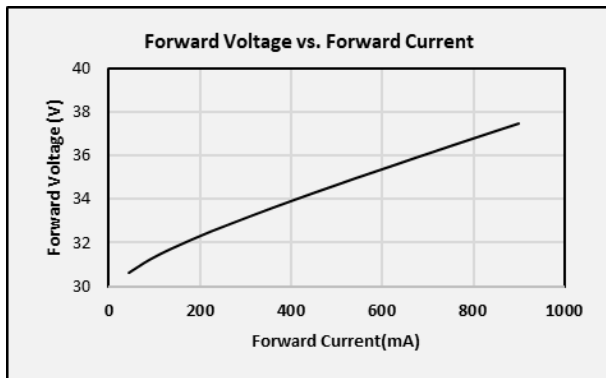
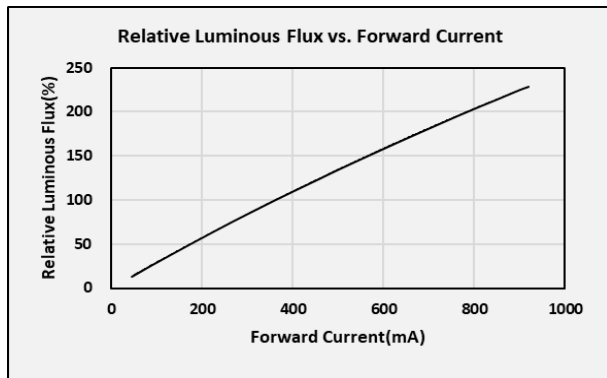
a) Spectrum Distribution (I_f = Sorting Current)

CRI Ra 90

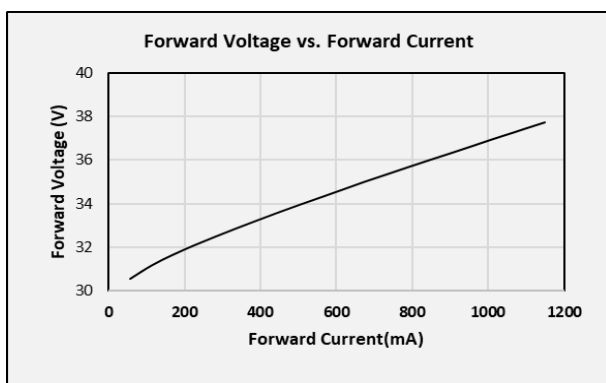
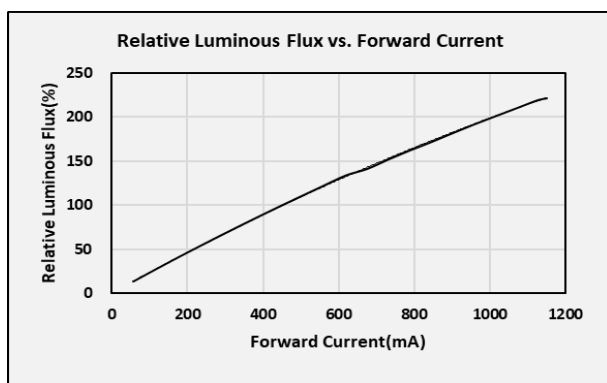


b) Forward Current Characteristics ($T_J = 85^\circ\text{C}$)

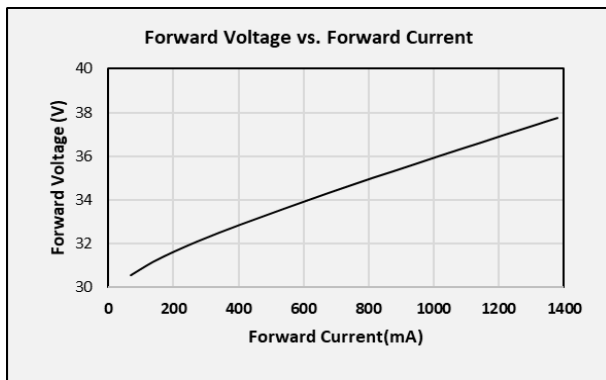
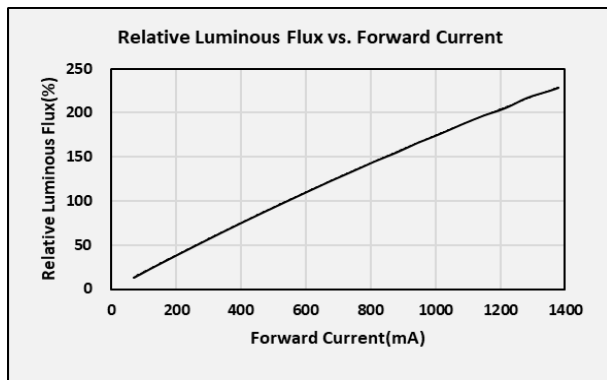
1) LC013D



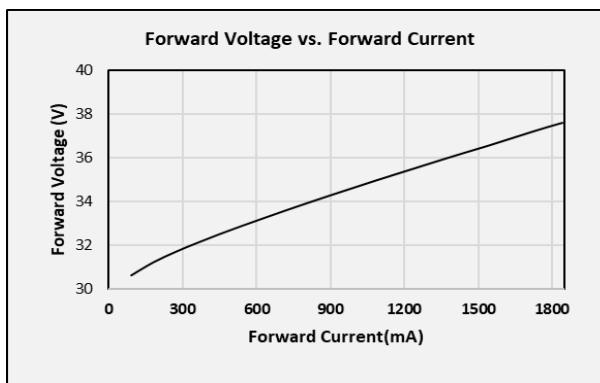
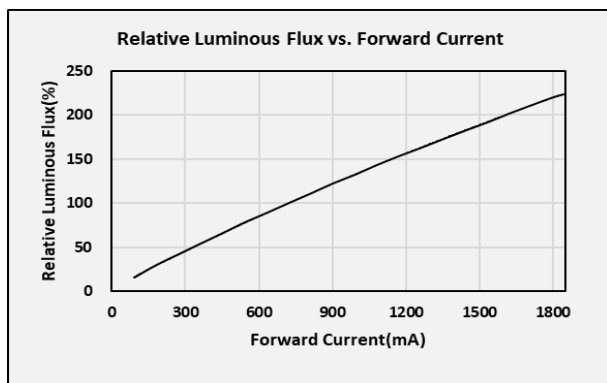
2) LC016D



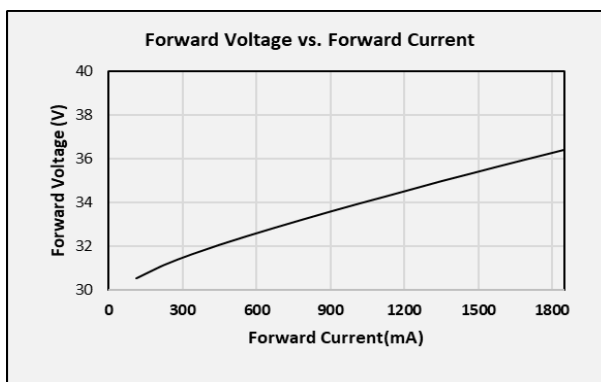
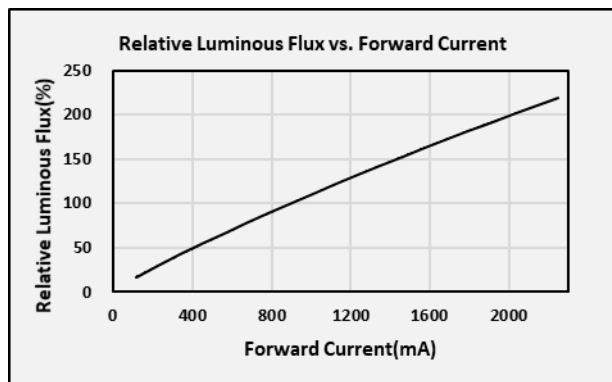
3) LC019D



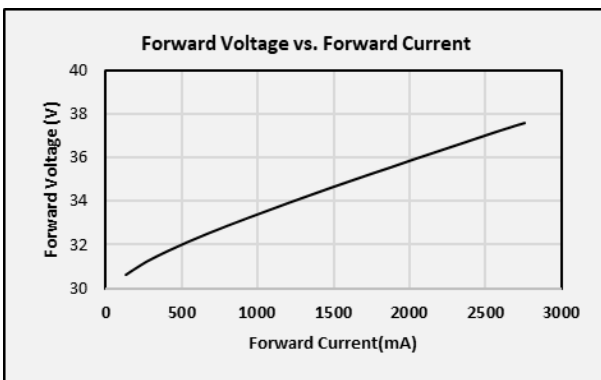
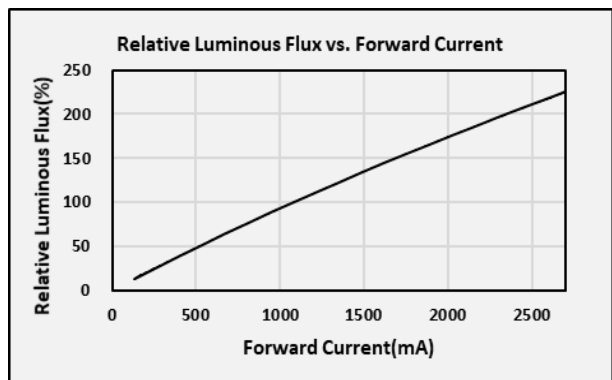
4) LC026D



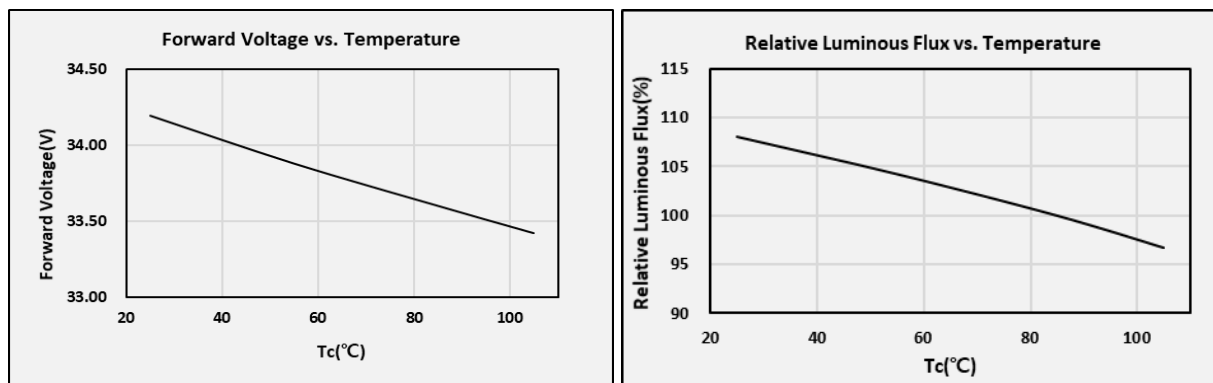
5) LC033D



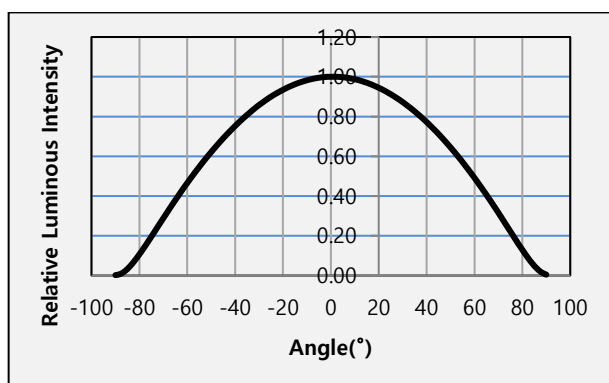
6) LC040D



c) Temperature Characteristics (I_F = Sorting Current)

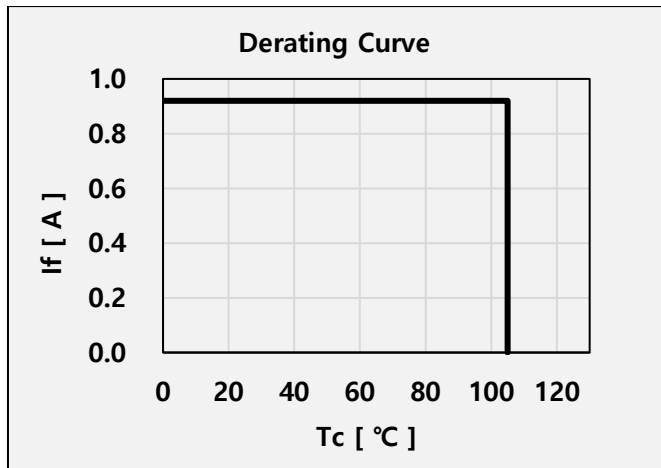


d) Beam Angle Characteristics (I_F = Sorting Current, $T_J = 85^{\circ}\text{C}$)

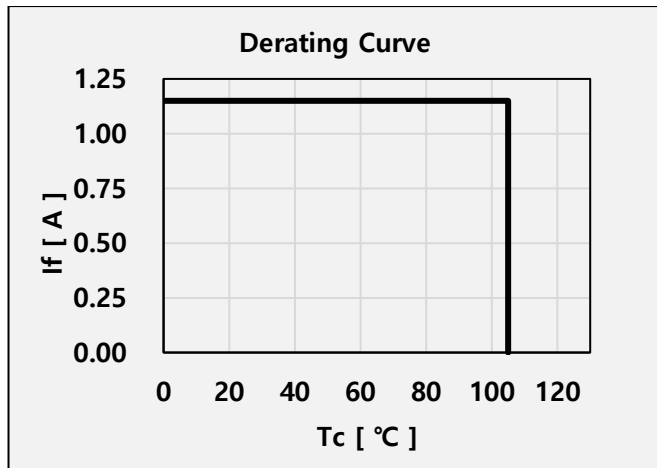


e) Derating Characteristics

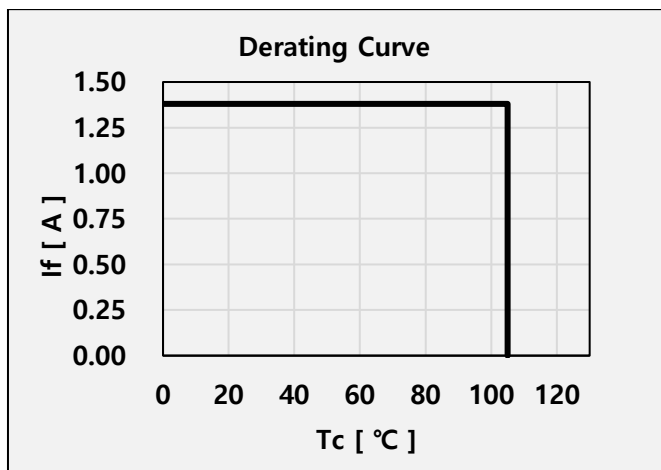
1) LC013D



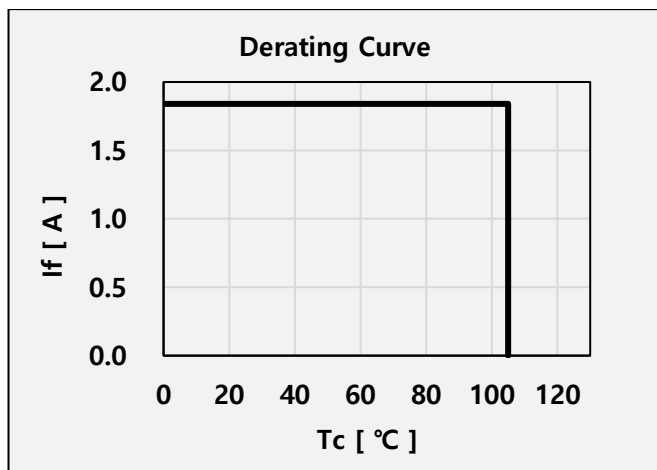
2) LC016D



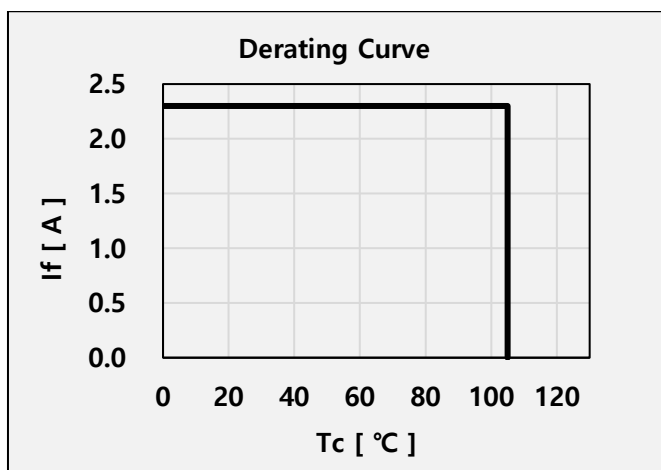
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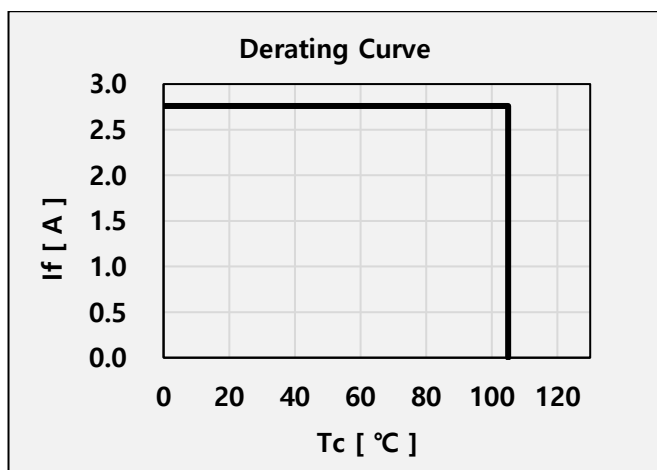
4) LC026D



5) LC033D

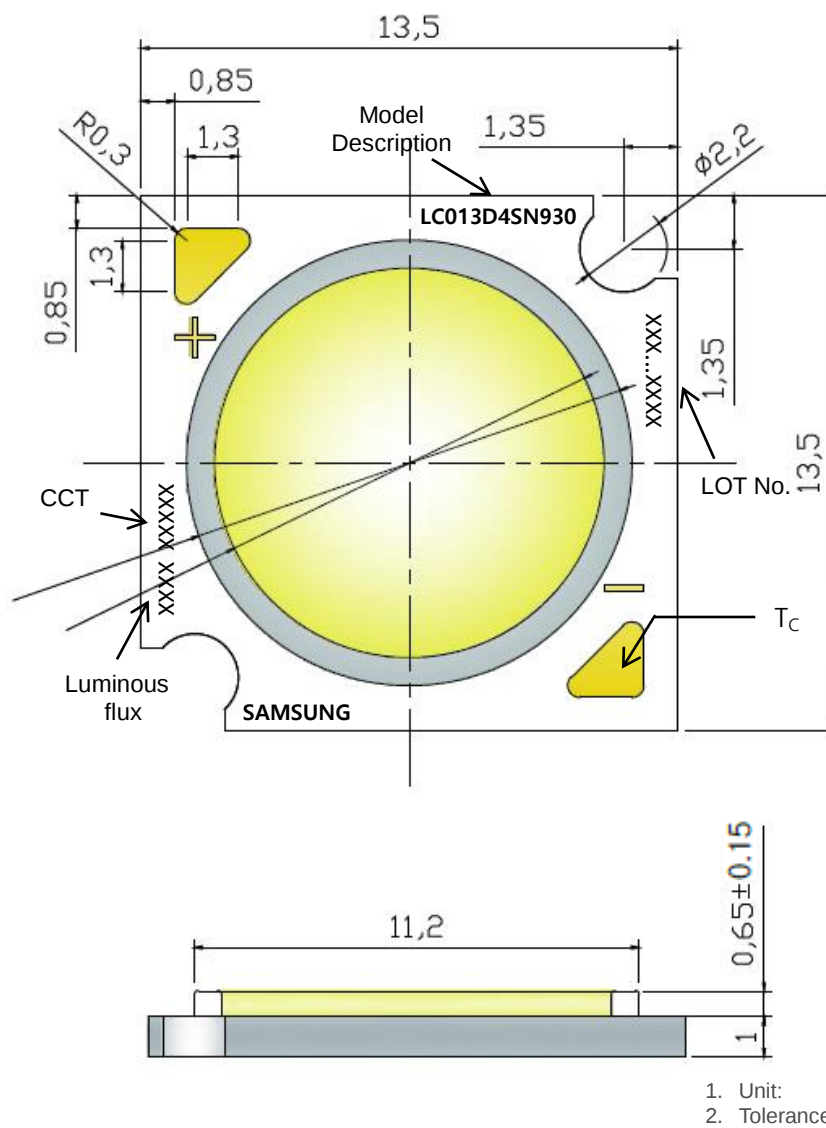


6) LC040D



4. Outline Drawing & Dimension

※ Model : LC013D

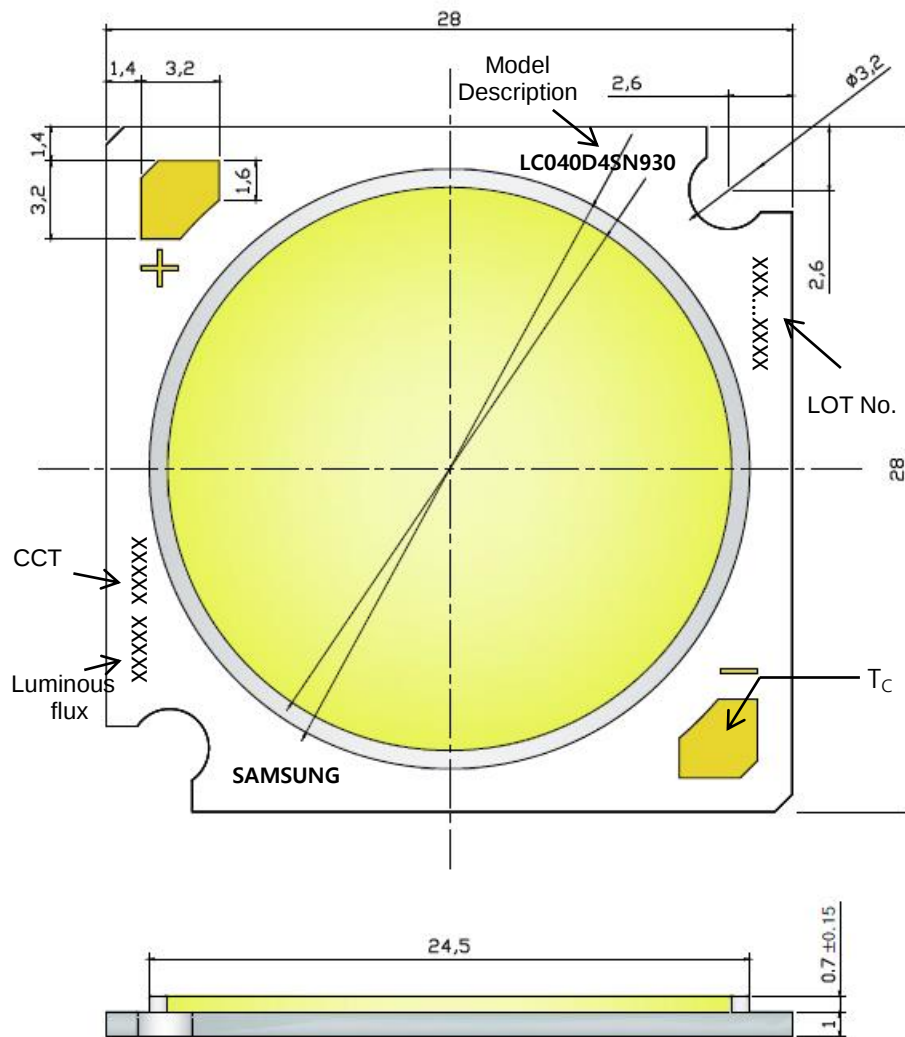


Item	Dimension	Tolerance	Unit
Length	13.5	±0.15	mm
Width	13.5	±0.15	mm
Height	Dam	±0.15	mm
	Substrate	±0.10	mm
LES Diameter	Light Emitting Surface	±0.30	mm

Note: Denoted product information above is only an example
(LC013D4SN930 : LC013D, Gen4, S90, Vivid white, 3000K)

Note: Denoted product information above is only an example
(LC026D4SN930 : LC026D, Gen4, S90, Vivid white, 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
 (LC040D4SN930 : LC040D, Gen4, S90, Vivid white, 3000K)

5. Reliability Test Items & Conditions

a) Test Items

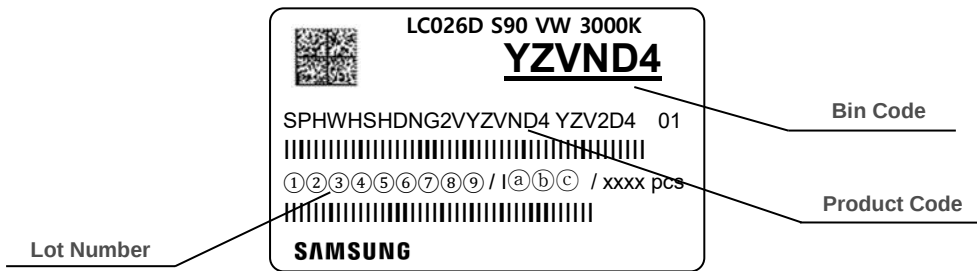
Test Item	Test Condition	Test Hour / Cycle
Wet High Temperature Operating Life Test (WHTOL)	60 °C, 90 % RH, DC Derating, I_F	1000 h
High Temperature Operating Life Test (HTOL)	85 °C, DC Derating, I_F	1000 h
Low Temperature Operating Life Test (LTOL)	-40 °C, DC, Derating I_F	1000 h
High Temperature Storage	105 °C	1000 h
Low Temperature Storage	-40 °C	1000 h
Wet High Temperature Storage Test	60°C, 90% RH	1000h
Temperature Cycling	-45 °C / 15min ~ 125 °C / 15min Temperature change within 5min	500 cycle
ESD (HBM)	R ₁ : 10 MΩ R ₂ : 1.5 kΩ C: 100 pF V: ±2 kV	5 times

b) Criteria for Judging the Damage

Item	Symbol	Test Condition ($T_c = 25\text{ °C}$)	Limit	
			Min.	Max.
Forward Voltage	V_F	I_F = Sorting Current	L.S.L. * 0.9	U.S.L. * 1.1
Luminous Flux	Φ_v	I_F = Sorting Current	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 9)
- ③④: Chromaticity bin (refer to page 21)
- ⑤⑥: Luminous Flux bin (refer to page 5-8)

b) Lot Number

The lot number is composed of the following characters:



①②③④⑤⑥⑦⑧⑨ / l(a)(b)(c) / xxx pcs

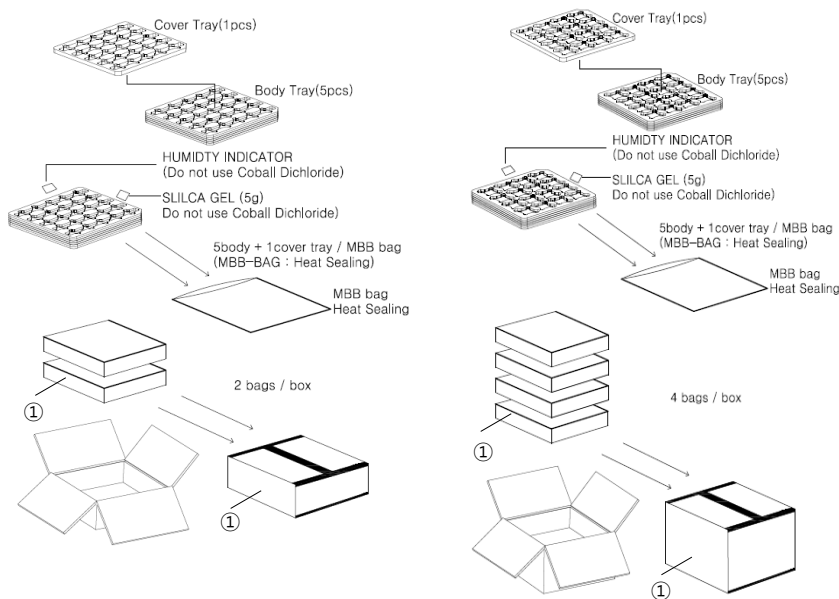
- ① : Production site (G: China)
- ② : Product (4: LED)
- ③ : Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
- ④ : Year (G: 2022, H: 2023, I: 2024...)
- ⑤ : Month (1~9, A, B, C)
- ⑥ : Day (1~9, A, B~V)
- ⑦⑧⑨ : Product serial number (001 ~ 999)
- a(b)(c)

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



① Side Label



(1P) Supplier Part Number : SPHWHSHDND2VYZVND4



(Q) Quantity : XXXX



(33P) Bin Code / YZVND4



(100) Data Code : 2212



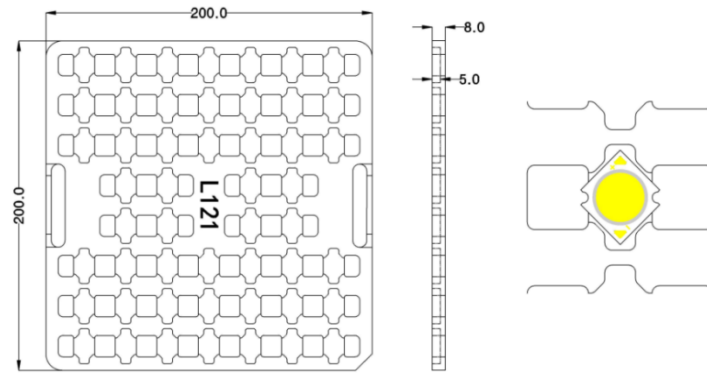
(1T) Lot Number / I001



(4L) Country of Origin : CN



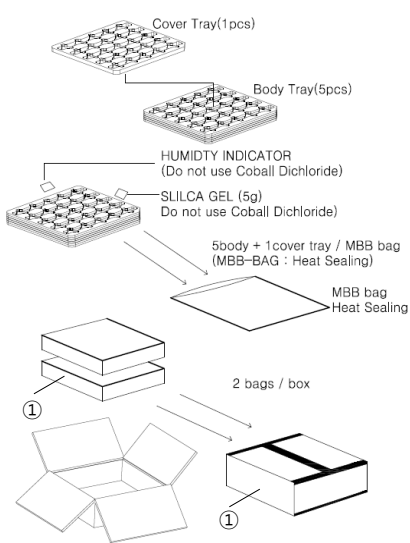
b) Tray



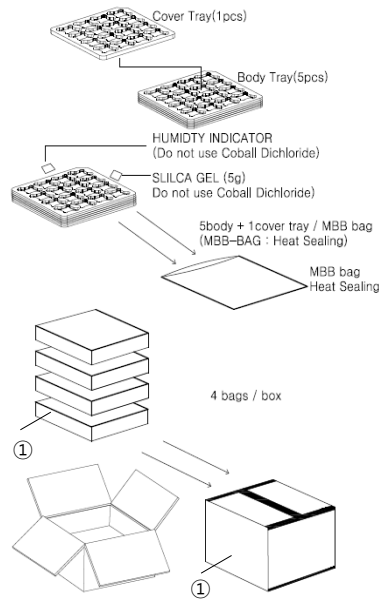
※ Model : LC016D, LC019D, LC026D, LC033D

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



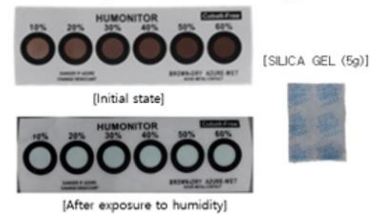
※ Small Box



※ Middle Box



[MBB BAG drawing]



[SILICA GEL (5g)]

① Side Label

LC026D S90 Vivid white 3000K
YZVND4
SPHWHSHDNG2VYZVND4 YZVND4 01
G4AGCK001 / I001 / xxx pcs
SAMSUNG

(1P) Supplier Part Number : SPHWHSHDNG2VYZVND4



(33P) Bin Code / YZVND4



(1T) Lot Number / I001



(Q) Quantity : XXX



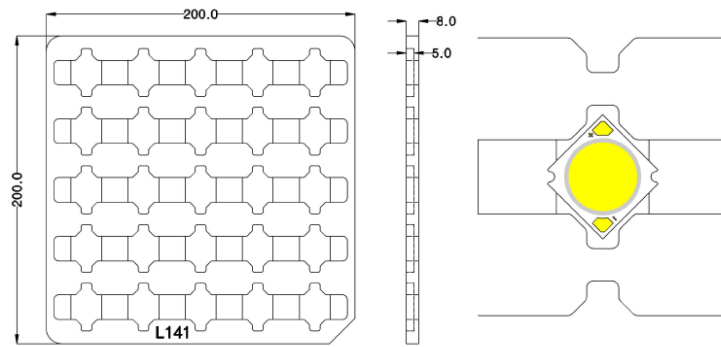
(100) Data Code : 2212



(4L) Country of Origin : CN



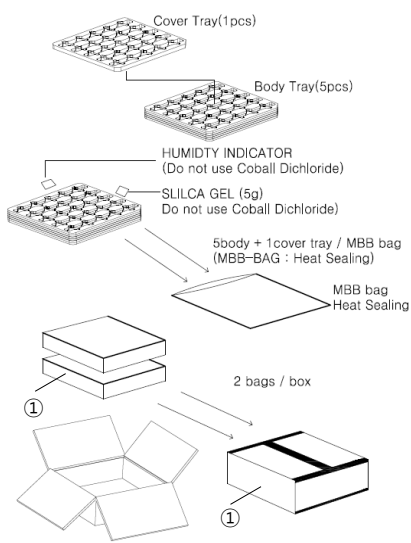
b) Tray



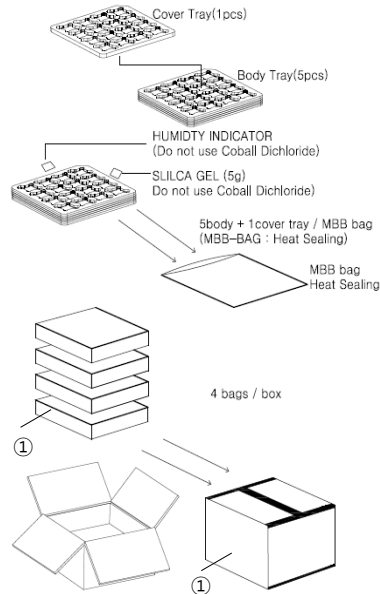
※ Model : LC040D

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



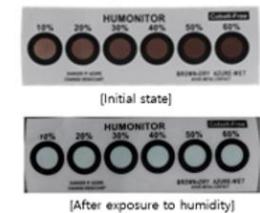
※ Small Box



※ Middle Box



[MBB BAG drawing]



[SILICA GEL (5g)]

① Side Label



(1P) Supplier Part Number : SPHWHSHDNK2VYZVND4



(33P) Bin Code / YZVND4



(1T) Lot Number / I001



(Q) Quantity : XXX



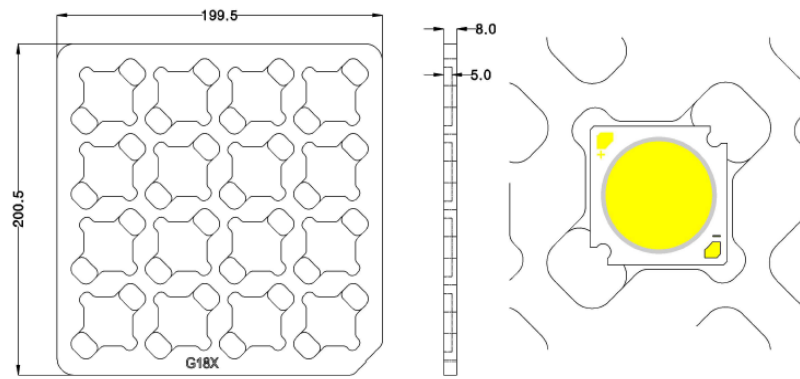
(100) Data Code : 2212



(4L) Country of Origin : CN

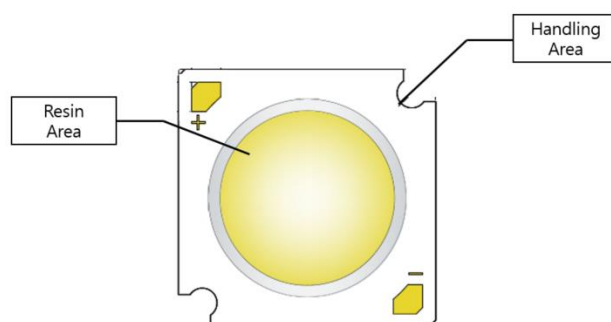


b) Tray



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 (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.
- 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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We are also leading in the Internet of Things space through, among others, our Digital Health and Smart Home initiatives. We employ 307,000 people across 84 countries. To discover more, please visit our official website at www.samsung.com and our official blog at global.samsungtomorrow.com.

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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