

High Voltage LED Series
Chip on Board

COB R - Series Fashion_ Vivid Color



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

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

Item	Unit	Model	Rank	Min.	Typ.	Max.
Forward Voltage (V_F)	V	LC013D	YH	31.8	34.6	37.5
		LC016D	YH	31.8	34.6	37.5
		LC019D	YH	31.8	34.6	37.5
		LC026D	YH	31.8	34.6	37.5
		LC033D	YH	31.8	34.6	37.5
		LC040D	YH	31.8	34.6	37.5
Thermal Resistance (junction to case point)	$^\circ\text{C/W}$	LC013D	-	-	1.27	-
		LC016D	-	-	1.01	-
		LC019D	-	-	0.9	-
		LC026D	-	-	0.71	-
		LC033D	-	-	0.6	-
		LC040D	-	-	0.48	-
Beam Angle	$^\circ$	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 ($T_J = T_C = 85^\circ\text{C}$)
- 2) Samsung maintains measurement tolerance of: forward voltage = $\pm 5\%$, 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 °C (lm)		T _c = 25 °C (lm)	
	CCT (K)	Rank	Min.	Typ.	Min.	Typ.
LC013D	3000	D2	1241	1334	1478	1590
	3300	D2	1296	1394	1545	1661
	3500	D2	1333	1433	1588	1708
	4000	D2	1425	1533	1699	1827
LC016D	3000	D2	1623	1745	1934	2080
	3300	D2	1695	1823	2021	2173
	3500	D2	1744	1875	2078	2235
	4000	D2	1864	2005	2222	2390
LC019D	3000	D2	1923	2068	2292	2465
	3300	D2	2009	2160	2395	2575
	3500	D2	2066	2222	2463	2648
	4000	D2	2210	2376	2634	2832
LC026D	3000	D2	2516	2706	2999	3225
	3300	D2	2629	2827	3133	3369
	3500	D2	2704	2907	3222	3465
	4000	D2	2891	3108	3446	3705
LC033D	3000	D2	3105	3339	3701	3980
	3300	D2	3244	3488	3867	4158
	3500	D2	3337	3588	3977	4276
	4000	D2	3568	3836	4252	4572
LC040D	3000	D2	3860	4150	4600	4947
	3300	D2	4032	4335	4806	5168
	3500	D2	4147	4459	4942	5314
	4000	D2	4434	4768	5285	5682

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 °C).
- 2) Samsung maintains measurement tolerance of: Luminous flux = ±7 %, CRI = ±1
- 3) CCT of the product is defined as only CIE x,y coordinates and related CCT in Kelvin is just for reference

2. Product Code Information

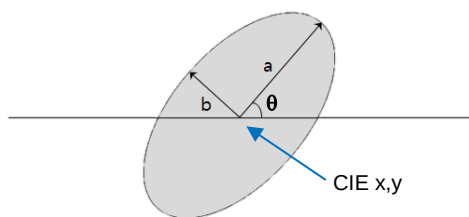
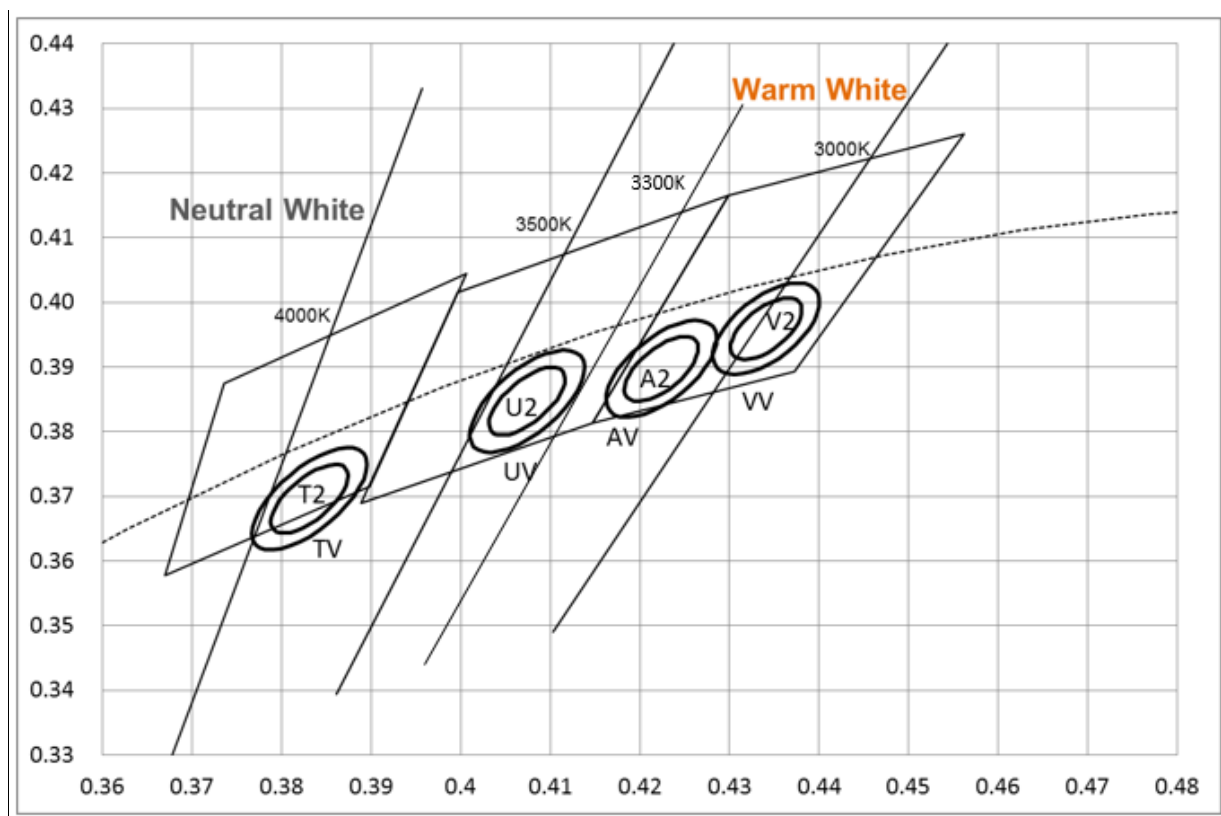
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
S	P	H	W	H	A	H	D	N	G	2	V	Y	Z	V	V	D	2

Digit	PKG Information	Code	Specification
1 2 3	Samsung Package High Power	SPH	
4 5	Color	WH	White
6	Product Version	A	
7 8	Form Factor	HD	COB
9	Lens Type	N	No lens
10	Internal Code	D E F G H K	LC013 LC016 LC019 LC026 LC033 LC040
11	Internal Code	2	
12	CRI & Sorting Temperature	V	VIVID 85 °C
13 14	Forward Voltage (V)	YZ	31.8~37.5
15	CCT (K)	V A U T	3000 3300 3500 4000
16	MacAdam	V 2	Color Bin for Vivid product (Mac3) Color Bin for Vivid product (Mac2)
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	3000	SPHWHAHNDND2VYZV2D2	YZ	V2	D2	1241~
		SPHWHAHNDND2VYZVVD2		VV		
	3300	SPHWHAHNDND2VYZA2D2	YZ	A2	D2	1296~
		SPHWHAHNDND2VYZAVD2		AV		
	3500	SPHWHAHNDND2VYZU2D2	YZ	U2	D2	1333~
		SPHWHAHNDND2VYZUVD2		UV		
	4000	SPHWHAHNDND2VYZT2D2	YZ	T2	D2	1425~
		SPHWHAHNDND2VYZTVD2		TV		
LC016D	3000	SPHWHAHDNE2VYZV2D2	YZ	V2	D2	1623~
		SPHWHAHDNE2VYZVVD2		VV		
	3300	SPHWHAHDNE2VYZA2D2	YZ	A2	D2	1695~
		SPHWHAHDNE2VYZAVD2		AV		
	3500	SPHWHAHDNE2VYZU2D2	YZ	U2	D2	1744~
		SPHWHAHDNE2VYZUVD2		UV		
	4000	SPHWHAHDNE2VYZT2D2	YZ	T2	D2	1864~
		SPHWHAHDNE2VYZTVD2		TV		
LC019D	3000	SPHWHAHDNF2VYZV2D2	YZ	V2	D2	1923~
		SPHWHAHDNF2VYZVVD2		VV		
	3300	SPHWHAHDNF2VYZA2D2	YZ	A2	D2	2009~
		SPHWHAHDNF2VYZAVD2		AV		
	3500	SPHWHAHDNF2VYZU2D2	YZ	U2	D2	2066~
		SPHWHAHDNF2VYZUVD2		UV		
	4000	SPHWHAHDNF2VYZT2D2	YZ	T2	D2	2210~
		SPHWHAHDNF2VYZTVD2		TV		

Model	Nominal CCT (K)	Product Code	V _F Rank	Color Rank	Flux Rank	Flux Range (Φ _v , lm)
LC026D	3000	SPHWAHDNG2VYZV2D2	YZ	V2	D2	2516~
		SPHWAHDNG2VYZVVD2		VV		
	3300	SPHWAHDNG2VYZA2D2	YZ	A2	D2	2629~
		SPHWAHDNG2VYZAVD2		AV		
	3500	SPHWAHDNG2VYZU2D2	YZ	U2	D2	2704~
		SPHWAHDNG2VYZUVD2		UV		
	4000	SPHWAHDNG2VYZT2D2	YZ	T2	D2	2891~
		SPHWAHDNG2VYZTVD2		TV		
LC033D	3000	SPHWAHDNH2VYZV2D2	YZ	V2	D2	3105~
		SPHWAHDNH2VYZVVD2		VV		
	3300	SPHWAHDNH2VYZA2D2	YZ	A2	D2	3244~
		SPHWAHDNH2VYZAVD2		AV		
	3500	SPHWAHDNH2VYZU2D2	YZ	U2	D2	3337~
		SPHWAHDNH2VYZUVD2		UV		
	4000	SPHWAHDNH2VYZT2D2	YZ	T2	D2	3568~
		SPHWAHDNH2VYZTVD2		TV		
LC040D	3000	SPHWAHDNK2VYZV2D2	YZ	V2	D2	3860~
		SPHWAHDNK2VYZVVD2		VV		
	3300	SPHWAHDNK2VYZA2D2	YZ	A2	D2	4032~
		SPHWAHDNK2VYZAVD2		AV		
	3500	SPHWAHDNK2VYZU2D2	YZ	U2	D2	4147~
		SPHWAHDNK2VYZUVD2		UV		
	4000	SPHWAHDNK2VYZT2D2	YZ	T2	D2	4434~
		SPHWAHDNK2VYZTVD2		TV		

b) Chromaticity Region & Coordinates (I_F = Sorting Current, $T_J = 85^\circ\text{C}$)


MacAdam Ellipse (3000K, V2, VV)					
Step	CIE x	CIE y	θ	a	b
2-step	0.4341	0.3959	53.22	0.0056	0.0027
3-step	0.4341	0.3959	53.22	0.0083	0.0041

MacAdam Ellipse (3300K, A2, AV)					
Step	CIE x	CIE y	θ	a	b
2-step	0.4224	0.3897	53.6	0.0059	0.0027
3-step	0.4224	0.3897	53.6	0.0088	0.0041

MacAdam Ellipse (3500K, U2, UV)					
Step	CIE x	CIE y	θ	a	b
2-step	0.4074	0.3847	54.0	0.0062	0.0027
3-step	0.4074	0.3847	54.0	0.0093	0.0041

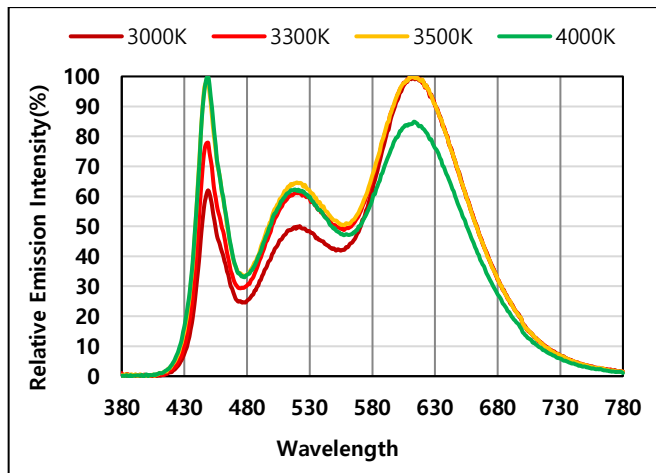
MacAdam Ellipse (4000K, T2, TV)					
Step	CIE x	CIE y	θ	a	b
2-step	0.3831	0.3696	53.7	0.0063	0.0027
3-step	0.3831	0.3696	53.7	0.0094	0.0040

Note:

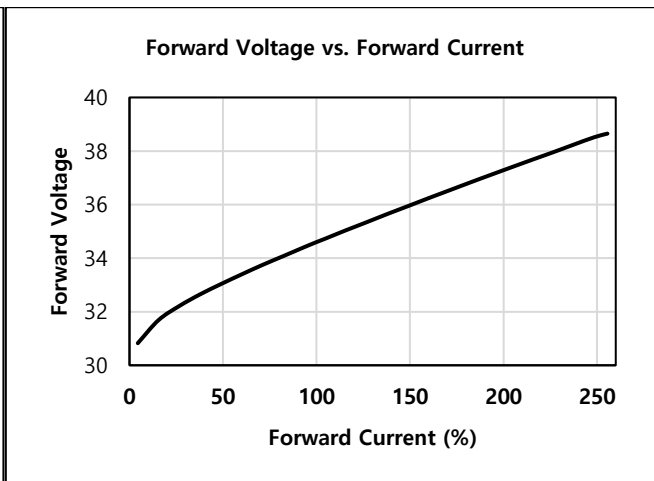
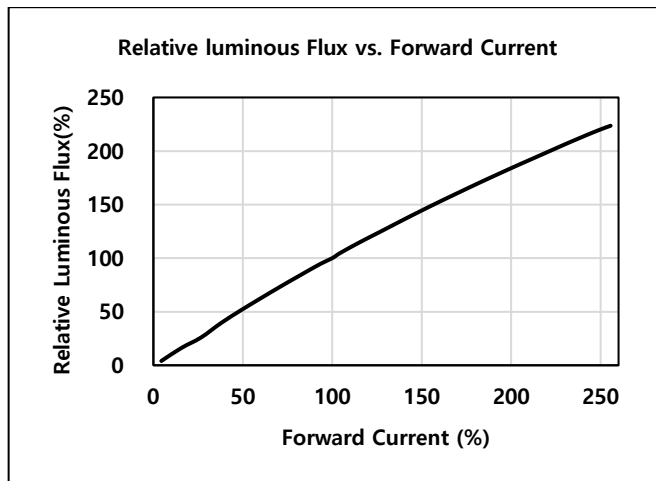
- 1) Samsung maintains measurement tolerance of: $C_x, C_y = \pm 0.005$
- 2) CCT of the product is defined as only CIE x,y coordinates and related CCT in Kelvin is just for reference

3. Typical Characteristics Graphs

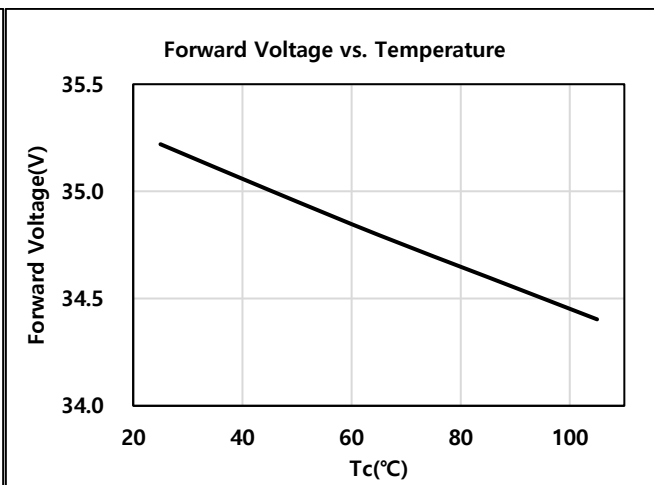
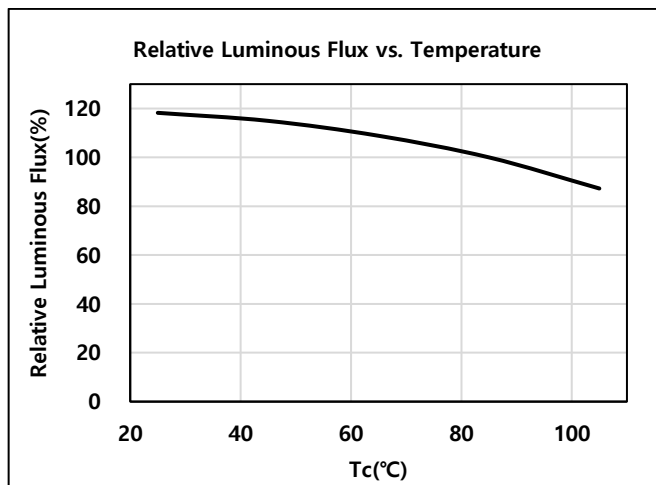
a) Spectrum Distribution (I_F = Sorting Current, $T_J = 85^\circ\text{C}$)



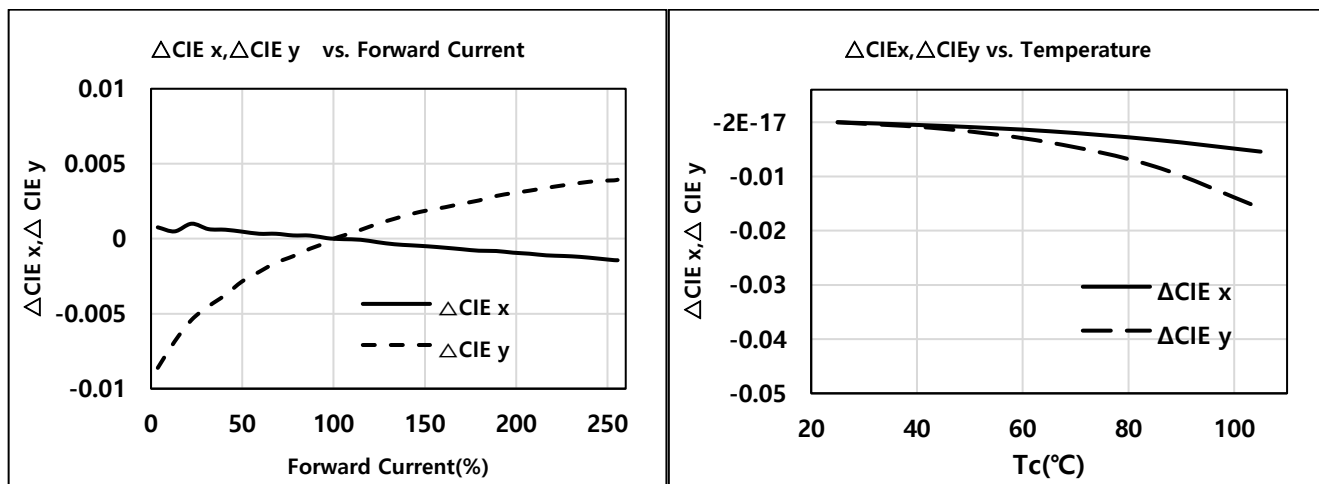
b) Forward Current Characteristics ($T_J = 85^\circ\text{C}$)



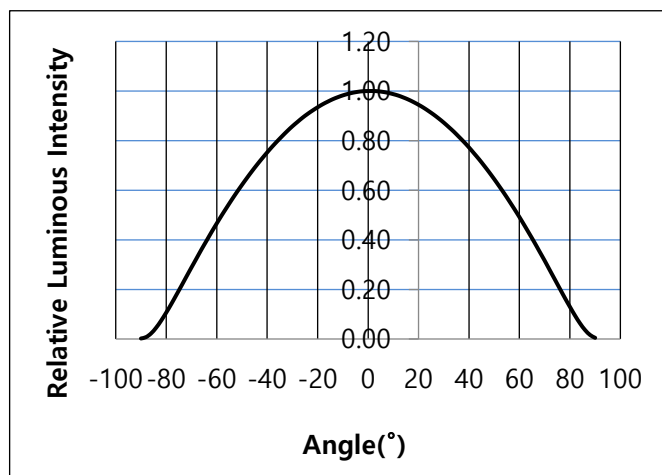
c) Temperature Characteristics (I_F = Sorting Current)



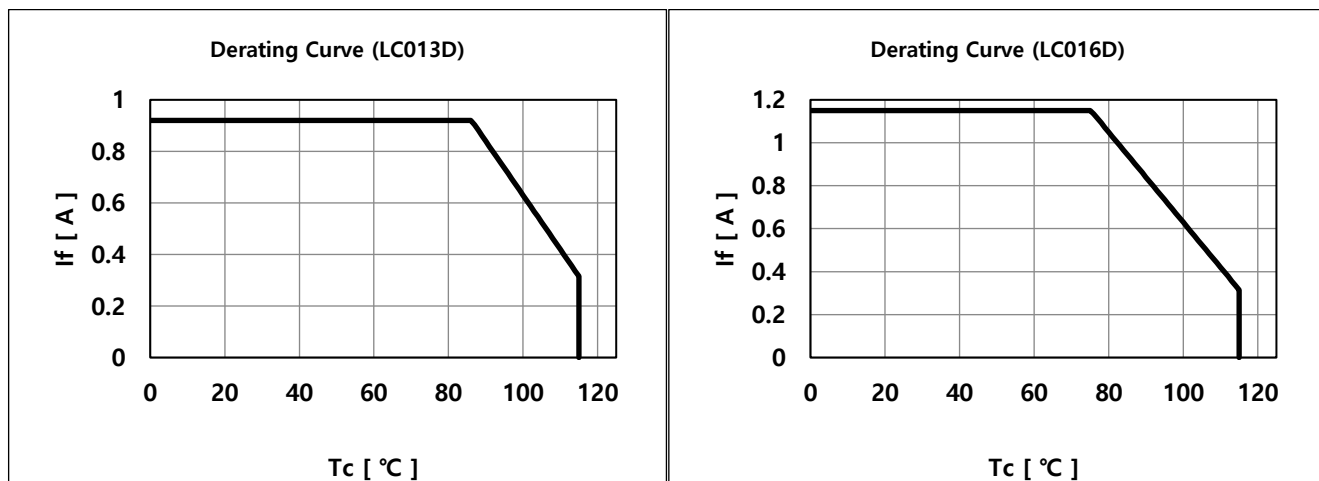
d) Color Shift Characteristics (I_F = Sorting Current, $T_J = 85^\circ\text{C}$)



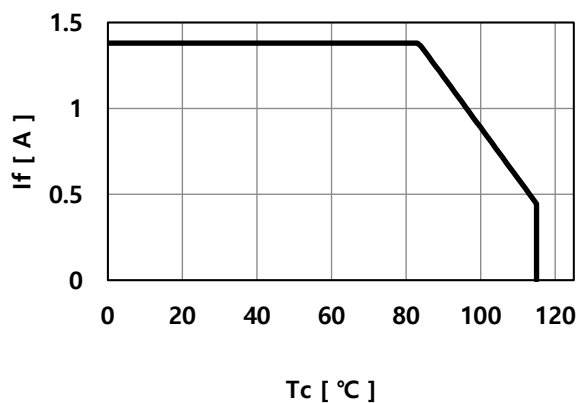
e) Beam Angle Characteristics (I_F = Sorting Current, $T_J = 85^\circ\text{C}$)



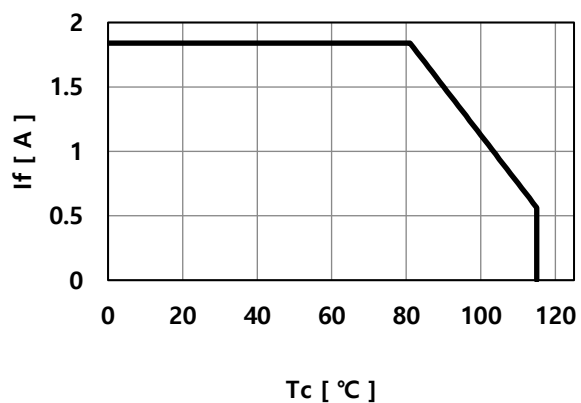
f) Derating Characteristics



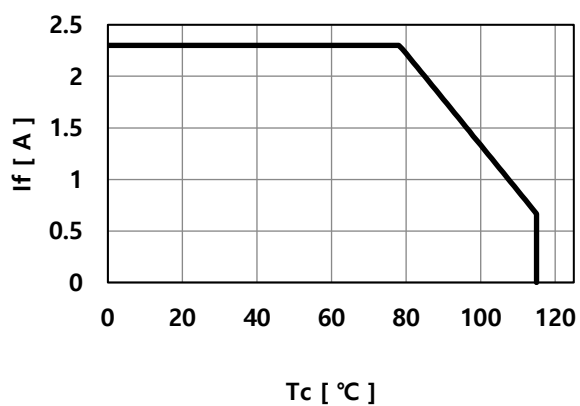
Derating Curve (LC019D)



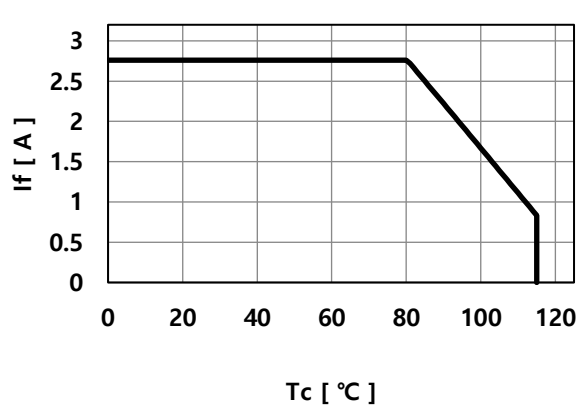
Derating Curve (LC026D)



Derating Curve (LC033D)

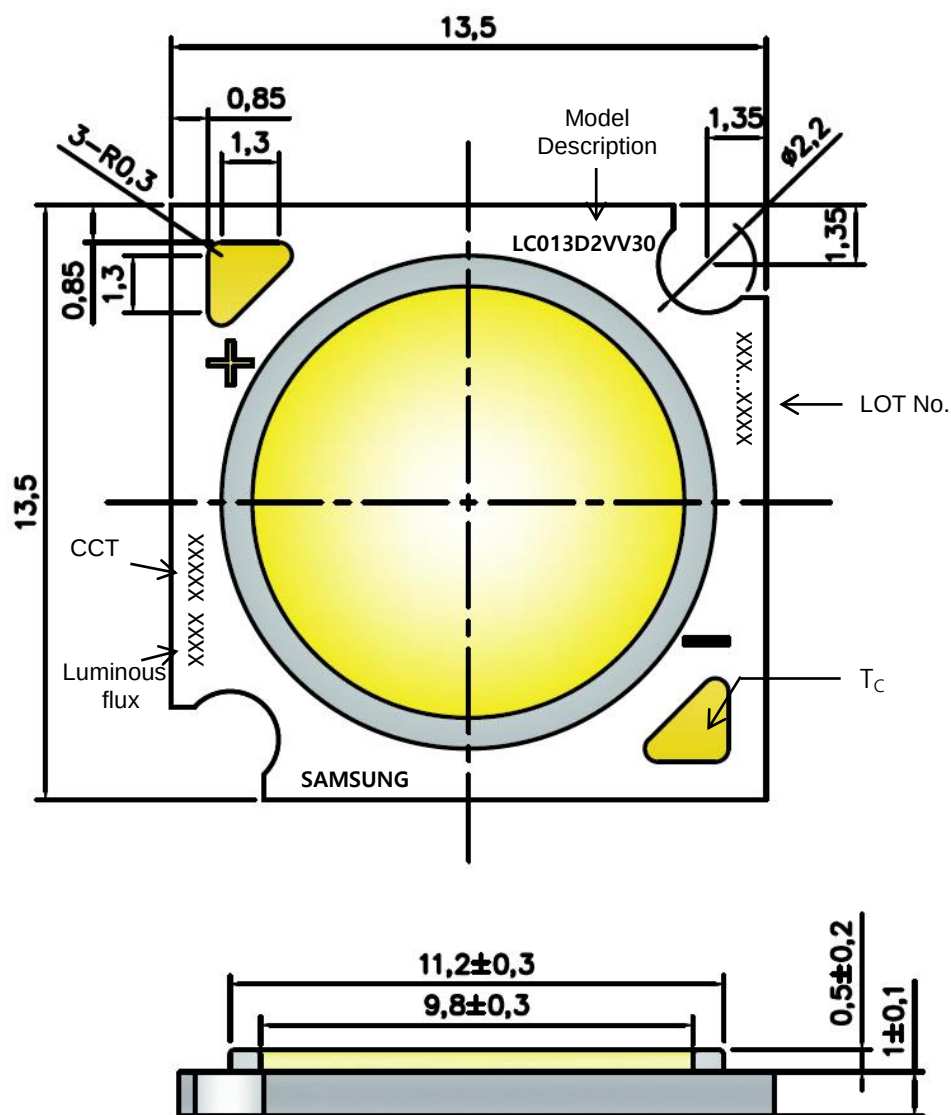


Derating Curve (LC040D)



4. Outline Drawing & Dimension

※ Model : LC013D

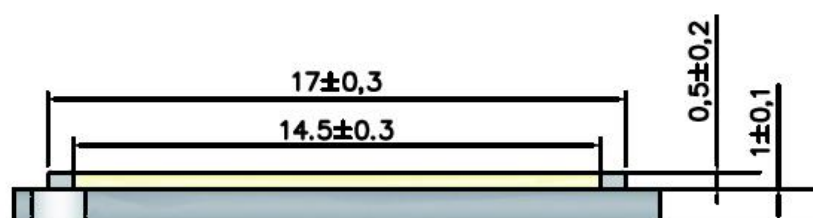
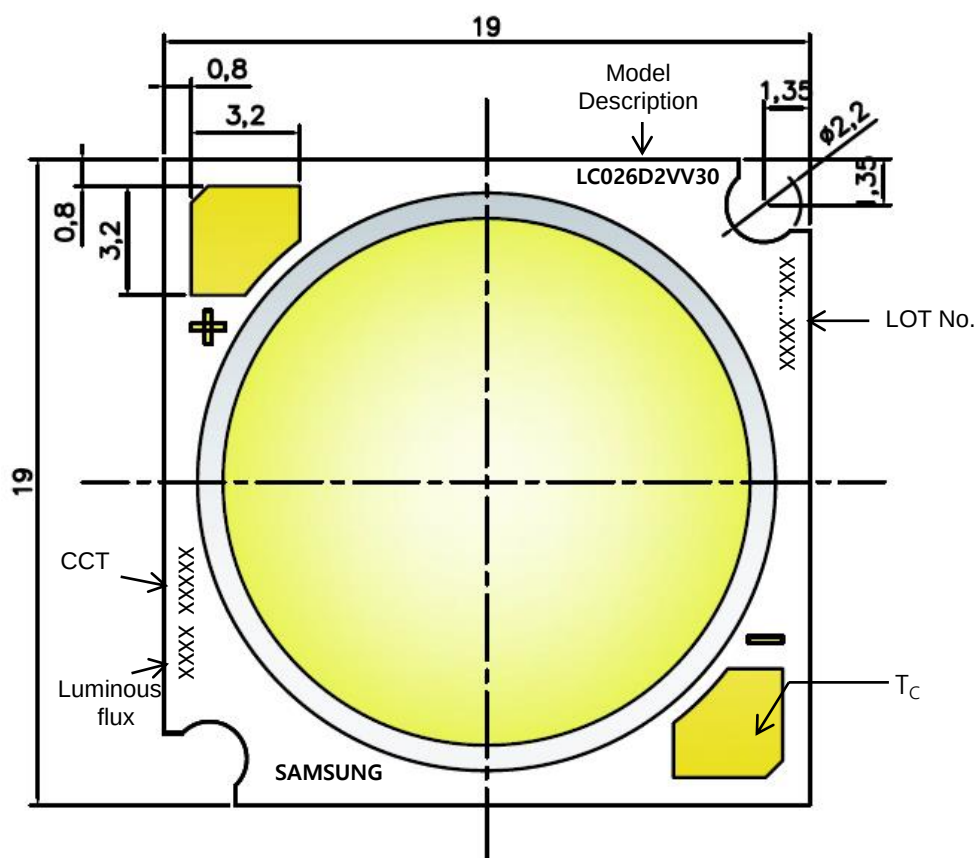


1. Unit: mm
2. Tolerance: ± 0.3 mm

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
(LC013D2VV30 :LC013D, Gen3, Vivid, 3000K)

※ Model : LC016D, LC019D, LC026D, LC033D

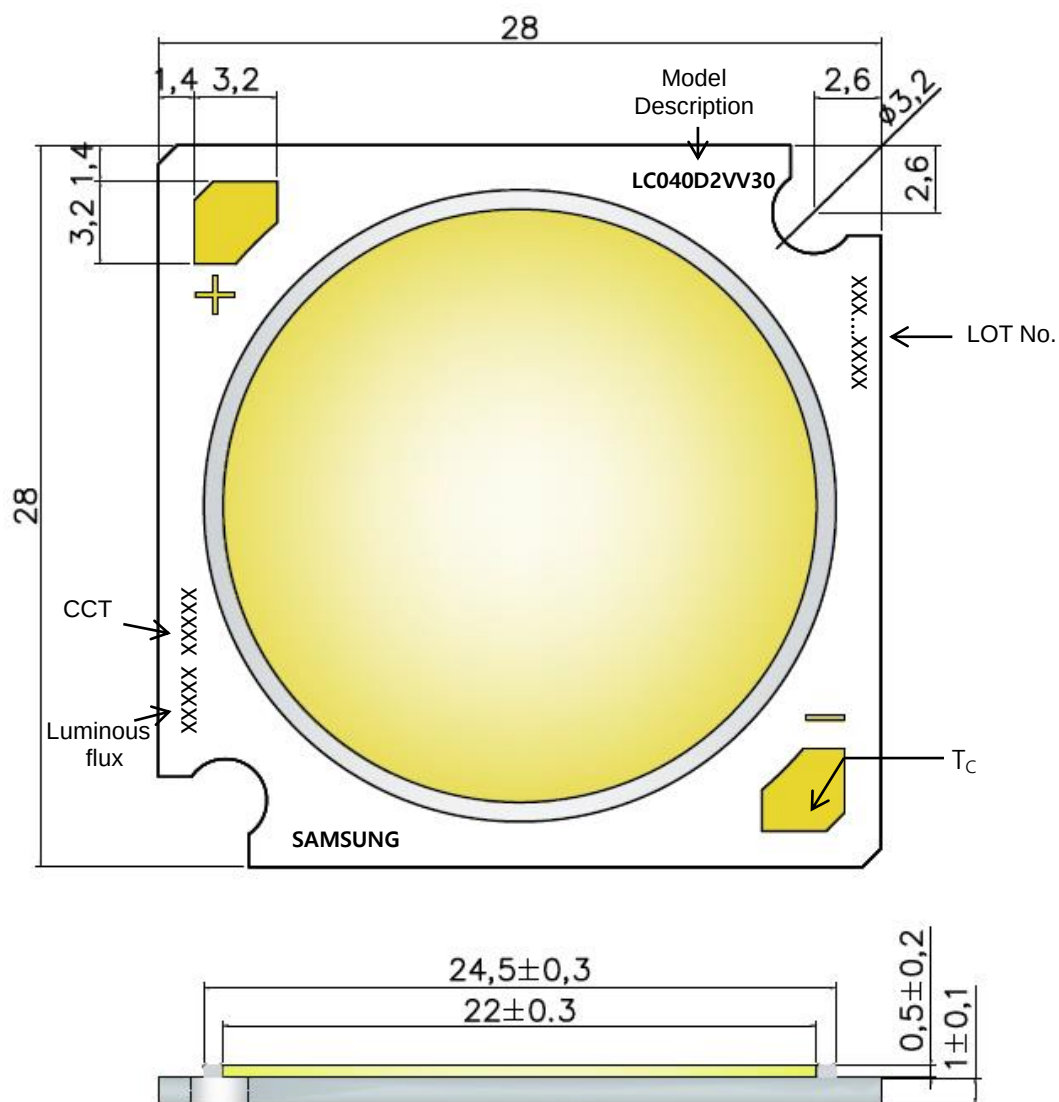


1. Unit: mm
2. Tolerance: ± 0.3 mm

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

Note: Denoted product information above is only an example
(LC026D2VV30 : LC026D, Gen3, Vivid, 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
(LC040D2VV30 : LC040D, Gen2, Vivid, 3000K)

5. Reliability Test Items & Conditions

a) Test Items

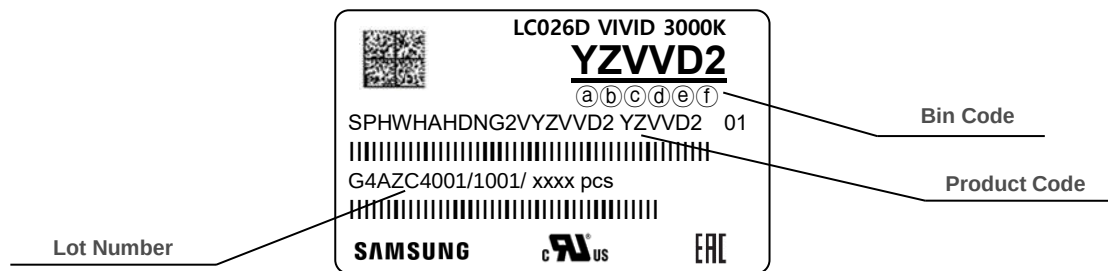
Test Item	Test Condition	Test Hour / Cycle
High Temperature Humidity Life Test	60 °C, 90 % RH,, DC Derating, I_F	1000 h
High Temperature Life Test	85 °C, DC Derating, I_F	1000 h
Low Temperature Life Test	-40 °C, DC, Derating I_F	1000 h
High Temperature Storage	120 °C	1000 h
Low Temperature Storage	-40 °C	1000 h
Temperature Cycle	-40 °C/ 125 °C each 15 min, Light up condition : 150 °C Hot plate, 30sec.	100 cycles
ESD (HBM)	R ₁ : 10 MΩ R ₂ : 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 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 = 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



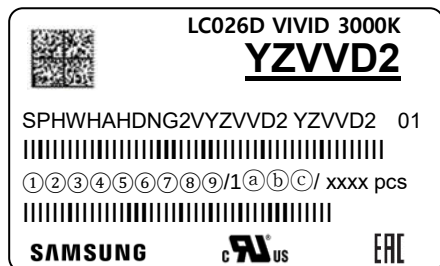
Note: Denoted bincode and product code above is only an example (see description on page 5)

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

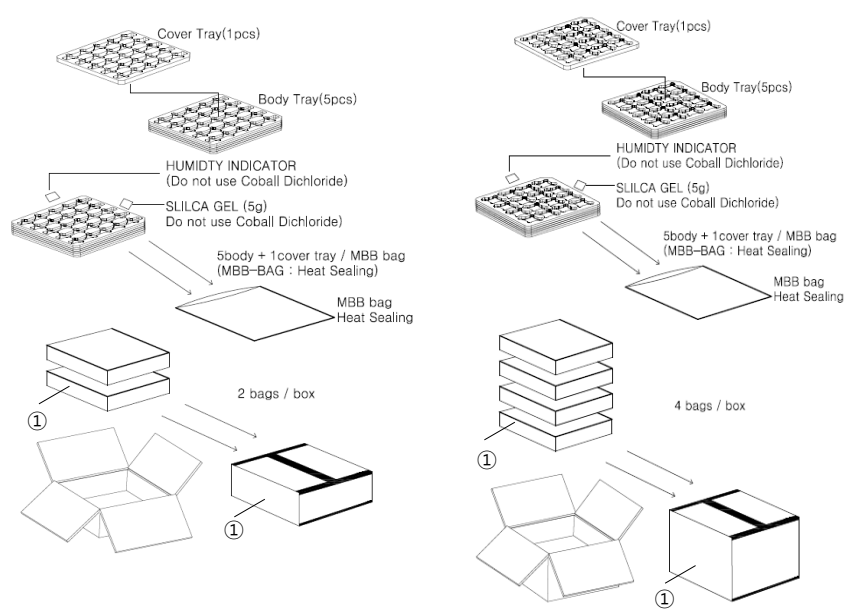
- ① : Production site (S: Giheung, Korea, G: Tianjin, China)
- ② : 4(LED)
- ③ : Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
- ④ : Year (F: 2021, G: 2022, H: 2023...)
- ⑤ : Month (1~9, A, B, C)
- ⑥⑦⑧⑨ : Day (1~9, A, B~V)
- ⒶⒷⒸ : Product serial number (001 ~ 999)

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

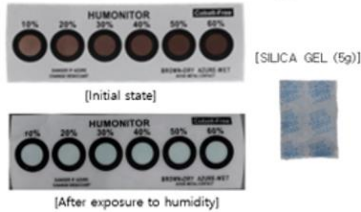


※ Small Box

※ Middle Box



[MBB BAG drawing]



[SILICA GEL (5g)]

① Side Label



LC013D VIVID 3000K
YZVVD2

SPHWHAMDND2VYZVVD2 01
G4AZC4001/1001/ xxxx pcs



(1P) Supplier Part Number : SPHWHAMDND2VYZVVD2


(33P) Bin Code / YZVVD2

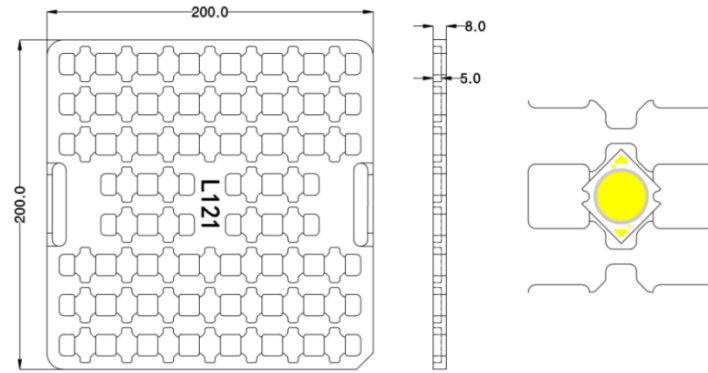

(1T) Lot Number / 1001


(Q) Quantity : XXXX


(100) Data Code : 2109


(4L) Country of Origin : CN

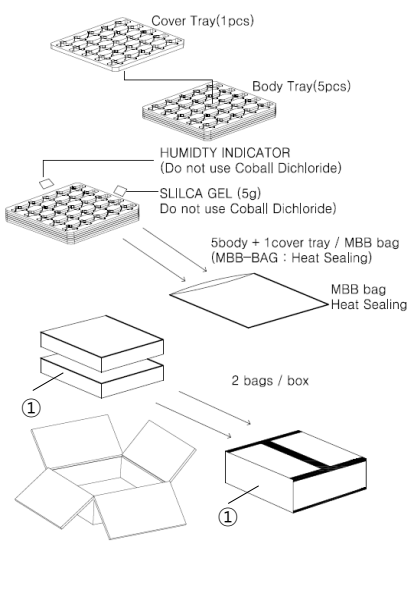

b) Tray



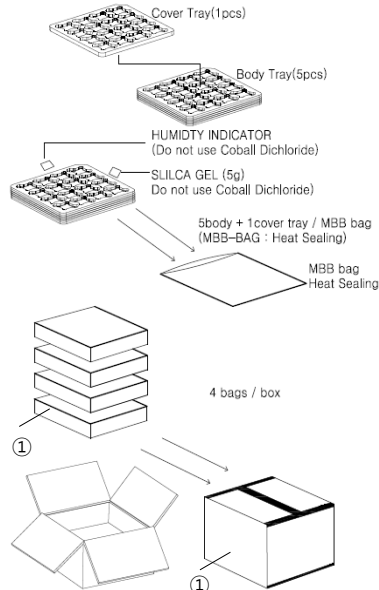
※ Model : LC016D, LC019D, LC026D, LC033D

Packing material	Max. quantity in pcs of COB	Dimension(mm)			
		Length	Width	Height	Tolerance
Tray	25	200	200	8	1
Aluminum 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]



[Initial state]



[After exposure to humidity]

[SILICA GEL (5g)]



① Side Label



LC026D VIVID 3000K
YZVVD2

SPHWHADNG2VYZVVD2 YZVVD2 01
G4AZC4001/1001/ xxxx pcs

SAMSUNG  

(1P) Supplier Part Number : SPHWHADNG2VYZVVD2



(33P) Bin Code / YZVVD2



(1T) Lot Number / 1001



(Q) Quantity : XXXX



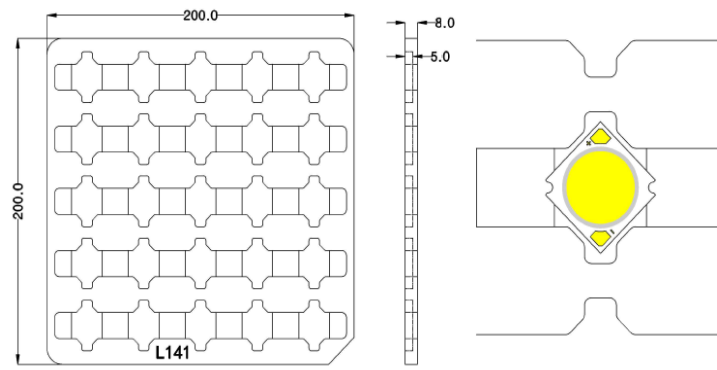
(100) Data Code : 2109



(4L) Country of Origin : CN



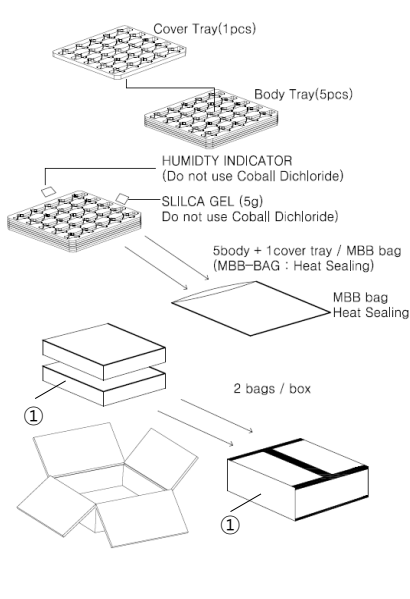
b) Tray



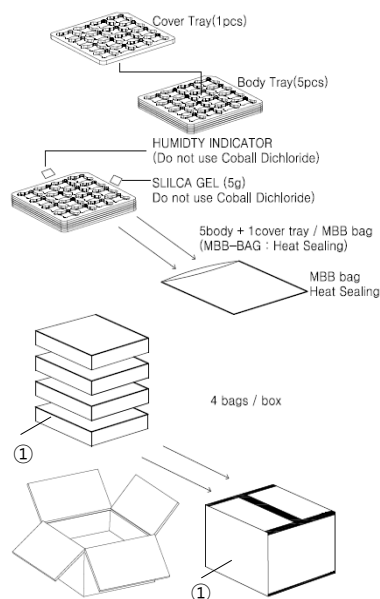
※ Model : LC040D

Packing material	Max. quantity in pcs of COB	Dimension(mm)			
		Length	Width	Height	Tolerance
Tray	16	200	200	8	1
Aluminum 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



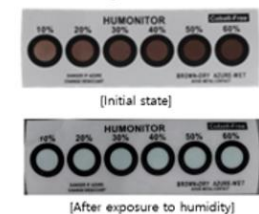
※ Small Box



※ Middle Box



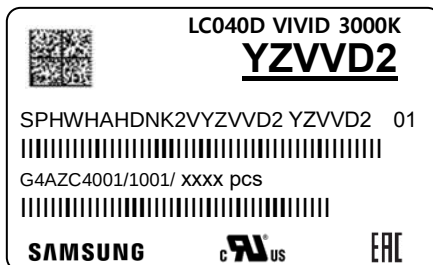
[MBB BAG drawing]



[Silica Gel (5g)]



① Side Label



(1P) Supplier Part Number : SPHWAHDNK2VYZVVD2



(33P) Bin Code / YZVVD2



(1T) Lot Number / 1001



(Q) Quantity : XXXX



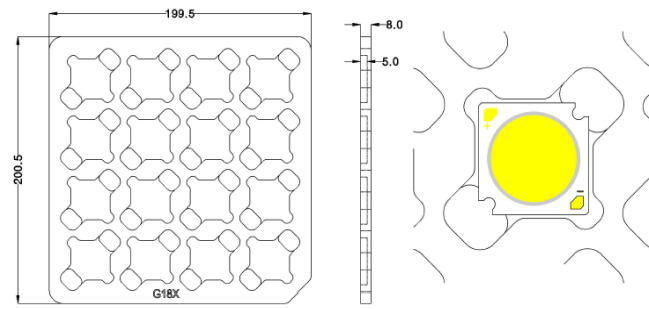
(100) Data Code : 2109



(4L) Country of Origin : CN

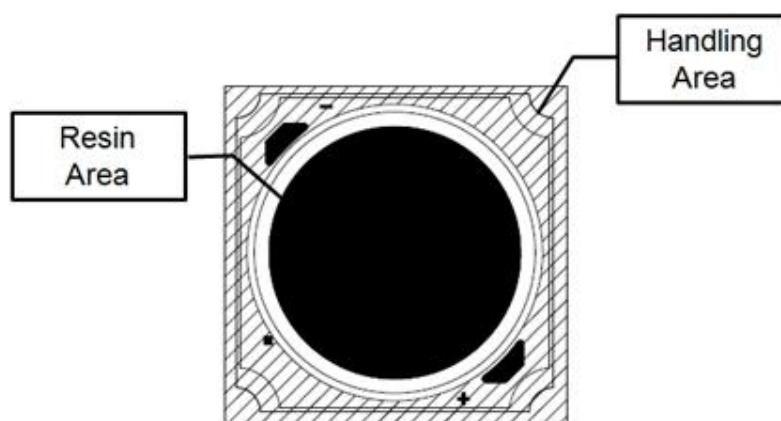


b) Tray



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 (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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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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