

High Voltage LED Series  
Chip on Board

# COB D-Gen.4



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	-
		LC003D	230 / 8.4		-
		LC006D	460 / 16.8		-
		LC009D	690 / 25.3		-
		LC013D	920 / 33.7		-
		LC016D	1150 / 42.1		-
Forward Current / Power Dissipation	$I_F / P_D$	LC019D	1380 / 50.5	mA / W	-
		LC026D	1840 / 67.3		-
		LC033D	2300 / 84.2		-
		LC040D	2760 / 101.0		-
		LC060D	2760 / 153.2		-
		LC080D	4140 / 229.8		-
ESD (HBM)	-	-	±2	kV	-

**b) Electro-optical Characteristics (I<sub>F</sub> = Sorting Current, T<sub>J</sub> = 85 °C)**

Item	Unit	Model	Rank	Min.	Typ.	Max.
Forward Voltage (V <sub>F</sub> )	V	All model	YZ	30.6	33.6	36.6
			1Z	45.5	50.5	55.5
Color Rendering Index (R <sub>a</sub> /R <sub>9</sub> )	-	All model	3	70 / -50	-	-
			5	80 / 0	-	-
			7	90 / 50	-	-
			-	-	-	-
Beam Angle	°	-	-	-	115	-
Nominal Power / Sorting Current	W / mA	LC003D	-	-	3.0 / 90	-
		LC006D	-	-	6.0 / 180	-
		LC009D	-	-	9.1 / 270	-
		LC013D	-	-	12.1 / 360	-
		LC016D	-	-	15.1 / 450	-
		LC019D	-	-	18.1 / 540	-
		LC026D	-	-	24.2 / 720	-
		LC033D	-	-	30.2 / 900	-
		LC040D	-	-	36.3 / 1080	-
		LC060D	-	-	54.5 / 1080	-
		LC080D	-	-	81.8 / 1620	-
		LC003D	-	-	2.43	-
		LC006D	-	-	1.41	-
		LC009D	-	-	0.94	-
LC013D	-	-	0.81	-		
LC016D	-	-	0.64	-		
LC019D	-	-	0.57	-		
LC026D	-	-	0.45	-		
LC033D	-	-	0.38	-		
LC040D	-	-	0.30	-		
LC060D	-	-	0.23	-		
LC080D	-	-	0.15	-		
Thermal Resistance (Junction to chip case)	°C/W	-	-	-	-	-

**Notes:**

- 1) The COB is tested in pulsed condition at rated test current (10 ms pulse width) and rated temperature (T<sub>J</sub> = T<sub>C</sub> = T<sub>a</sub> = 85 °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 ( $I_F = \text{Sorting Current}$ )

Model	CRI (R <sub>a</sub> ) Min.	Nominal CCT (K)	Flux Rank	Flux@ T <sub>J</sub> = 85 °C (lm)			
				Min.	Typ.	Max.	
LC003D	80	2700	D4	457	486	-	
		3000	D4	478	508	-	
		3500	D4	489	521	-	
		4000	D4	499	531	-	
		5000	D4	504	536	-	
		5700	D4	504	536	-	
		6500	D4	496	527	-	
	90	2700	D4	378	402	-	
		3000	D4	406	432	-	
		3500	D4	421	448	-	
		4000	D4	434	462	-	
		5000	D4	439	467	-	
		80	2700	D4	900	957	-
			3000	D4	957	1018	-
3500	D4		964	1025	-		
4000	D4		983	1045	-		
5000	D4		992	1055	-		
5700	D4		992	1055	-		
6500	D4		982	1045	-		
LC006D	90	2700	D4	754	802	-	
		3000	D4	813	864	-	
		3500	D4	836	890	-	
		4000	D4	855	910	-	
		5000	D4	865	920	-	

#### 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 =  $\pm 1$

Model	CRI (Ra) Min.	Nominal CCT (K)	Flux Rank	Flux@ T <sub>J</sub> = 85 °C (lm)		
				Min.	Typ.	Max.
LC009D	70	3000	D4	1524	1621	-
		4000	D4	1587	1689	-
		5000	D4	1566	1666	-
	80	2700	D4	1349	1435	-
		3000	D4	1409	1499	-
		3500	D4	1438	1530	-
		4000	D4	1474	1568	-
		5000	D4	1488	1583	-
		5700	D4	1488	1583	-
	90	6500	D4	1464	1558	-
		2700	D4	1115	1186	-
		3000	D4	1202	1278	-
		3500	D4	1237	1316	-
		4000	D4	1283	1365	-
	LC013D	70	5000	D4	1297	1380
2200			D4	1777	1891	-
2700			D4	1876	1996	-
3000			D4	1997	2124	-
4000			D4	2073	2206	-
80		5000	D4	2026	2156	-
		5700	D4	2055	2186	-
		2700	D4	1762	1875	-
		3000	D4	1853	1972	-
		3500	D4	1888	2009	-
		4000	D4	1925	2048	-
		5000	D4	1947	2071	-
		5700	D4	1944	2068	-
		6500	D4	1922	2044	-
90		2700	D4	1465	1559	-
	3000	D4	1579	1680	-	
	3500	D4	1627	1731	-	
	4000	D4	1675	1782	-	
	5000	D4	1712	1822	-	

**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> = 85 °C).
- 2) Samsung maintains measurement tolerance of: Luminous flux = ±7 %, CRI = ±1

Model	CRI (Ra) Min.	Nominal CCT (K)	Flux Rank	Flux@ T <sub>J</sub> = 85 °C (lm)		
				Min.	Typ.	Max.
LC016D	70	2200	D4	2349	2499	-
		2700	D4	2416	2570	-
		3000	D4	2630	2798	-
		4000	D4	2740	2915	-
		5000	D4	2704	2876	-
		5700	D4	2716	2889	-
	80	2700	D4	2329	2478	-
		3000	D4	2399	2552	-
		3500	D4	2457	2614	-
		4000	D4	2532	2694	-
		5000	D4	2569	2733	-
		5700	D4	2559	2722	-
	90	6500	D4	2527	2689	-
		2700	D4	1898	2019	-
		3000	D4	2035	2165	-
		3500	D4	2102	2236	-
		4000	D4	2203	2344	-
		5000	D4	2239	2382	-
LC019D	70	2200	D4	2813	2993	-
		2700	D4	3021	3214	-
		3000	D4	3150	3351	-
		4000	D4	3282	3491	-
		5000	D4	3238	3445	-
		5700	D4	3253	3460	-
	80	2700	D4	2790	2968	-
		3000	D4	2877	3061	-
		3500	D4	2933	3120	-
		4000	D4	3024	3217	-
		5000	D4	3077	3273	-
		5700	D4	3055	3250	-
	90	6500	D4	3027	3220	-
		2700	D4	2275	2420	-
		3000	D4	2453	2610	-
		3500	D4	2529	2690	-
		4000	D4	2632	2800	-
		5000	D4	2681	2852	-

**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> = 85 °C).
- 2) Samsung maintains measurement tolerance of: Luminous flux = ±7 %, CRI = ±1

Model	CRI (R <sub>a</sub> ) Min.	Nominal CCT (K)	Flux Rank	Flux@ T <sub>J</sub> = 85 °C (lm)		
				Min.	Typ.	Max.
LC026D	70	2200	D4	3703	3939	-
		2700	D4	3911	4161	-
		3000	D4	4157	4422	-
		4000	D4	4289	4563	-
		5000	D4	4202	4471	-
		5700	D4	4281	4554	-
	80	2700	D4	3668	3902	-
		3000	D4	3859	4105	-
		3500	D4	3907	4156	-
		4000	D4	3975	4229	-
		5000	D4	4064	4323	-
		5700	D4	4025	4282	-
	90	6500	D4	3998	4253	-
		2700	D4	3031	3225	-
		3000	D4	3256	3464	-
		3500	D4	3341	3554	-
		4000	D4	3482	3704	-
		5000	D4	3568	3796	-
LC033D	70	2200	D4	4536	4825	-
		2700	D4	4871	5182	-
		3000	D4	5079	5403	-
		4000	D4	5292	5629	-
		5000	D4	5221	5554	-
		5700	D4	5244	5579	-
	80	2700	D4	4498	4785	-
		3000	D4	4741	5044	-
		3500	D4	4819	5127	-
		4000	D4	4914	5227	-
		5000	D4	4961	5277	-
		5700	D4	4961	5277	-
	90	6500	D4	4880	5192	-
		2700	D4	3765	4005	-
		3000	D4	4061	4320	-
		3500	D4	4181	4448	-
		4000	D4	4276	4549	-
		5000	D4	4323	4599	-

**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> = 85 °C).
- 2) Samsung maintains measurement tolerance of: Luminous flux = ±7 %, CRI = ±1



Model	CRI (R <sub>a</sub> ) Min.	Nominal CCT (K)	Flux Rank	Flux@ T <sub>J</sub> = 85 °C (lm)		
				Min.	Typ.	Max.
LC040D	70	2200	D4	5609	5967	-
		2700	D4	5833	6205	-
		3000	D4	6167	6561	-
		4000	D4	6544	6962	-
		5000	D4	6423	6833	-
		5700	D4	6486	6900	-
	80	2700	D4	5563	5918	-
		3000	D4	5754	6122	-
		3500	D4	5960	6340	-
		4000	D4	6077	6465	-
		5000	D4	6085	6474	-
		5700	D4	6135	6527	-
	90	6500	D4	6036	6421	-
		2700	D4	4605	4899	-
		3000	D4	4878	5189	-
		3500	D4	5082	5407	-
		4000	D4	5253	5588	-
		5000	D4	5355	5697	-
LC060D	70	5700	D4	5239	5574	-
		2200	D4	8305	8836	-
		2700	D4	8664	9217	-
		3000	D4	9300	9894	-
		4000	D4	9690	10308	-
		5000	D4	9416	10017	-
	80	5700	D4	9603	10216	-
		2700	D4	8236	8762	-
		3000	D4	8680	9234	-
		3500	D4	8806	9368	-
		4000	D4	8998	9572	-
		5000	D4	9084	9664	-
	90	5700	D4	9084	9664	-
		6500	D4	8937	9507	-
		2700	D4	6810	7245	-
		3000	D4	7280	7745	-
		3500	D4	7536	8017	-
		4000	D4	7830	8329	-
		5000	D4	7916	8421	-
		5700	D4	7758	8253	-

**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> = 85 °C).
- 2) Samsung maintains measurement tolerance of: Luminous flux = ±7 %, CRI = ±1

Model	CRI (R <sub>a</sub> ) Min.	Nominal CCT (K)	Flux Rank	Flux@T <sub>j</sub> = 85 °C (lm)			
				Min.	Typ.	Max.	
LC080D	70	2200	D4	12020	12787	-	
		2700	D4	12909	13733	-	
		3000	D4	13460	14319	-	
		4000	D4	14023	14918	-	
		5000	D4	14124	15025	-	
		5700	D4	13898	14785	-	
	80	2700	D4	11920	12681	-	
		3000	D4	12589	13392	-	
		3500	D4	12771	13586	-	
		4000	D4	13022	13853	-	
		5000	D4	13147	13986	-	
		5700	D4	13147	13986	-	
	90	6500	D4	12934	13760	-	
		2700	D4	9925	10559	-	
		3000	D4	10689	11372	-	
		3500	D4	11005	11707	-	
		4000	D4	11331	12055	-	
		5000	D4	11457	12188	-	
			5700	D4	11227	11944	-

**Notes:**

- 2) 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> = 85 °C).
- 2) Samsung maintains measurement tolerance of: Luminous flux = ±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	5	Y	Z	W	3	D	4

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>A</b> LC003D <b>B</b> LC006D <b>C</b> LC009D <b>D</b> LC013D <b>E</b> LC016D <b>F</b> LC019D <b>G</b> LC026D <b>H</b> LC033D <b>K</b> LC040D <b>L</b> LC060D <b>M</b> LC080D	
11	Internal Code	<b>2</b>	
12	CRI & Sorting Temperature	<b>3</b> Min. 70 (85°C) <b>5</b> Min. 80 (85°C) <b>7</b> Min. 90 (85°C)	
13 14	Forward Voltage (V)	<b>YZ</b> 30.6~36.6 <b>1Z</b> 45.5~55.5 (60W, 80W)	
15	CCT (K)	<b>W</b> 2700K <b>V</b> 3000K <b>U</b> 3500K <b>T</b> 4000K <b>R</b> 5000K <b>Q</b> 5700K <b>P</b> 6500K	
16	MacAdam Step	<b>1</b> MacAdam 1-step <b>2</b> MacAdam 2-step <b>3</b> MacAdam 3-step	
17 18	Luminous Flux (Lm)	<b>D4</b>	COB D-series Gen.4 level

## a) Binning Structure

※ LC<sub>oo3</sub>D(I<sub>F</sub> = 90 mA, T<sub>J</sub> = 85 °C)

CRI(R <sub>a</sub> ) Min.	Nominal CCT(K)	Product Code	V <sub>F</sub> Rank	Color Rank	Flux Rank	Flux Range (Φ <sub>v</sub> , lm)	
80	2700	SPHWAHDNA25YZW1D4	YZ	W1	D4	457 ~	
		SPHWAHDNA25YZW2D4		W2			
	3000	SPHWAHDNA25YZV1D4	YZ	V1	D4	478 ~	
		SPHWAHDNA25YZV2D4		V2			
	3500	SPHWAHDNA25YZU1D4	YZ	U1	D4	489 ~	
		SPHWAHDNA25YZU2D4		U2			
	4000	SPHWAHDNA25YZT1D4	YZ	T1	D4	499 ~	
		SPHWAHDNA25YZT2D4		T2			
	5000	SPHWAHDNA25YZR2D4	YZ	R2	D4	504 ~	
		SPHWAHDNA25YZR3D4		R3			
	5700	SPHWAHDNA25YZQ2D4	YZ	Q2	D4	504 ~	
		SPHWAHDNA25YZQ3D4		Q3			
	6500	SPHWAHDNA25YZP2D4	YZ	P2	D4	496 ~	
		SPHWAHDNA25YZP3D4		P3			
	90	2700	SPHWAHDNA27YZW1D4	YZ	W1	D4	378 ~
			SPHWAHDNA27YZW2D4		W2		
3000		SPHWAHDNA27YZV1D4	YZ	V1	D4	406 ~	
		SPHWAHDNA27YZV2D4		V2			
3500		SPHWAHDNA27YZU1D4	YZ	U1	D4	421 ~	
		SPHWAHDNA27YZU2D4		U2			
4000		SPHWAHDNA27YZT1D4	YZ	T1	D4	434 ~	
		SPHWAHDNA27YZT2D4		T2			
5000		SPHWAHDNA27YZR2D4	YZ	R2	D4	439 ~	
		SPHWAHDNA27YZR3D4		R3			

※ LCoo6D(I<sub>F</sub> = 180 mA, T<sub>J</sub> = 85 °C)

CRI(R <sub>a</sub> ) Min.	Nominal CCT(K)	Product Code	V <sub>F</sub> Rank	Color Rank	Flux Rank	Flux Range (Φ <sub>v</sub> , lm)	
80	2700	SPHWAHDNB25YZW1D4	YZ	W1	D4	900 ~	
		SPHWAHDNB25YZW2D4		W2			
	3000	SPHWAHDNB25YZV1D4	YZ	V1	D4	957 ~	
		SPHWAHDNB25YZV2D4		V2			
	3500	SPHWAHDNB25YZU1D4	YZ	U1	D4	964 ~	
		SPHWAHDNB25YZU2D4		U2			
	4000	SPHWAHDNB25YZT1D4	YZ	T1	D4	983 ~	
		SPHWAHDNB25YZT2D4		T2			
	5000	SPHWAHDNB25YZR2D4	YZ	R2	D4	992 ~	
		SPHWAHDNB25YZR3D4		R3			
	5700	SPHWAHDNB25YZQ2D4	YZ	Q2	D4	992 ~	
		SPHWAHDNB25YZQ3D4		Q3			
	6500	SPHWAHDNB25YZP2D4	YZ	P2	D4	982 ~	
		SPHWAHDNB25YZP3D4		P3			
	90	2700	SPHWAHDNB27YZW1D4	YZ	W1	D4	754 ~
			SPHWAHDNB27YZW2D4		W2		
3000		SPHWAHDNB27YZV1D4	YZ	V1	D4	813 ~	
		SPHWAHDNB27YZV2D4		V2			
3500		SPHWAHDNB27YZU1D4	YZ	U1	D4	836 ~	
		SPHWAHDNB27YZU2D4		U2			
4000		SPHWAHDNB27YZT1D4	YZ	T1	D4	855 ~	

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	SPHWAHDNB27YZT2D4		T2	
	SPHWAHDNB27YZR2D4		R2	
5000	SPHWAHDNB27YZR3D4	YZ	D4	865 ~
			R3	

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※ LCoogD(I<sub>F</sub> = 270 mA, T<sub>J</sub> = 85 °C)

CRI(R <sub>a</sub> ) Min.	Nominal CCT(K)	Product Code	V <sub>F</sub> Rank	Color Rank	Flux Rank	Flux Range (Φ <sub>v</sub> , lm)
70	3000	SPHWHHDNC23YZV2D4	YZ	V2	D4	1524 ~
		SPHWHHDNC23YZV3D4		V3		
	4000	SPHWHHDNC23YZT2D4	YZ	T2	D4	1587 ~
		SPHWHHDNC23YZT3D4		T3		
	5000	SPHWHHDNC23YZR2D4	YZ	R2	D4	1566 ~
		SPHWHHDNC23YZR3D4		R3		
80	2700	SPHWHHDNC25YZW1D4	YZ	W1	D4	1349 ~
		SPHWHHDNC25YZW2D4		W2		
	3000	SPHWHHDNC25YZV1D4	YZ	V1	D4	1409 ~
		SPHWHHDNC25YZV2D4		V2		
	3500	SPHWHHDNC25YZU1D4	YZ	U1	D4	1438 ~
		SPHWHHDNC25YZU2D4		U2		
	4000	SPHWHHDNC25YZT1D4	YZ	T1	D4	1474 ~
		SPHWHHDNC25YZT2D4		T2		
	5000	SPHWHHDNC25YZR2D4	YZ	R2	D4	1488 ~
		SPHWHHDNC25YZR3D4		R3		
	5700	SPHWHHDNC25YZQ2D4	YZ	Q2	D4	1488 ~
		SPHWHHDNC25YZQ3D4		Q3		

		SPHWAHDNC25YZP2D4	P2		
6500	YZ		D4	1464 ~	
		SPHWAHDNC25YZP3D4	P3		
		SPHWAHDNC27YZW1D4	W1		
2700	YZ		D4	1115 ~	
		SPHWAHDNC27YZW2D4	W2		
90		SPHWAHDNC27YZV1D4	V1		
3000	YZ		D4	1202 ~	
		SPHWAHDNC27YZV2D4	V2		
		SPHWAHDNC27YZU1D4	U1		
3500	YZ		D4	1237 ~	
		SPHWAHDNC27YZU2D4	U2		
		SPHWAHDNC27YZT1D4	T1		
90	4000	YZ	D4	1283 ~	
		SPHWAHDNC27YZT2D4	T2		
		SPHWAHDNC27YZR2D4	R2		
5000	YZ		D4	1297 ~	
		SPHWAHDNC27YZR3D4	R3		



※ LCo13D(I<sub>F</sub> = 360 mA, T<sub>J</sub> = 85 °C)

CRI(R <sub>a</sub> ) Min.	Nominal CCT(K)	Product Code	V <sub>F</sub> Rank	Color Rank	Flux Rank	Flux Range (Φ <sub>v</sub> , lm)
70	2200	SPHWHHDND23YZY2D4	YZ	Y2	D4	1777 ~
		SPHWHHDND23YZY3D4		Y3		
	2700	SPHWHHDND23YZW2D4	YZ	V2	D4	1876 ~
		SPHWHHDND23YZW3D4		V3		
	3000	SPHWHHDND23YZV2D4	YZ	V2	D4	1997 ~
		SPHWHHDND23YZV3D4		V3		
	4000	SPHWHHDND23YZT2D4	YZ	T2	D4	2073 ~
		SPHWHHDND23YZT3D4		T3		
	5000	SPHWHHDND23YZR2D4	YZ	R2	D4	2026 ~
		SPHWHHDND23YZR3D4		R3		
	5700	SPHWHHDND23YZQ2D4	YZ	Q2	D4	2055 ~
		SPHWHHDND23YZQ3D4		Q3		
80	2700	SPHWHHDND25YZW1D4	YZ	W1	D4	1762 ~
		SPHWHHDND25YZW2D4		W2		
	3000	SPHWHHDND25YZV1D4	YZ	V1	D4	1853 ~
		SPHWHHDND25YZV2D4		V2		
	3500	SPHWHHDND25YZU1D4	YZ	U1	D4	1888 ~
		SPHWHHDND25YZU2D4		U2		
	4000	SPHWHHDND25YZT1D4	YZ	T1	D4	1925 ~
		SPHWHHDND25YZT2D4		T2		
	5000	SPHWHHDND25YZR2D4	YZ	R2	D4	1947 ~
		SPHWHHDND25YZR3D4		R3		
	5700	SPHWHHDND25YZQ2D4	YZ	Q2	D4	1944 ~
		SPHWHHDND25YZQ3D4		Q3		

6500	SPHWWAHDND25YZP2D4	YZ	P2	D4	1922 ~
	SPHWWAHDND25YZP3D4		P3		
2700	SPHWWAHDND27YZW1D4	YZ	W1	D4	1465 ~
	SPHWWAHDND27YZW2D4		W2		
3000	SPHWWAHDND27YZV1D4	YZ	V1	D4	1579 ~
	SPHWWAHDND27YZV2D4		V2		
3500	SPHWWAHDND27YZU1D4	YZ	U1	D4	1627 ~
	SPHWWAHDND27YZU2D4		U2		
4000	SPHWWAHDND27YZT1D4	YZ	T1	D4	1675 ~
	SPHWWAHDND27YZT2D4		T2		
5000	SPHWWAHDND27YZR2D4	YZ	R2	D4	1712 ~
	SPHWWAHDND27YZR3D4		R3		

※ LCo16D(I<sub>F</sub> = 450 mA, T<sub>J</sub> = 85 °C)

CRI(R <sub>a</sub> ) Min.	Nominal CCT(K)	Product Code	V <sub>F</sub> Rank	Color Rank	Flux Rank	Flux Range (Φ <sub>v</sub> , lm)
70	2200	SPHWWAHDNE23YZY2D4	YZ	Y2	D4	2349 ~
		SPHWWAHDNE23YZY3D4		Y3		
	2700	SPHWWAHDNE23YZW2D4	YZ	Y2	D4	2416 ~
		SPHWWAHDNE23YZW3D4		Y3		
	3000	SPHWWAHDNE23YZV2D4	YZ	V2	D4	2630 ~
		SPHWWAHDNE23YZV3D4		V3		
	4000	SPHWWAHDNE23YZT2D4	YZ	T2	D4	2740 ~
		SPHWWAHDNE23YZT3D4		T3		
	5000	SPHWWAHDNE23YZR2D4	YZ	R2	D4	2704 ~
		SPHWWAHDNE23YZR3D4		R3		
	5700	SPHWWAHDNE23YZQ2D4	YZ	Q2	D4	2716 ~
		SPHWWAHDNE23YZQ3D4		Q3		
80	2700	SPHWWAHDNE25YZW1D4	YZ	W1	D4	2329 ~
		SPHWWAHDNE25YZW2D4		W2		
	3000	SPHWWAHDNE25YZV1D4	YZ	V1	D4	2399 ~
		SPHWWAHDNE25YZV2D4		V2		
	3500	SPHWWAHDNE25YZU1D4	YZ	U1	D4	2457 ~
		SPHWWAHDNE25YZU2D4		U2		
	4000	SPHWWAHDNE25YZT1D4	YZ	T1	D4	2532 ~
		SPHWWAHDNE25YZT2D4		T2		
	5000	SPHWWAHDNE25YZR2D4	YZ	R2	D4	2569 ~
		SPHWWAHDNE25YZR3D4		R3		
	5700	SPHWWAHDNE25YZQ2D4	YZ	Q2	D4	2559 ~
		SPHWWAHDNE25YZQ3D4		Q3		

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6500	SPHWWAHDNE25YZP2D4	YZ	P2	D4	2527 ~
	SPHWWAHDNE25YZP3D4		P3		
2700	SPHWWAHDNE27YZW1D4	YZ	W1	D4	1898 ~
	SPHWWAHDNE27YZW2D4		W2		
3000	SPHWWAHDNE27YZV1D4	YZ	V1	D4	2035 ~
	SPHWWAHDNE27YZV2D4		V2		
3500	SPHWWAHDNE27YZU1D4	YZ	U1	D4	2102 ~
	SPHWWAHDNE27YZU2D4		U2		
4000	SPHWWAHDNE27YZT1D4	YZ	T1	D4	2203 ~
	SPHWWAHDNE27YZT2D4		T2		
5000	SPHWWAHDNE27YZR2D4	YZ	R2	D4	2239 ~
	SPHWWAHDNE27YZR3D4		R3		

※ LCo19D(I<sub>F</sub> = 540 mA, T<sub>J</sub> = 85 °C)

CRI(R <sub>a</sub> ) Min.	Nominal CCT(K)	Product Code	V <sub>F</sub> Rank	Color Rank	Flux Rank	Flux Range (Φ <sub>v</sub> , lm)
70	2200	SPHWAHDF23YZY2D4	YZ	Y2	D4	2813 ~
		SPHWAHDF23YZY3D4		Y3		
	2700	SPHWAHDF23YZW2D4	YZ	W2	D4	3021 ~
		SPHWAHDF23YZW3D4		W3		
	3000	SPHWAHDF23YZV2D4	YZ	V2	D4	3150 ~
		SPHWAHDF23YZV3D4		V3		
	4000	SPHWAHDF23YZT2D4	YZ	T2	D4	3282 ~
		SPHWAHDF23YZT3D4		T3		
	5000	SPHWAHDF23YZR2D4	YZ	R2	D4	3238 ~
		SPHWAHDF23YZR3D4		R3		
	5700	SPHWAHDF23YZQ2D4	YZ	Q2	D4	3253 ~
		SPHWAHDF23YZQ3D4		Q3		
80	2700	SPHWAHDF25YZW1D4	YZ	W1	D4	2790 ~
		SPHWAHDF25YZW2D4		W2		
	3000	SPHWAHDF25YZV1D4	YZ	V1	D4	2877 ~
		SPHWAHDF25YZV2D4		V2		
	3500	SPHWAHDF25YZU1D4	YZ	U1	D4	2933 ~
		SPHWAHDF25YZU2D4		U2		
	4000	SPHWAHDF25YZT1D4	YZ	T1	D4	3024 ~
		SPHWAHDF25YZT2D4		T2		
	5000	SPHWAHDF25YZR2D4	YZ	R2	D4	3077 ~
		SPHWAHDF25YZR3D4		R3		
	5700	SPHWAHDF25YZQ2D4	YZ	Q2	D4	3055 ~
		SPHWAHDF25YZQ3D4		Q3		
	6500	SPHWAHDF25YZP2D4	YZ	P2	D4	3027 ~
		SPHWAHDF25YZP3D4		P3		

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90	2700	SPHWWAHDNF27YZW1D4	YZ	W1	D4	2275 ~
		SPHWWAHDNF27YZW2D4		W2		
	3000	SPHWWAHDNF27YZV1D4	YZ	V1	D4	2453 ~
		SPHWWAHDNF27YZV2D4		V2		
	3500	SPHWWAHDNF27YZU1D4	YZ	U1	D4	2529 ~
		SPHWWAHDNF27YZU2D4		U2		
	4000	SPHWWAHDNF27YZT1D4	YZ	T1	D4	2632 ~
		SPHWWAHDNF27YZT2D4		T2		
	5000	SPHWWAHDNF27YZR2D4	YZ	R2	D4	2681 ~
		SPHWWAHDNF27YZR3D4		R3		

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※ LCo26D(I<sub>F</sub> = 720 mA, T<sub>J</sub> = 85 °C)

CRI(R <sub>a</sub> ) Min.	Nominal CCT(K)	Product Code	V <sub>F</sub> Rank	Color Rank	Flux Rank	Flux Range (Φ <sub>v</sub> , lm)
70	2200	SPHWHAHNDNG23YZY2D4	YZ	Y2	D4	3703 ~
		SPHWHAHNDNG23YZY3D4		Y3		
	2700	SPHWHAHNDNG23YZW2D4	YZ	W2	D4	3911 ~
		SPHWHAHNDNG23YZW3D4		W3		
	3000	SPHWHAHNDNG23YZV2D4	YZ	V2	D4	4157 ~
		SPHWHAHNDNG23YZV3D4		V3		
	4000	SPHWHAHNDNG23YZT2D4	YZ	T2	D4	4289 ~
		SPHWHAHNDNG23YZT3D4		T3		
	5000	SPHWHAHNDNG23YZR2D4	YZ	R2	D4	4202 ~
		SPHWHAHNDNG23YZR3D4		R3		
	5700	SPHWHAHNDNG23YZQ2D4	YZ	Q2	D4	4281 ~
		SPHWHAHNDNG23YZQ3D4		Q3		
80	2700	SPHWHAHNDNG25YZW1D4	YZ	W1	D4	3668 ~
		SPHWHAHNDNG25YZW2D4		W2		
	3000	SPHWHAHNDNG25YZV1D4	YZ	V1	D4	3859 ~
		SPHWHAHNDNG25YZV2D4		V2		
	3500	SPHWHAHNDNG25YZU1D4	YZ	U1	D4	3907 ~
		SPHWHAHNDNG25YZU2D4		U2		
	4000	SPHWHAHNDNG25YZT1D4	YZ	T1	D4	3975 ~
		SPHWHAHNDNG25YZT2D4		T2		
	5000	SPHWHAHNDNG25YZR2D4	YZ	R2	D4	4064 ~
		SPHWHAHNDNG25YZR3D4		R3		
	5700	SPHWHAHNDNG25YZQ2D4	YZ	Q2	D4	4025 ~
		SPHWHAHNDNG25YZQ3D4		Q3		
	6500	SPHWHAHNDNG25YZP2D4	YZ	P2	D4	3998 ~
		SPHWHAHNDNG25YZP3D4		P3		

90	2700	SPHWHAHDNG27YZW1D4	YZ	W1	D4	3031 ~
		SPHWHAHDNG27YZW2D4		W2		
	3000	SPHWHAHDNG27YZV1D4	YZ	V1	D4	3256 ~
		SPHWHAHDNG27YZV2D4		V2		
	3500	SPHWHAHDNG27YZU1D4	YZ	U1	D4	3341 ~
		SPHWHAHDNG27YZU2D4		U2		
	4000	SPHWHAHDNG27YZT1D4	YZ	T1	D4	3482 ~
		SPHWHAHDNG27YZT2D4		T2		
	5000	SPHWHAHDNG27YZR2D4	YZ	R2	D4	3568 ~
		SPHWHAHDNG27YZR3D4		R3		



※ LCo33D(I<sub>F</sub> = 900 mA, T<sub>J</sub> = 85 °C)

CRI(R <sub>a</sub> ) Min.	Nominal CCT(K)	Product Code	V <sub>F</sub> Rank	Color Rank	Flux Rank	Flux Range (Φ <sub>v</sub> , lm)
70	2200	SPHWAHDNH23YZY2D4	YZ	Y2	D4	4536 ~
		SPHWAHDNH23YZY3D4		Y3		
	2700	SPHWAHDNH23YZW2D4	YZ	W2	D4	4871 ~
		SPHWAHDNH23YZW3D4		W3		
	3000	SPHWAHDNH23YZV2D4	YZ	V2	D4	5079 ~
		SPHWAHDNH23YZV3D4		V3		
	4000	SPHWAHDNH23YZT2D4	YZ	T2	D4	5292 ~
		SPHWAHDNH23YZT3D4		T3		
	5000	SPHWAHDNH23YZR2D4	YZ	R2	D4	5221 ~
		SPHWAHDNH23YZR3D4		R3		
	5700	SPHWAHDNH23YZQ2D4	YZ	Q2	D4	5244 ~
		SPHWAHDNH23YZQ3D4		Q3		
80	2700	SPHWAHDNH25YZW1D4	YZ	W1	D4	4498 ~
		SPHWAHDNH25YZW2D4		W2		
	3000	SPHWAHDNH25YZV1D4	YZ	V1	D4	4741 ~
		SPHWAHDNH25YZV2D4		V2		
	3500	SPHWAHDNH25YZU1D4	YZ	U1	D4	4819 ~
		SPHWAHDNH25YZU2D4		U2		
	4000	SPHWAHDNH25YZT1D4	YZ	T1	D4	4914 ~
		SPHWAHDNH25YZT2D4		T2		
	5000	SPHWAHDNH25YZR2D4	YZ	R2	D4	4961 ~
		SPHWAHDNH25YZR3D4		R3		
	5700	SPHWAHDNH25YZQ2D4	YZ	Q2	D4	4961 ~
		SPHWAHDNH25YZQ3D4		Q3		
	6500	SPHWAHDNH25YZP2D4	YZ	P2	D4	4880 ~
		SPHWAHDNH25YZP3D4		P3		

90	2700	SPHWAHDNH27YZW1D4	YZ	W1	D4	3765 ~
		SPHWAHDNH27YZW2D4		W2		
	3000	SPHWAHDNH27YZV1D4	YZ	V1	D4	4061 ~
		SPHWAHDNH27YZV2D4		V2		
	3500	SPHWAHDNH27YZU1D4	YZ	U1	D4	4181 ~
		SPHWAHDNH27YZU2D4		U2		
	4000	SPHWAHDNH27YZT1D4	YZ	T1	D4	4276 ~
		SPHWAHDNH27YZT2D4		T2		
	5000	SPHWAHDNH27YZR2D4	YZ	R2	D4	4323 ~
		SPHWAHDNH27YZR3D4		R3		

※ LCo<sub>4</sub>oD(I<sub>F</sub> = 1080 mA, T<sub>J</sub> = 85 °C)

CRI(R <sub>a</sub> ) Min.	Nominal CCT(K)	Product Code	V <sub>F</sub> Rank	Color Rank	Flux Rank	Flux Range (Φ <sub>v</sub> , lm)	
70	2200	SPHWAHDNK23YZY2D4	YZ	Y2	D4	5609 ~	
		SPHWAHDNK23YZY3D4		Y3			
	2700	SPHWAHDNK23YZW2D4	YZ	W2	D4	5833 ~	
		SPHWAHDNK23YZW3D4		W3			
	3000	SPHWAHDNK23YZV2D4	YZ	V2	D4	6167 ~	
		SPHWAHDNK23YZV3D4		V3			
	4000	SPHWAHDNK23YZT2D4	YZ	T2	D4	6544 ~	
		SPHWAHDNK23YZT3D4		T3			
	5000	SPHWAHDNK23YZR2D4	YZ	R2	D4	6423 ~	
		SPHWAHDNK23YZR3D4		R3			
	5700	SPHWAHDNK23YZQ2D4	YZ	Q2	D4	6486 ~	
		SPHWAHDNK23YZQ3D4		Q3			
	80	2700	SPHWAHDNK25YZW1D4	YZ	W1	D4	5563 ~
			SPHWAHDNK25YZW2D4		W2		
		3000	SPHWAHDNK25YZV1D4	YZ	V1	D4	5754 ~
			SPHWAHDNK25YZV2D4		V2		
3500		SPHWAHDNK25YZU1D4	YZ	U1	D4	5960 ~	
		SPHWAHDNK25YZU2D4		U2			
4000		SPHWAHDNK25YZT1D4	YZ	T1	D4	6077 ~	
		SPHWAHDNK25YZT2D4		T2			
5000		SPHWAHDNK25YZR2D4	YZ	R2	D4	6085 ~	
		SPHWAHDNK25YZR3D4		R3			
5700		SPHWAHDNK25YZQ2D4	YZ	Q2	D4	6135 ~	
		SPHWAHDNK25YZQ3D4		Q3			
6500		SPHWAHDNK25YZP2D4	YZ	P2	D4	6036 ~	
		SPHWAHDNK25YZP3D4		P3			

90

2700	SPHWAHDNK27YZW1D4	YZ	W1	D4	4605 ~
	SPHWAHDNK27YZW2D4		W2		
3000	SPHWAHDNK27YZV1D4	YZ	V1	D4	4878 ~
	SPHWAHDNK27YZV2D4		V2		
3500	SPHWAHDNK27YZU1D4	YZ	U1	D4	5082 ~
	SPHWAHDNK27YZU2D4		U2		
4000	SPHWAHDNK27YZT1D4	YZ	T1	D4	5253 ~
	SPHWAHDNK27YZT2D4		T2		
5000	SPHWAHDNK27YZR2D4	YZ	R2	D4	5355 ~
	SPHWAHDNK27YZR3D4		R3		
5700	SPHWAHDNK27YZQ2D4	YZ	Q2	D4	5239 ~
	SPHWAHDNK27YZQ3D4		Q3		

※ LCo6oD(I<sub>F</sub> = 1080 mA, T<sub>J</sub> = 85 °C)

CRI(R <sub>a</sub> ) Min.	Nominal CCT(K)	Product Code	V <sub>F</sub> Rank	Chrom. Bin	Flux Rank	Flux Range (Φ <sub>v</sub> , lm)	
70	2200	SPHWWAHDNL231ZY2D4	1Z	Y2	D4	8305 ~	
		SPHWWAHDNL231ZY3D4		Y3			
	2700	SPHWWAHDNL231ZW2D4	1Z	W2	D4	8664 ~	
		SPHWWAHDNL231ZW3D4		W3			
	3000	SPHWWAHDNL231ZV2D4	1Z	V2	D4	9300 ~	
		SPHWWAHDNL231ZV3D4		V3			
	4000	SPHWWAHDNL231ZT2D4	1Z	T2	D4	9690 ~	
		SPHWWAHDNL231ZT3D4		T3			
	5000	SPHWWAHDNL231ZR2D4	1Z	R2	D4	9416 ~	
		SPHWWAHDNL231ZR3D4		R3			
	5700	SPHWWAHDNL231ZQ2D4	1Z	Q2	D4	9603 ~	
		SPHWWAHDNL231ZQ3D4		Q3			
	80	2700	SPHWWAHDNL251ZW1D4	1Z	W1	D4	8236 ~
			SPHWWAHDNL251ZW2D4		W2		
		3000	SPHWWAHDNL251ZV1D4	1Z	V1	D4	8680 ~
			SPHWWAHDNL251ZV2D4		V2		
3500		SPHWWAHDNL251ZU1D4	1Z	U1	D4	8806 ~	
		SPHWWAHDNL251ZU2D4		U2			
4000		SPHWWAHDNL251ZT1D4	1Z	T1	D4	8998 ~	
		SPHWWAHDNL251ZT2D4		T2			
5000		SPHWWAHDNL251ZR2D4	1Z	R2	D4	9084 ~	
		SPHWWAHDNL251ZR3D4		R3			
5700		SPHWWAHDNL251ZQ2D4	1Z	Q2	D4	9084 ~	
		SPHWWAHDNL251ZQ3D4		Q3			
6500		SPHWWAHDNL251ZP2D4	1Z	P2	D4	8937 ~	
		SPHWWAHDNL251ZP3D4		P3			

90

2700	SPHWHAHADNL271ZW1D4	1Z	W1	D4	6810 ~
	SPHWHAHADNL271ZW2D4		W2		
3000	SPHWHAHADNL271ZV1D4	1Z	V1	D4	7280 ~
	SPHWHAHADNL271ZV2D4		V2		
3500	SPHWHAHADNL271ZU1D4	1Z	U1	D4	7536 ~
	SPHWHAHADNL271ZU2D4		U2		
4000	SPHWHAHADNL271ZT1D4	1Z	T1	D4	7830 ~
	SPHWHAHADNL271ZT2D4		U2		
5000	SPHWHAHADNL271ZR2D4	1Z	R2	D4	7916 ~
	SPHWHAHADNL271ZR3D4		R3		
5700	SPHWHAHADNL271ZQ2D4	1Z	Q2	D4	7758 ~
	SPHWHAHADNL271ZQ3D4		Q3		

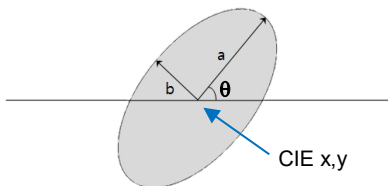
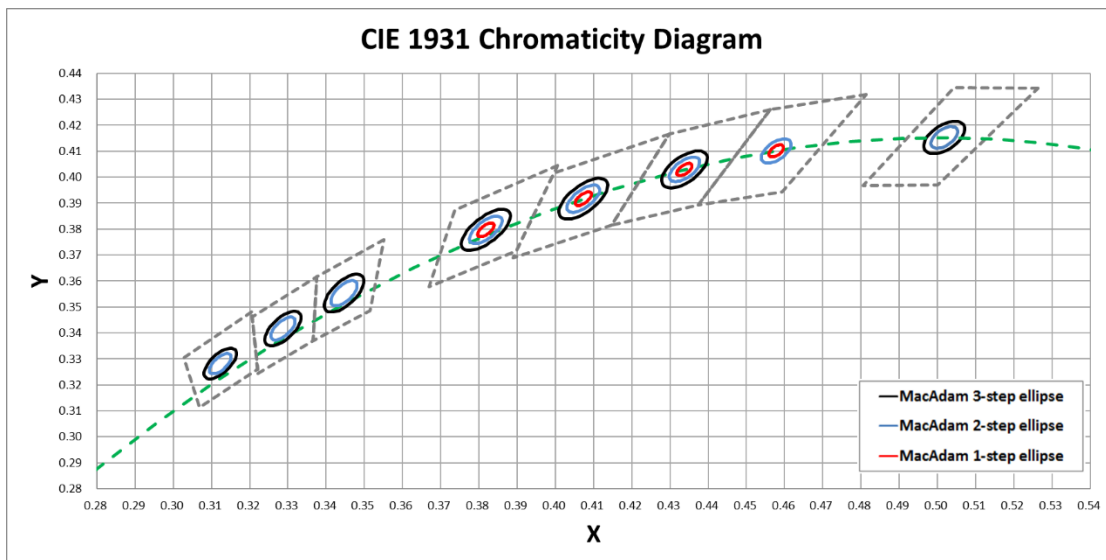
※ LCo8oD(I<sub>F</sub> = 1620 mA, T<sub>J</sub> = 85 °C)

CRI(R <sub>a</sub> ) Min.	Nominal CCT(K)	Product Code	V <sub>F</sub> Rank	Chrom. Bin	Flux Rank	Flux Range (Φ <sub>v</sub> , lm)	
70	2200	SPHWWAHDNM231ZY2D4	1Z	Y2	D4	12020 ~	
		SPHWWAHDNM231ZY3D4		Y3			
	2700	SPHWWAHDNM231ZW2D4	1Z	W2	D4	12909 ~	
		SPHWWAHDNM231ZW3D4		W3			
	3000	SPHWWAHDNM231ZV2D4	1Z	V2	D4	13460 ~	
		SPHWWAHDNM231ZV3D4		V3			
	4000	SPHWWAHDNM231ZT2D4	1Z	T2	D4	14023 ~	
		SPHWWAHDNM231ZT3D4		T3			
	5000	SPHWWAHDNM231ZR2D4	1Z	R2	D4	14124 ~	
		SPHWWAHDNM231ZR3D4		R3			
	5700	SPHWWAHDNM231ZQ2D4	1Z	Q2	D4	13898 ~	
		SPHWWAHDNM231ZQ3D4		Q3			
	80	2700	SPHWWAHDNM251ZW1D4	1Z	W1	D4	11920 ~
			SPHWWAHDNM251ZW2D4		W2		
		3000	SPHWWAHDNM251ZV1D4	1Z	V1	D4	12589 ~
			SPHWWAHDNM251ZV2D4		V2		
		3500	SPHWWAHDNM251ZU1D4	1Z	U1	D4	12771 ~
			SPHWWAHDNM251ZU2D4		U2		
4000		SPHWWAHDNM251ZT1D4	1Z	T1	D4	13022 ~	
		SPHWWAHDNM251ZT2D4		T2			
5000		SPHWWAHDNM251ZR2D4	1Z	R2	D4	13147 ~	
		SPHWWAHDNM251ZR3D4		R3			
5700		SPHWWAHDNM251ZQ2D4	1Z	Q2	D4	13147 ~	
		SPHWWAHDNM251ZQ3D4		Q3			

6500	SPHWWAHDNM251ZP2D4	1Z	P2	D4	12934 ~
	SPHWWAHDNM251ZP3D4		P3		
2700	SPHWWAHDNM271ZW1D4	1Z	W1	D4	9925~
	SPHWWAHDNM271ZW2D4		W2		
3000	SPHWWAHDNM271ZV1D4	1Z	V1	D4	10689 ~
	SPHWWAHDNM271ZV2D4		V2		
3500	SPHWWAHDNM271ZU1D4	1Z	U1	D4	11005 ~
	SPHWWAHDNM271ZU2D4		U2		
4000	SPHWWAHDNM271ZT1D4	1Z	T1	D4	11331 ~
	SPHWWAHDNM271ZT2D4		T2		
5000	SPHWWAHDNM271ZR2D4	1Z	R2	D4	11457 ~
	SPHWWAHDNM271ZR3D4		R3		
5700	SPHWWAHDNM271ZQ2D4	1Z	Q2	D4	11227 ~
	SPHWWAHDNM271ZQ3D4		Q3		



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



MacAdam Ellipse (Y2, Y3)					
Step	CIE x	CIE y	$\theta$	a	b
2-step	0.5018	0.4153	53.45	0.0048	0.0026
3-step	0.5018	0.4153	53.45	0.0072	0.004

MacAdam Ellipse (W1, W2)					
Step	CIE x	CIE y	$\theta$	a	b
2-step	0.4578	0.4101	53.7	0.0027	0.0014
3-step	0.4578	0.4101	53.7	0.0054	0.0028

MacAdam Ellipse (V1, V2, V3)					
Step	CIE x	CIE y	$\theta$	a	b
1-step	0.4338	0.403	53.22	0.0028	0.0014
2-step	0.4338	0.403	53.22	0.0056	0.0027
3-step	0.4338	0.403	53.22	0.0083	0.0041

MacAdam Ellipse (U1, U2, U3)					
Step	CIE x	CIE y	$\theta$	a	b
1-step	0.4073	0.3917	54	0.0031	0.0014
2-step	0.4073	0.3917	54	0.0062	0.0028
3-step	0.4073	0.3917	54	0.0093	0.0041

MacAdam Ellipse (T1, T2, T3)					
Step	CIE x	CIE y	$\theta$	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
3-step	0.3818	0.3797	53.72	0.0094	0.004

MacAdam Ellipse (R2, R3)					
Step	CIE x	CIE y	$\theta$	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

MacAdam Ellipse (O2, O3)					
Step	CIE x	CIE y	$\theta$	a	b
2-step	0.3287	0.3417	59.1	0.005	0.0021
3-step	0.3287	0.3417	59.1	0.0075	0.0032

MacAdam Ellipse (P2, P3)					
Step	CIE x	CIE y	$\theta$	a	b
2-step	0.3123	0.3282	58.57	0.0045	0.0019
3-step	0.3123	0.3282	58.57	0.0067	0.0029

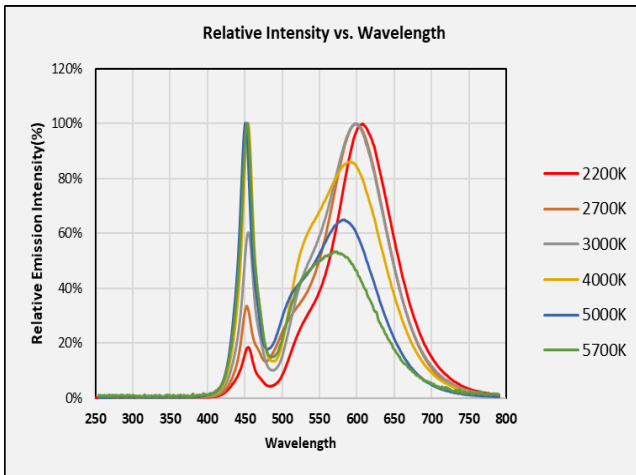
**Note:**

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

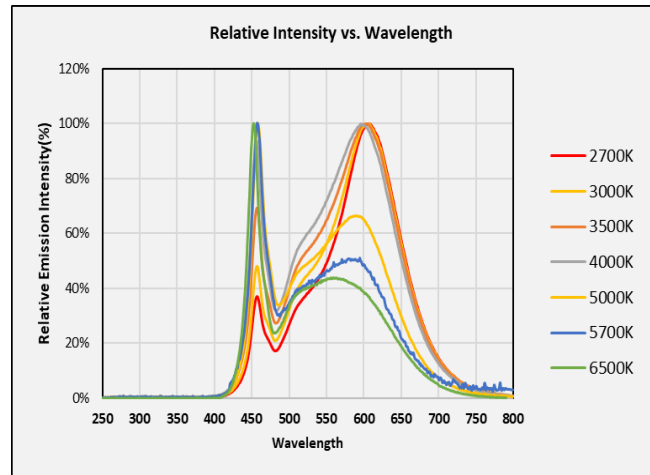
### 3. Typical Characteristics Graphs

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

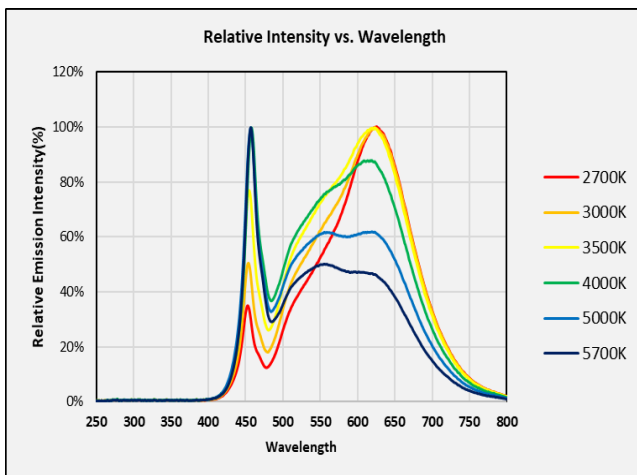
##### CRI Ra 70+



##### CRI Ra 80+

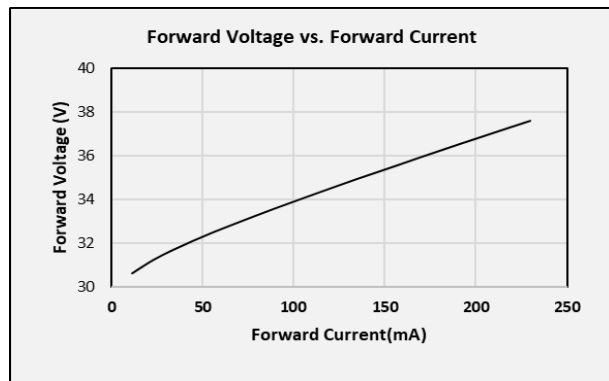
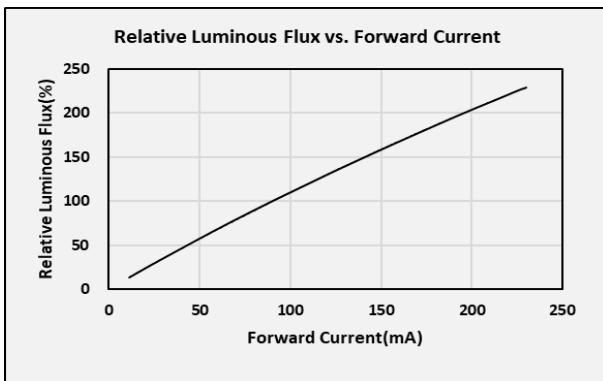


##### CRI Ra 90+

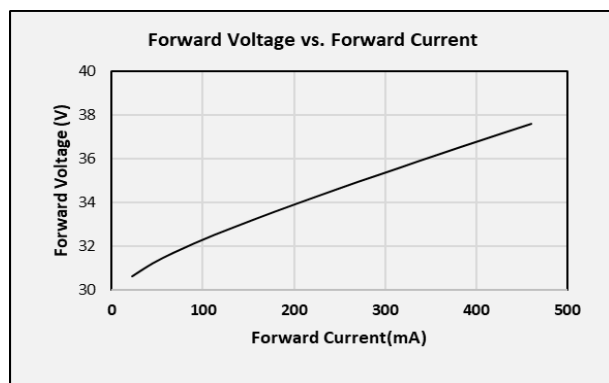
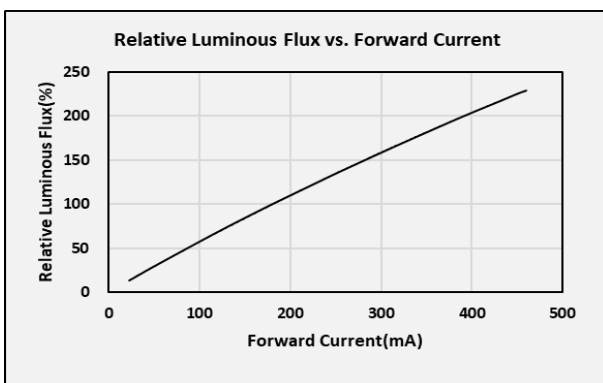


b) Forward Current Characteristics ( $T_J = 85\text{ }^\circ\text{C}$ )

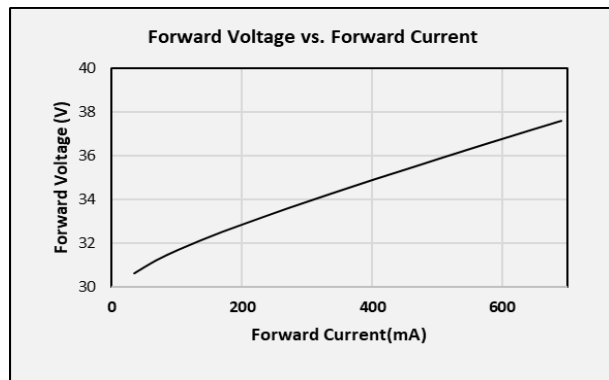
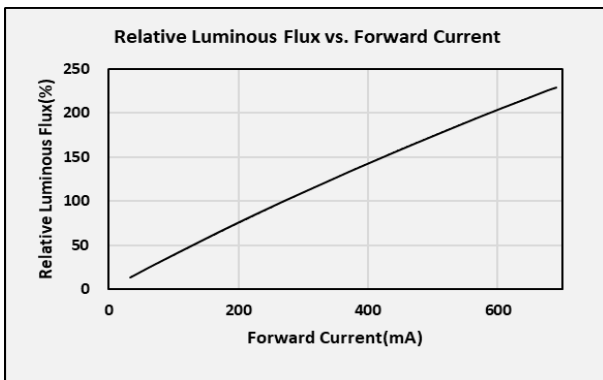
## 1) LC003D



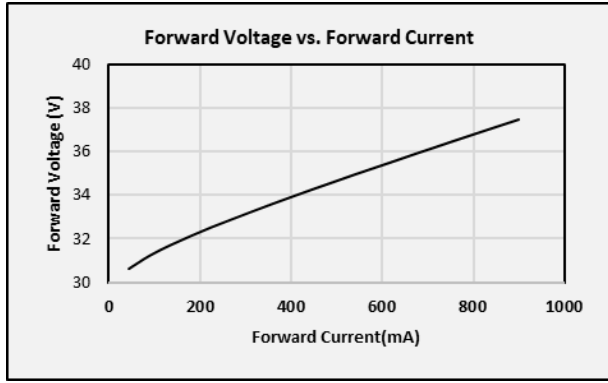
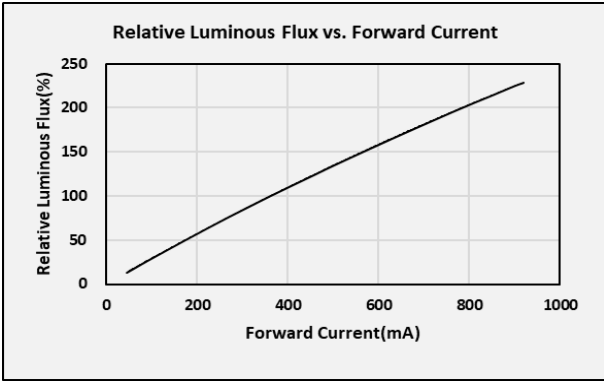
## 2) LC006D



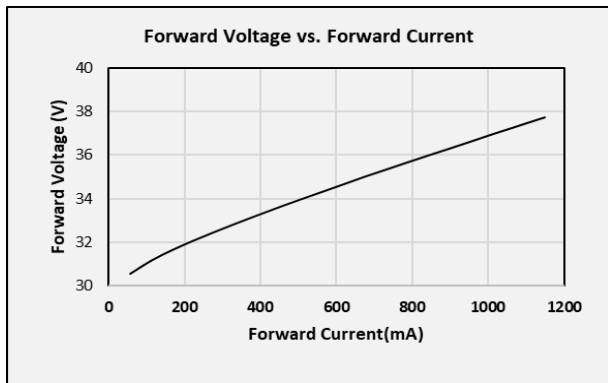
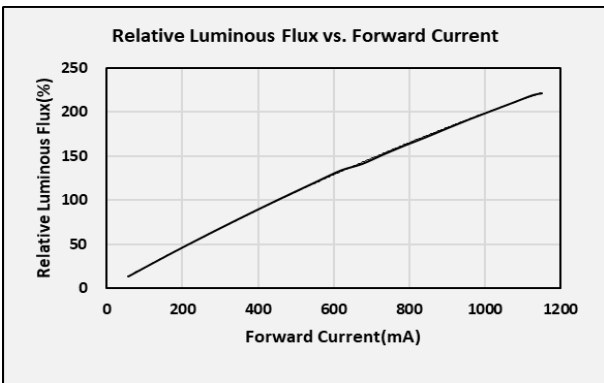
## 3) LC009D



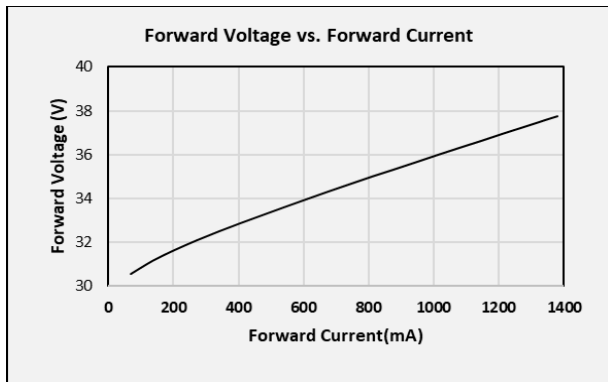
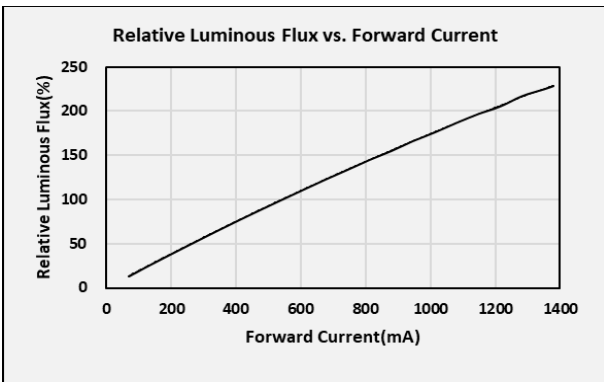
4) LC013D



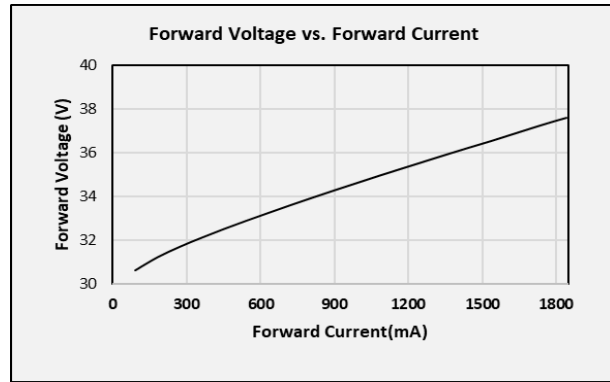
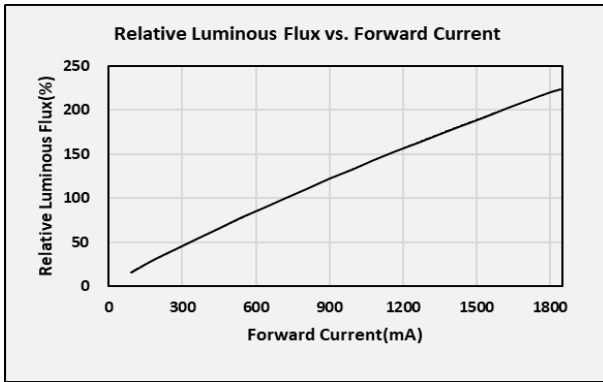
5) LC016D



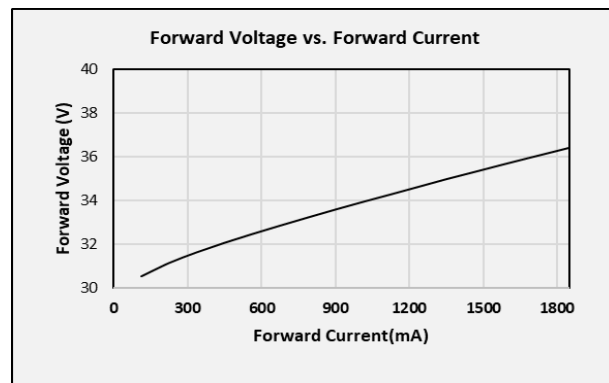
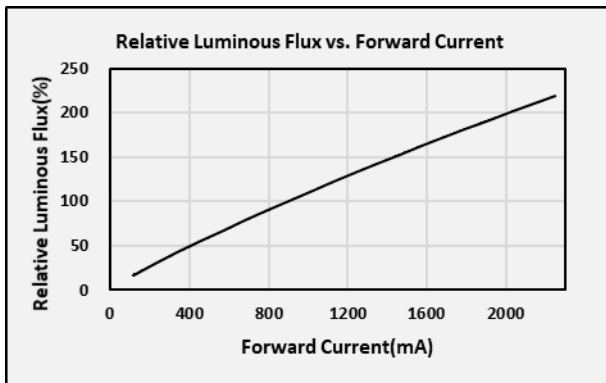
6) LC019D



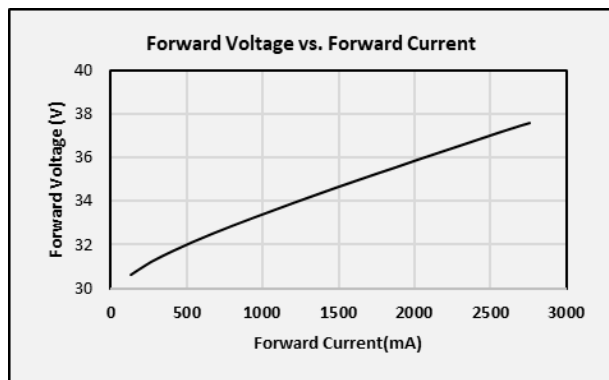
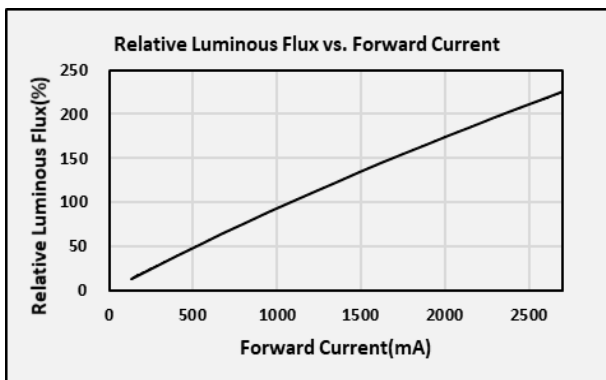
## 7) LC026D



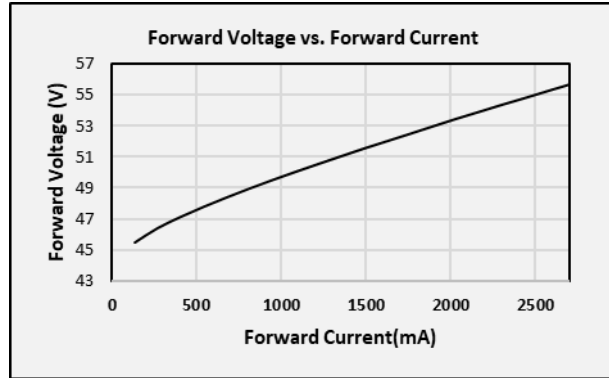
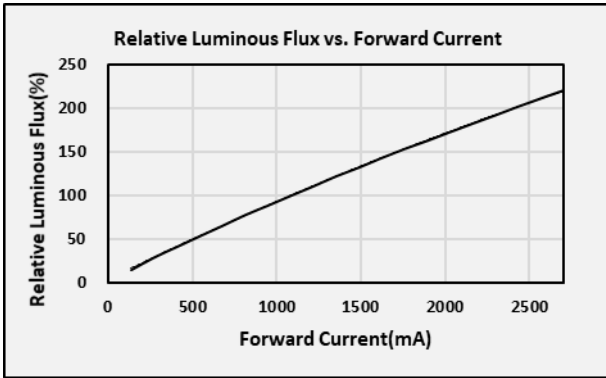
## 8) LC033D



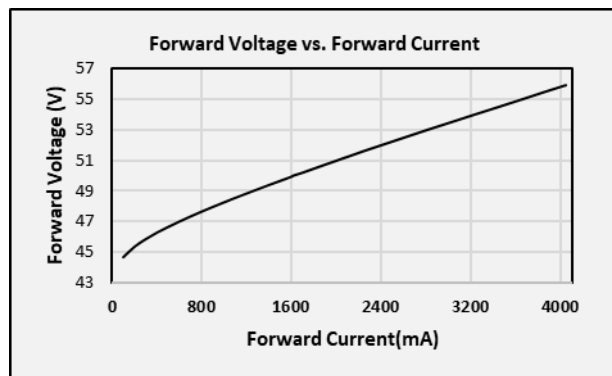
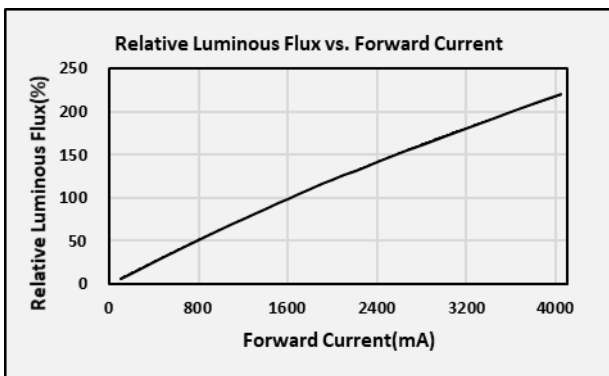
## 9) LC040D



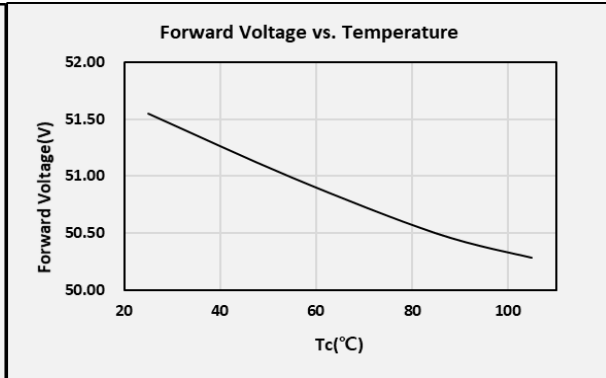
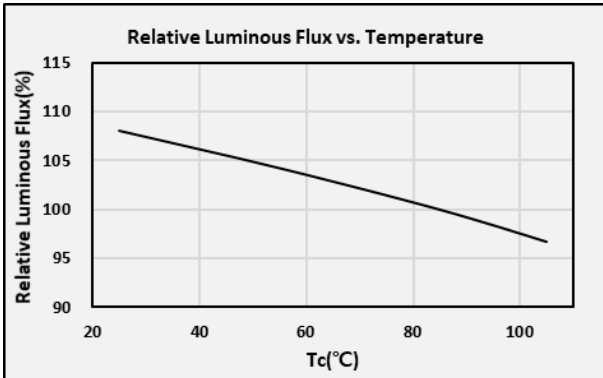
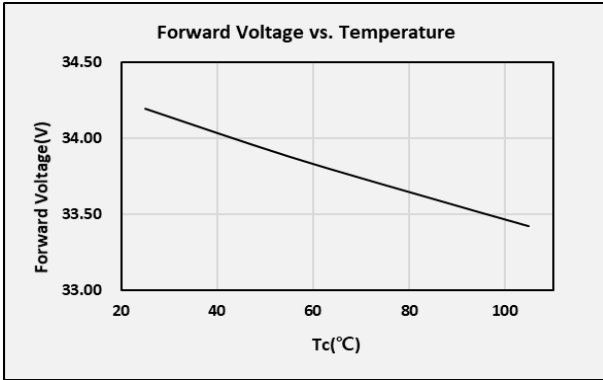
## 10) LC060D



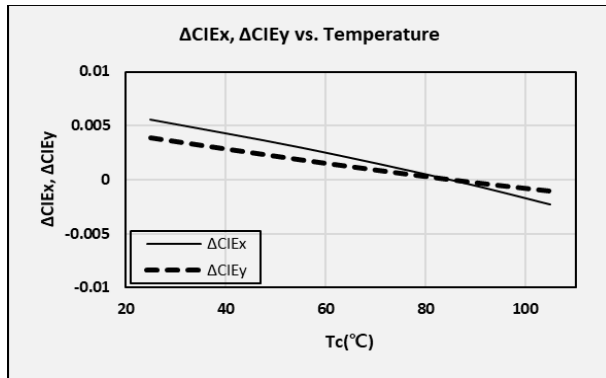
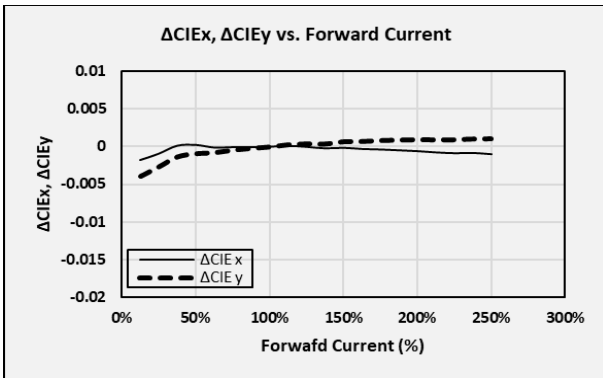
## 11) LC080D



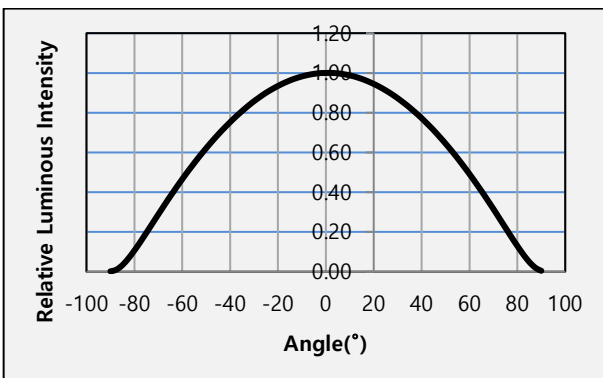
c) Temperature Characteristics ( $I_F$  = Sorting Current)



d) Color Shift Characteristics ( $T_J = 85\text{ °C}$ ,  $I_F$  = Sorting Current, CRI = 80+)

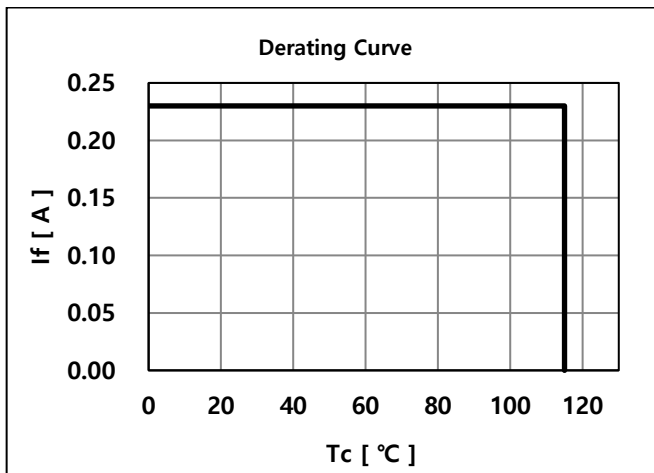


e) Beam Angle Characteristics ( $I_F$  = Sorting Current,  $T_J = 85\text{ °C}$ )

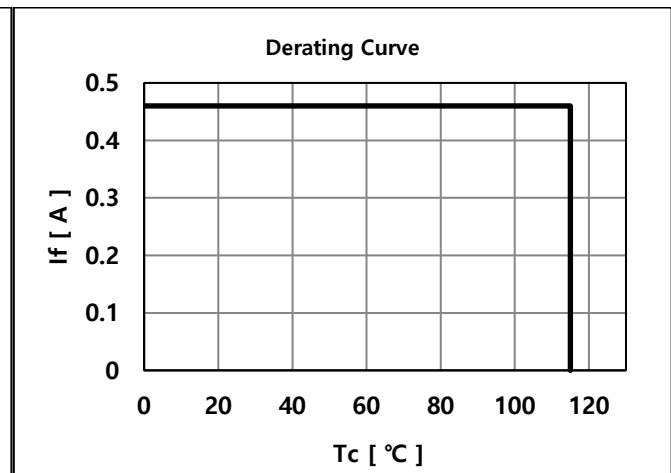


## f) Derating Characteristics

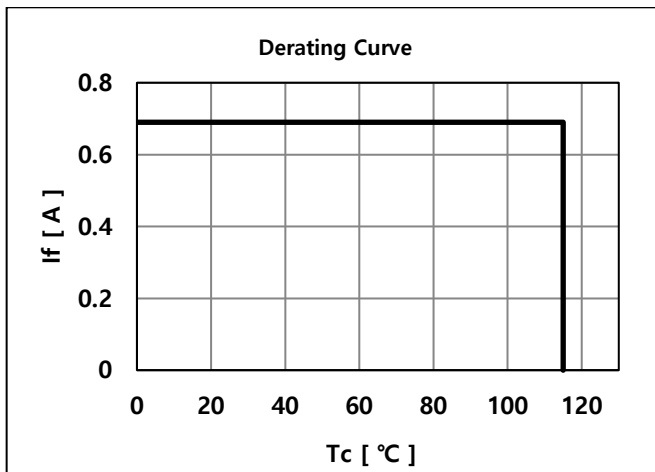
1) LC003D



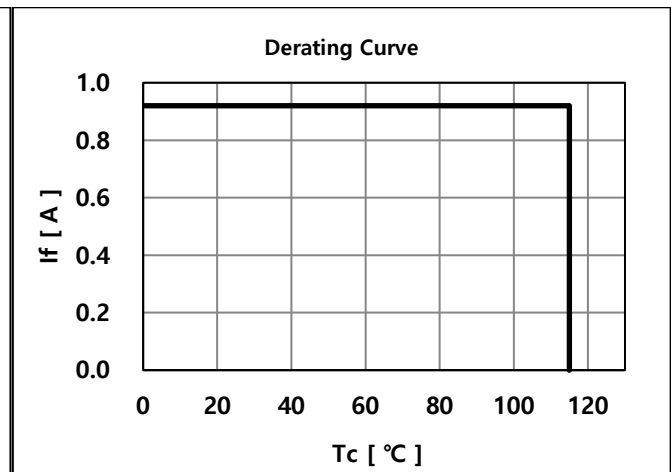
2) LC006D



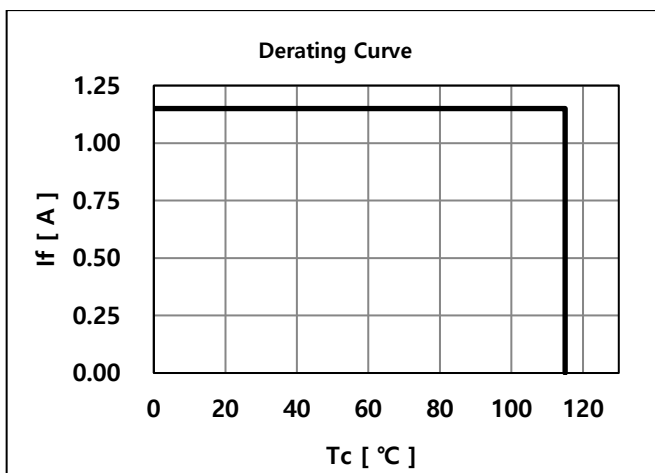
3) LC009D



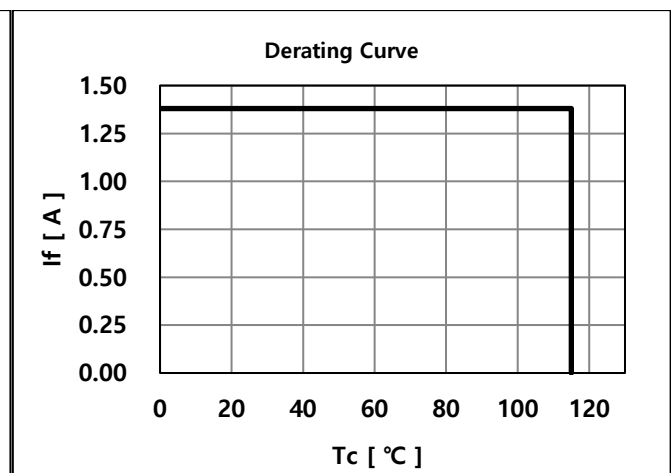
4) LC0013D



5) LC016D

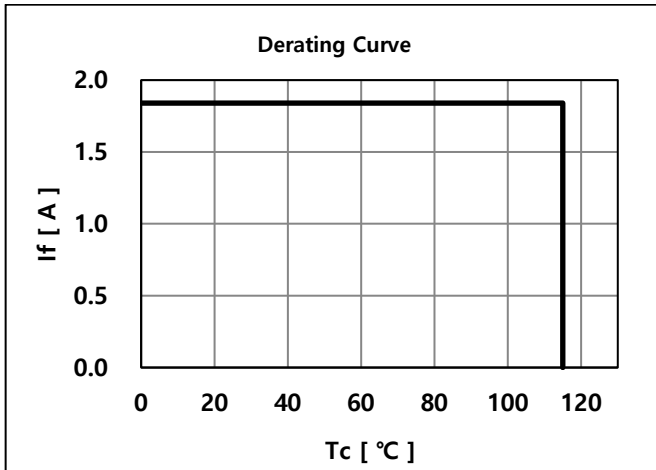


6) LC0019D

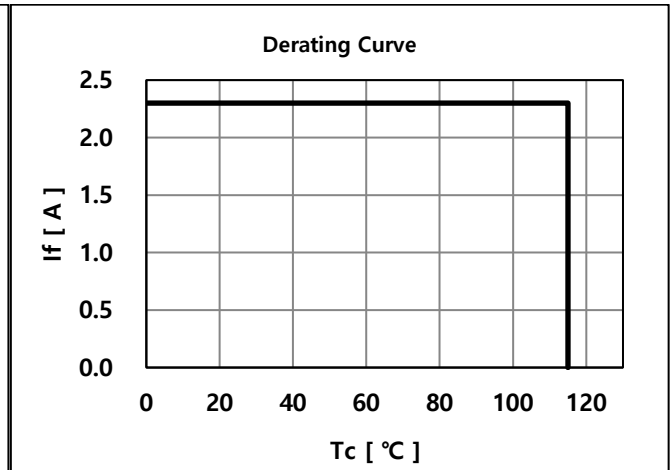




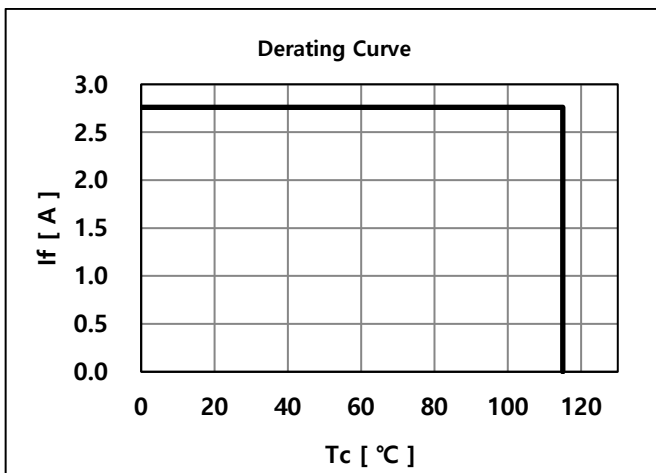
7) LC026D



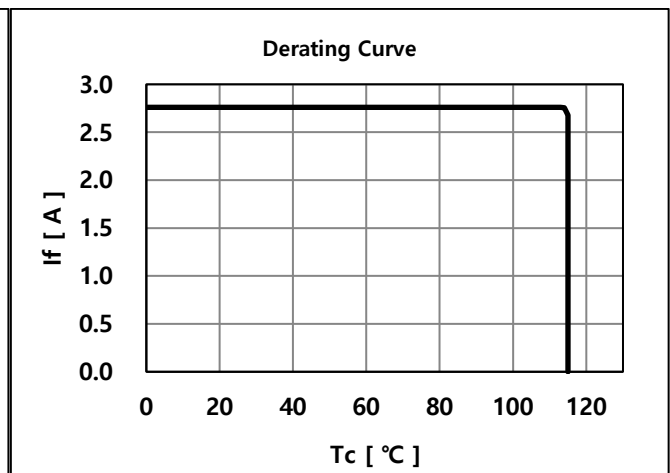
8) LC0033D



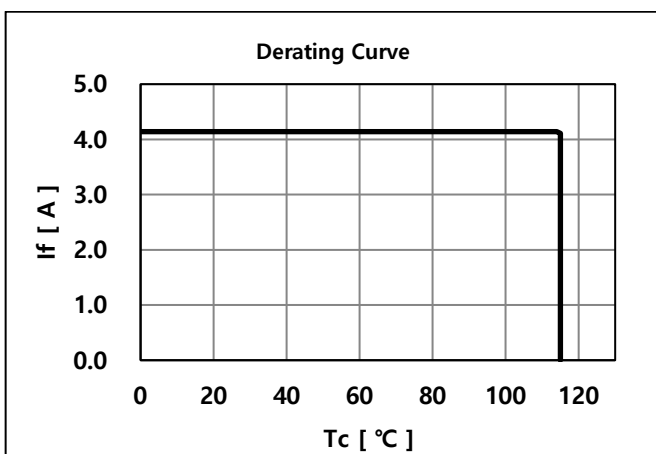
9) LC040D



10) LC060D

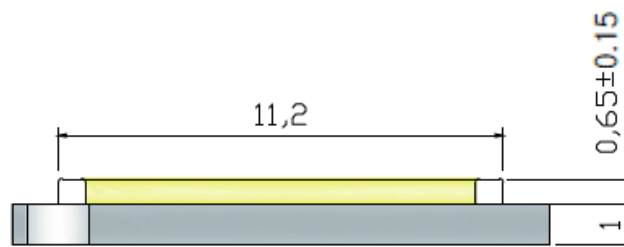
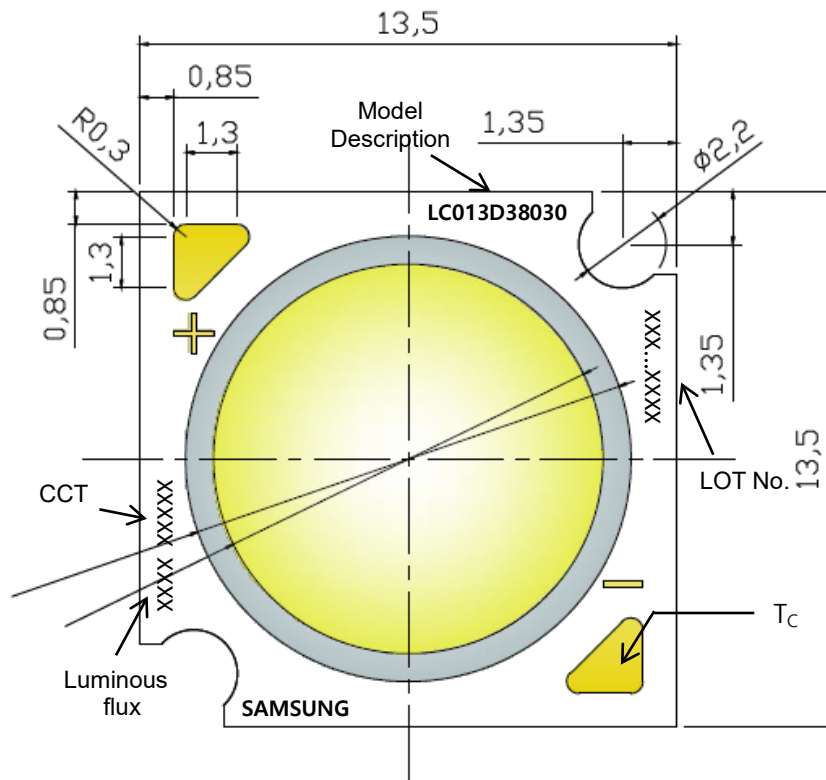


11) LC080D



4. Outline Drawing & Dimension

※ Model : LC003D, LC006D, LC009D, LC013D

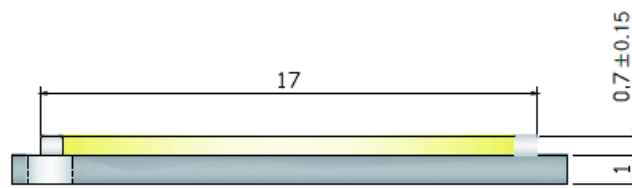
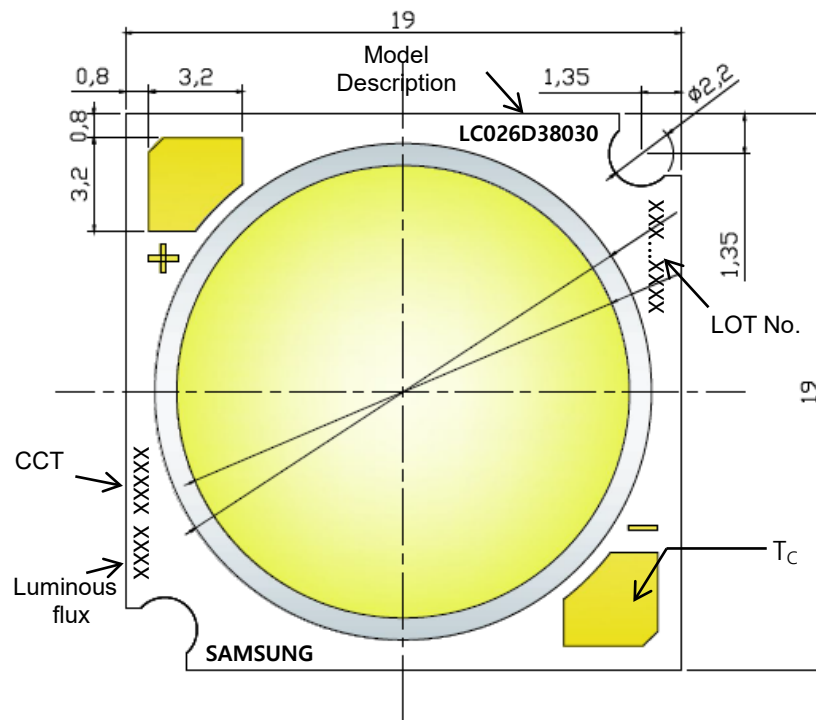


- 1. Unit: mm
- 2. Tolerance: ± 0.3 mm

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

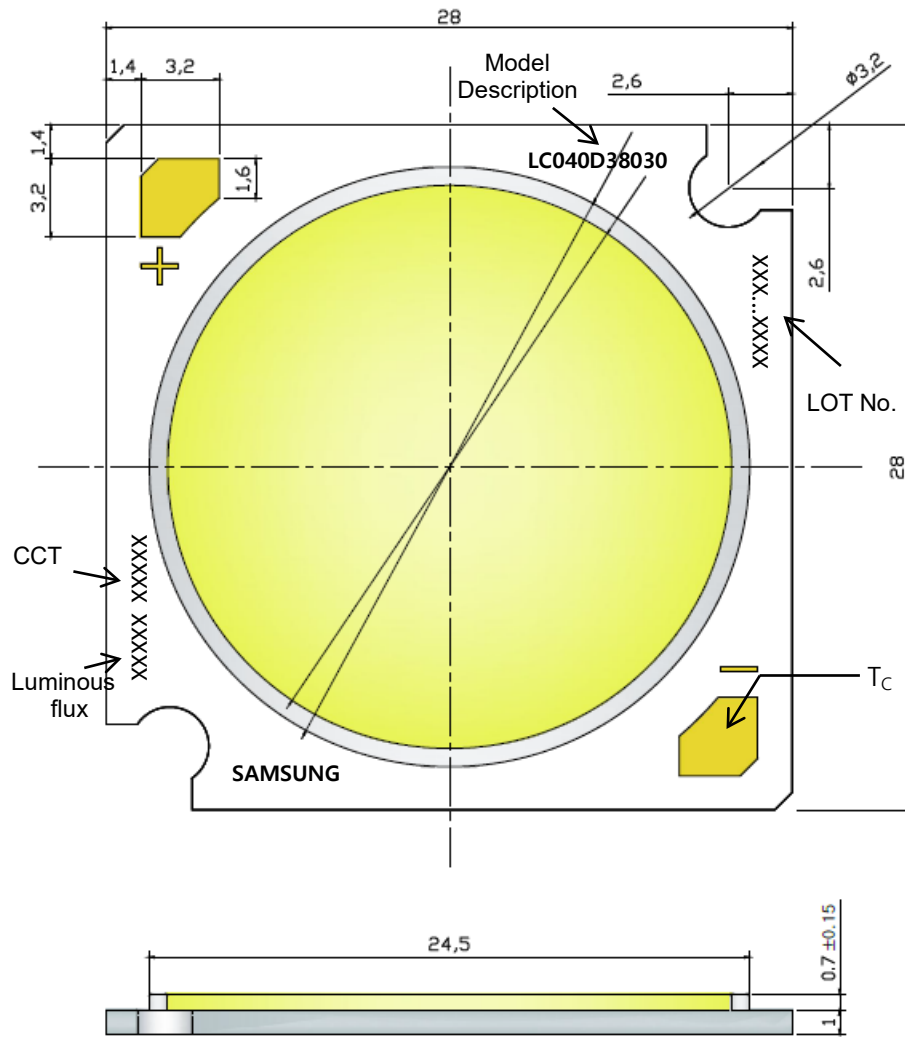


- 1. Unit: mm
- 2. Tolerance: ± 0.3 mm

Item	Dimension	Tolerance	Unit
Length	19.0	±0.15	mm
Width	19.0	±0.15	mm
Height	Dam	0.7	mm
	Substrate	1.0	mm
LES Diameter	Light Emitting Surface	14.5	mm

Note: Denoted product information above is only an example  
 ( LC026D48030 : LC026D, Gen4, CRI80+, 3000K )

※ Model : LC040D, LC060D, LC080D



- 1. Unit: mm
- 2. Tolerance:  $\pm 0.3$  mm

Item	Dimension	Tolerance	Unit
Length	28.0	$\pm 0.15$	mm
Width	28.0	$\pm 0.15$	mm
Height	Dam	$\pm 0.15$	mm
	Substrate	$\pm 0.10$	mm
LES Diameter	Light Emitting Surface	$\pm 0.30$	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
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	110 °C	1000 h
Low Temperature Storage	-40 °C	1000 h
Wet High Temperature Storage Test	85°C, 85% RH	1000h
Temperature Cycling	-45 °C / 15min ~ 125 °C / 15min Temperature change within 5min	500 cycle
Powered Temperature Cycle (PTC)	-40 °C/ 85 °C each 10 min, 20 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
Vibrations Variable Frequency	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
Hydrogen Sulphide(H <sub>2</sub> S)	25 °C 75%R.H. H <sub>2</sub> S concentration 15ppm	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>	$I_F = \text{Sorting Current}$	L.S.L. * 0.9	U.S.L. * 1.1
Luminous Flux	Φ <sub>v</sub>	$I_F = \text{Sorting Current}$	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:

ⒶⒷ: Forward Voltage bin (refer to page 9)

ⒸⒹ: Chromaticity bin (refer to page 21)

ⒺⒻ: Luminous Flux bin (refer to page 5-8)

### 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 (G: 2022, H: 2023, I: 2024...)

⑤ : Month (1~9, A, B, C)

⑥⑦⑧⑨ : Day (1~9, A, B~V)

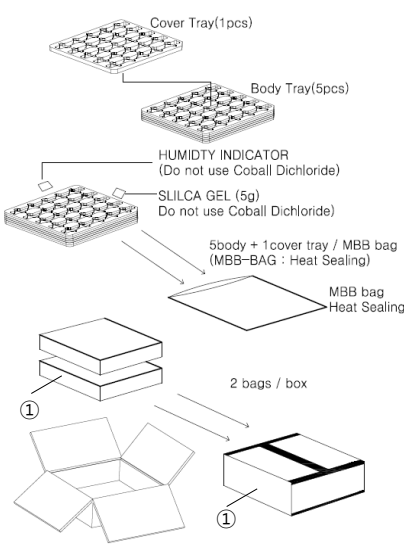
ⒶⒷⒸ : Product serial number (001 ~ 999)

## 7. Packing Structure

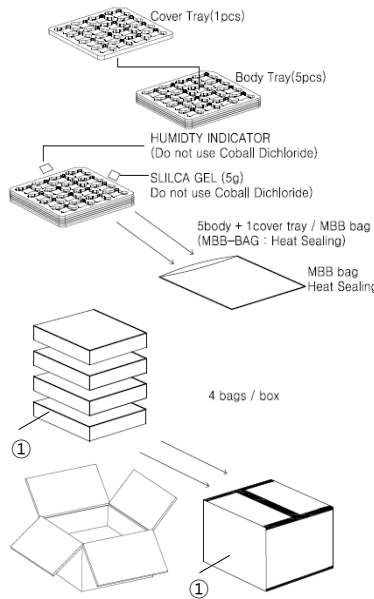
※ Model : L003D, LC006D, LC009D, LC013D

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

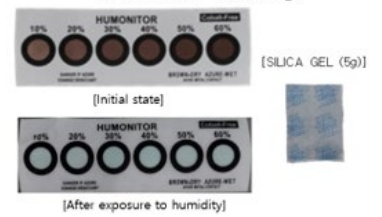
### a) Packing Structure



※ Small Box



※ Middle Box

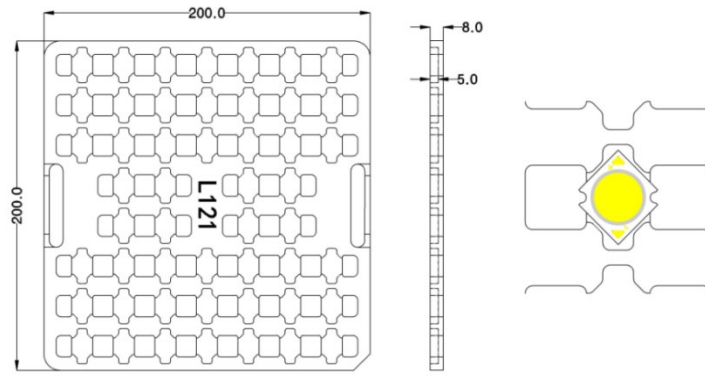


### ① Side Label

LC013D RA80 2700K  
**YZW2D4**  
 SPHWH AHDND25YZW2D4 YZW2D4 01  
 G4AZC4001/1001/ xxxx pcs  
**SAMSUNG**

(1P) Supplier Part Number : SPHWH AHDND25YZW2D4 (Q) Quantity : XXXX  
 (33P) Bin Code / YZW2D4 (100) Data Code : 2109  
 (1T) Lot Number / 1001 (4L) Country of Origin : CN

## b) Tray

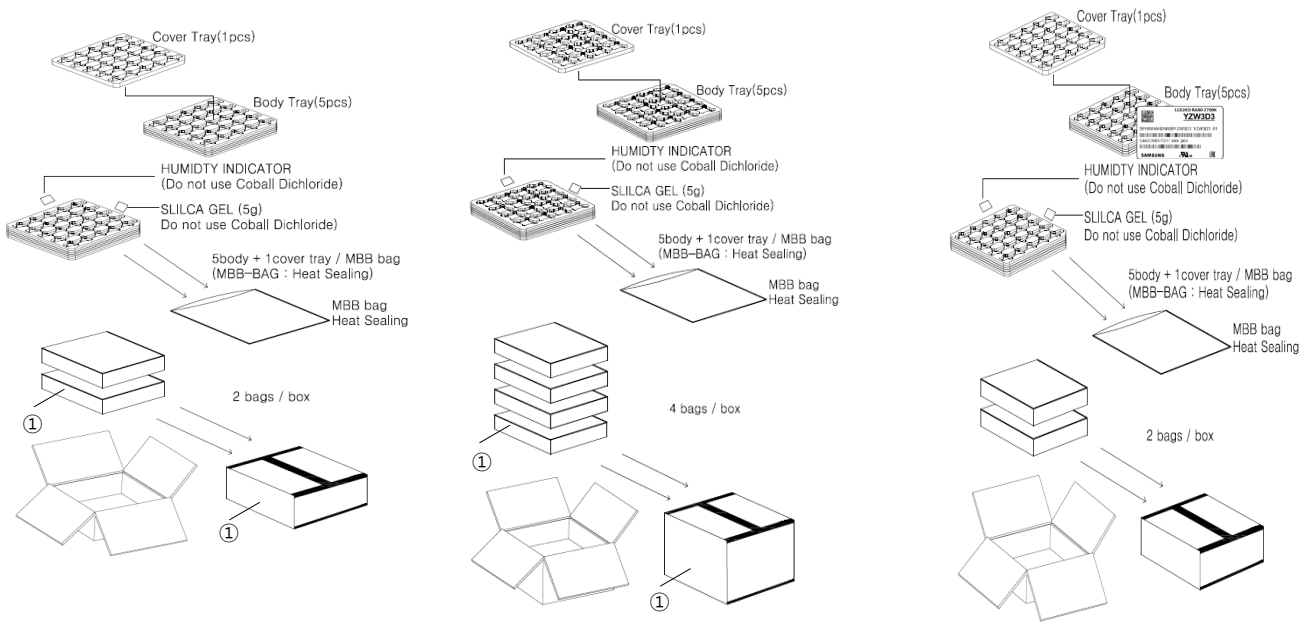




※ Model : LC016D, LC019D, LC026D, LC033D

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



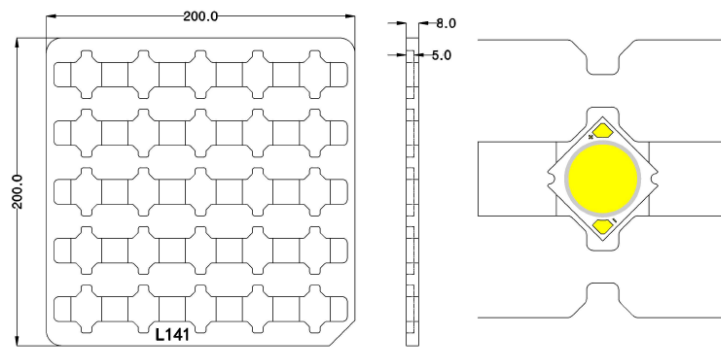
※ Small Box

※ Middle Box

① Side Label

 <p>LC026D RA80 2700K <b>YZW2D4</b></p> <p>SPHWHHDNG25YZW2D4 YZW2D4 01</p> <p>G4AZC4001/1001/ xxx pcs</p> <p><b>SAMSUNG</b></p>	<p>(1P) Supplier Part Number : SPHWHHDNG25YZW2D4</p> 	<p>(Q) Quantity : XXX</p> 
	<p>(33P) Bin Code / YZW2D4</p> 	<p>(100) Data Code : 2109</p> 
	<p>(1T) Lot Number / 1001</p> 	<p>(4L) Country of Origin : CN</p> 

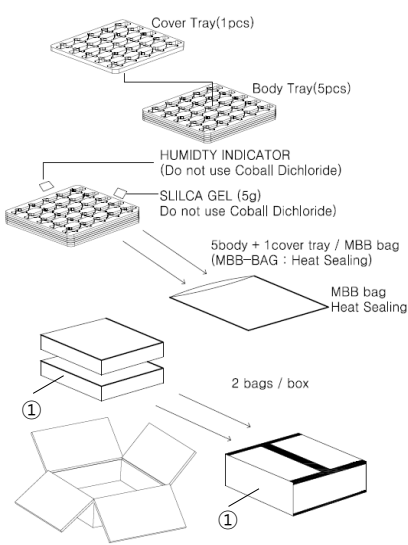
## b) Tray



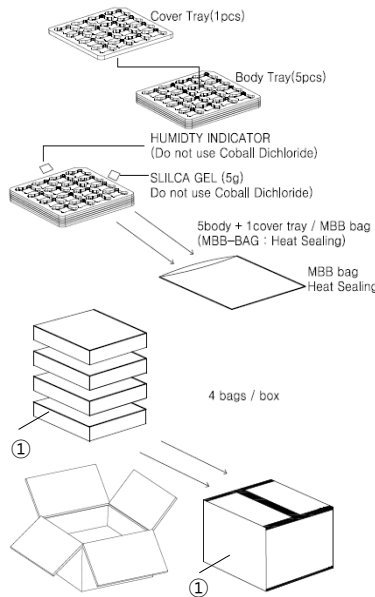
※ Model : LC040D, LC060D, LC080D

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

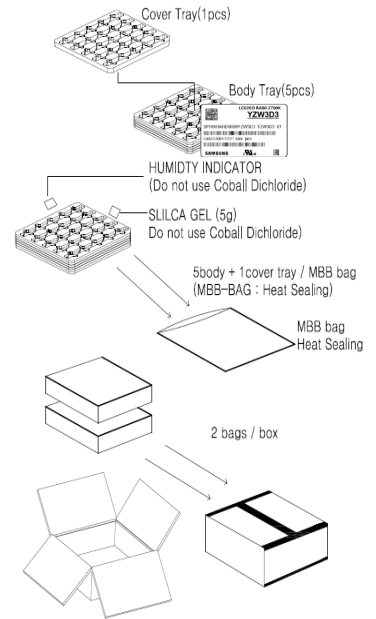
a) Packing Structure



※ Small Box



※ Middle Box

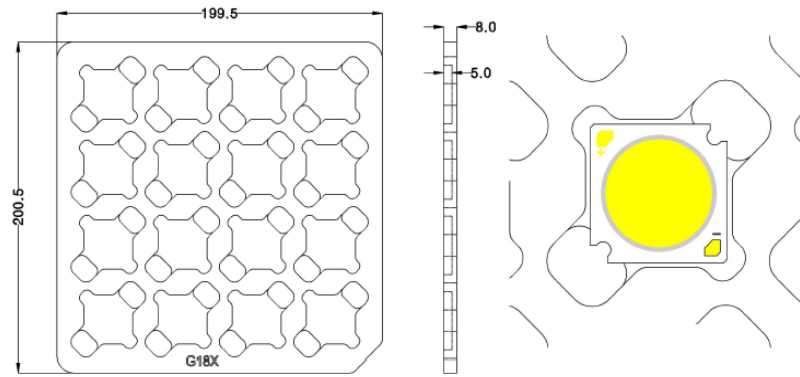


① Side Label

LC040D RA80 2700K  
**YZW2D4**  
SPHWAHDNK25YZW2D4 YZW2D4 01  
G4AZC4001/1001/ xxx pcs  
**SAMSUNG**

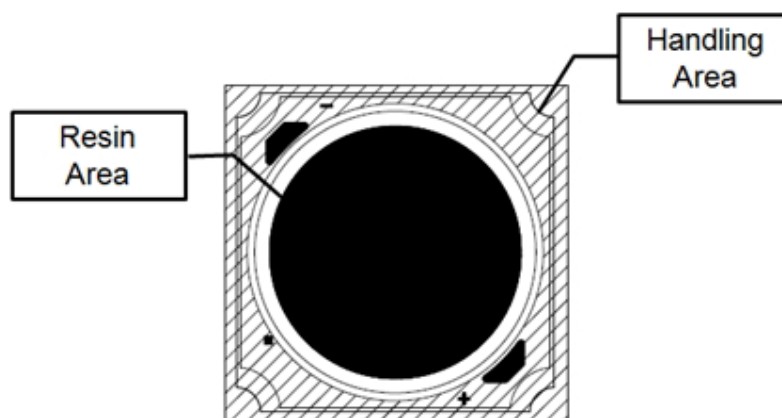
(1P) Supplier Part Number : SPHWAHDNK25YZW2D4  
 (Q) Quantity : XXX  
 (33P) Bin Code / YZW2D4  
 (1T) Lot Number / 1001  
 (100) Data Code : 2109  
 (4L) Country of Origin : CN

## 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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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](http://www.samsung.com) and our official blog at [global.samsungtomorrow.com](http://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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