

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	-		
		Thermal Resistance (Junction to chip case)	°C/W	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	-				

**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	468	498	-	
		3000	D4	490	521	-	
		3500	D4	501	534	-	
		4000	D4	511	544	-	
		5000	D4	517	549	-	
		5700	D4	517	549	-	
		6500	D4	508	540	-	
	90	2700	D4	387	412	-	
		3000	D4	416	443	-	
		3500	D4	432	459	-	
		4000	D4	445	474	-	
		5000	D4	450	479	-	
		80	2700	D4	923	981	-
			3000	D4	981	1043	-
3500	D4		988	1051	-		
4000	D4		1008	1071	-		
5000	D4		1017	1081	-		
5700	D4		1017	1081	-		
6500	D4		1007	1071	-		
LC006D	90	2700	D4	773	822	-	
		3000	D4	833	886	-	
		3500	D4	857	912	-	
		4000	D4	876	933	-	
		5000	D4	887	943	-	

#### Notes:

- 1) The COB is tested in pulsed operating condition at rated test current (10 ms pulse width) and rated temperature ( $T_J = T_C = 85 \text{ °C}$ ).
- 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	1562	1662	-
		4000	D4	1627	1731	-
		5000	D4	1605	1708	-
	80	2700	D4	1383	1471	-
		3000	D4	1444	1536	-
		3500	D4	1474	1568	-
		4000	D4	1511	1607	-
		5000	D4	1525	1623	-
		5700	D4	1525	1623	-
		6500	D4	1501	1597	-
		2700	D4	1143	1216	-
		3000	D4	1232	1310	-
	90	3500	D4	1268	1349	-
		4000	D4	1315	1399	-
		5000	D4	1329	1415	-
		2200	D4	1795	1910	-
		2700	D4	1923	2046	-
	LC013D	70	3000	D4	2047	2177
4000			D4	2125	2261	-
5000			D4	2077	2210	-
5700			D4	2106	2241	-
2700			D4	1806	1922	-
80		3000	D4	1899	2021	-
		3500	D4	1935	2059	-
		4000	D4	1973	2099	-
		5000	D4	1996	2123	-
		5700	D4	1993	2120	-
	6500	D4	1970	2095	-	
	2700	D4	1502	1598	-	
90	3000	D4	1618	1722	-	
	3500	D4	1668	1774	-	
	4000	D4	1717	1827	-	
	5000	D4	1755	1868	-	
	2700	D4	1502	1598	-	

**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.
LC016D	70	2200	D4	2384	2536	-
		2700	D4	2452	2609	-
		3000	D4	2670	2840	-
		4000	D4	2781	2959	-
		5000	D4	2744	2919	-
		5700	D4	2756	2932	-
	80	2700	D4	2364	2515	-
		3000	D4	2435	2590	-
		3500	D4	2494	2653	-
		4000	D4	2570	2734	-
		5000	D4	2608	2774	-
		5700	D4	2597	2763	-
	90	6500	D4	2566	2729	-
		2700	D4	1926	2049	-
		3000	D4	2066	2197	-
		3500	D4	2133	2270	-
		4000	D4	2236	2379	-
		5000	D4	2273	2418	-
LC019D	70	2200	D4	2856	3038	-
		2700	D4	3066	3262	-
		3000	D4	3197	3401	-
		4000	D4	3331	3543	-
		5000	D4	3287	3497	-
		5700	D4	3301	3512	-
	80	2700	D4	2832	3013	-
		3000	D4	2921	3107	-
		3500	D4	2977	3167	-
		4000	D4	3069	3265	-
		5000	D4	3123	3322	-
		5700	D4	3101	3299	-
	90	6500	D4	3072	3268	-
		2700	D4	2309	2456	-
		3000	D4	2490	2649	-
		3500	D4	2567	2730	-
		4000	D4	2671	2842	-
		5000	D4	2721	2895	-

**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	3758	3998	-
		2700	D4	3970	4223	-
		3000	D4	4219	4488	-
		4000	D4	4354	4631	-
		5000	D4	4266	4538	-
		5700	D4	4345	4622	-
	80	2700	D4	3723	3961	-
		3000	D4	3917	4167	-
		3500	D4	3965	4218	-
		4000	D4	4035	4292	-
		5000	D4	4125	4388	-
		5700	D4	4085	4346	-
	90	6500	D4	4058	4317	-
		2700	D4	3077	3273	-
		3000	D4	3305	3516	-
		3500	D4	3391	3607	-
		4000	D4	3534	3760	-
		5000	D4	3604	3834	-
LC033D	70	2200	D4	4604	4897	-
		2700	D4	4944	5260	-
		3000	D4	5155	5484	-
		4000	D4	5371	5713	-
		5000	D4	5299	5637	-
		5700	D4	5323	5663	-
	80	2700	D4	4565	4857	-
		3000	D4	4812	5120	-
		3500	D4	4892	5204	-
		4000	D4	4987	5305	-
		5000	D4	5035	5356	-
		5700	D4	5035	5356	-
	90	6500	D4	4954	5270	-
		2700	D4	3821	4065	-
		3000	D4	4122	4385	-
		3500	D4	4244	4515	-
		4000	D4	4340	4617	-
		5000	D4	4388	4668	-

**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.
LC040D	70	2200	D4	5693	6057	-
		2700	D4	5920	6298	-
		3000	D4	6260	6659	-
		4000	D4	6642	7066	-
		5000	D4	6519	6935	-
		5700	D4	6583	7004	-
	80	2700	D4	5646	6007	-
		3000	D4	5841	6214	-
		3500	D4	6049	6435	-
		4000	D4	6168	6562	-
		5000	D4	6177	6571	-
		5700	D4	6227	6625	-
	90	6500	D4	6126	6517	-
		2700	D4	4674	4972	-
		3000	D4	4951	5267	-
		3500	D4	5159	5488	-
		4000	D4	5332	5672	-
		5000	D4	5436	5782	-
LC060D	70	5700	D4	5318	5658	-
		2200	D4	8430	8969	-
		2700	D4	8794	9355	-
		3000	D4	9440	10042	-
		4000	D4	9835	10463	-
		5000	D4	9557	10167	-
	80	5700	D4	9747	10369	-
		2700	D4	8360	8893	-
		3000	D4	8810	9373	-
		3500	D4	8938	9509	-
		4000	D4	9133	9716	-
		5000	D4	9220	9809	-
	90	5700	D4	9220	9809	-
		6500	D4	9071	9650	-
		2700	D4	6912	7354	-
		3000	D4	7390	7861	-
		3500	D4	7649	8137	-
		4000	D4	7947	8454	-
		5000	D4	8034	8547	-
		5700	D4	7874	8377	-

**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	12140	12915	-	
		2700	D4	13232	14076	-	
		3000	D4	13797	14677	-	
		4000	D4	14374	15291	-	
		5000	D4	14477	15401	-	
		5700	D4	14245	15155	-	
	80	2700	D4	12218	12998	-	
		3000	D4	12904	13727	-	
		3500	D4	13090	13926	-	
		4000	D4	13348	14199	-	
		5000	D4	13476	14336	-	
		5700	D4	13476	14336	-	
	90	6500	D4	13257	14104	-	
		2700	D4	10173	10823	-	
		3000	D4	10956	11656	-	
		3500	D4	11280	12000	-	
		4000	D4	11614	12356	-	
		5000	D4	11743	12493	-	
			5700	D4	11508	12243	-

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

## a) Binning Structure

※  $\text{LCoo}_3\text{D}(\text{I}_F = 90 \text{ mA}, \text{T}_J = 85 \text{ }^\circ\text{C})$ 

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		YZ		D4	865 ~
	SPHWAHDNB27YZR3D4		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	SPHWHAHDC23YZV2D4	YZ	V2	D4	1524 ~
		SPHWHAHDC23YZV3D4		V3		
	4000	SPHWHAHDC23YZT2D4	YZ	T2	D4	1587 ~
		SPHWHAHDC23YZT3D4		T3		
	5000	SPHWHAHDC23YZR2D4	YZ	R2	D4	1566 ~
		SPHWHAHDC23YZR3D4		R3		
80	2700	SPHWHAHDC25YZW1D4	YZ	W1	D4	1349 ~
		SPHWHAHDC25YZW2D4		W2		
	3000	SPHWHAHDC25YZV1D4	YZ	V1	D4	1409 ~
		SPHWHAHDC25YZV2D4		V2		
	3500	SPHWHAHDC25YZU1D4	YZ	U1	D4	1438 ~
		SPHWHAHDC25YZU2D4		U2		
	4000	SPHWHAHDC25YZT1D4	YZ	T1	D4	1474 ~
		SPHWHAHDC25YZT2D4		T2		
	5000	SPHWHAHDC25YZR2D4	YZ	R2	D4	1488 ~
		SPHWHAHDC25YZR3D4		R3		
	5700	SPHWHAHDC25YZQ2D4	YZ	Q2	D4	1488 ~
		SPHWHAHDC25YZQ3D4		Q3		

		SPHWHAHDC25YZP2D4	P2		
6500		SPHWHAHDC25YZP3D4	P3		
		SPHWHAHDC27YZW1D4	W1		
2700		SPHWHAHDC27YZW2D4	W2		
90		SPHWHAHDC27YZV1D4	V1		
3000		SPHWHAHDC27YZV2D4	V2		
		SPHWHAHDC27YZU1D4	U1		
3500		SPHWHAHDC27YZU2D4	U2		
		SPHWHAHDC27YZT1D4	T1		
90	4000	SPHWHAHDC27YZT2D4	T2		
		SPHWHAHDC27YZR2D4	R2		
5000		SPHWHAHDC27YZR3D4	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	SPHWWAHDND23YZY2D4	YZ	Y2	D4	1777 ~
		SPHWWAHDND23YZY3D4		Y3		
	2700	SPHWWAHDND23YZW2D4	YZ	V2	D4	1876 ~
		SPHWWAHDND23YZW3D4		V3		
	3000	SPHWWAHDND23YZV2D4	YZ	V2	D4	1997 ~
		SPHWWAHDND23YZV3D4		V3		
	4000	SPHWWAHDND23YZT2D4	YZ	T2	D4	2073 ~
		SPHWWAHDND23YZT3D4		T3		
	5000	SPHWWAHDND23YZR2D4	YZ	R2	D4	2026 ~
		SPHWWAHDND23YZR3D4		R3		
	5700	SPHWWAHDND23YZQ2D4	YZ	Q2	D4	2055 ~
		SPHWWAHDND23YZQ3D4		Q3		
80	2700	SPHWWAHDND25YZW1D4	YZ	W1	D4	1762 ~
		SPHWWAHDND25YZW2D4		W2		
	3000	SPHWWAHDND25YZV1D4	YZ	V1	D4	1853 ~
		SPHWWAHDND25YZV2D4		V2		
	3500	SPHWWAHDND25YZU1D4	YZ	U1	D4	1888 ~
		SPHWWAHDND25YZU2D4		U2		
	4000	SPHWWAHDND25YZT1D4	YZ	T1	D4	1925 ~
		SPHWWAHDND25YZT2D4		T2		
	5000	SPHWWAHDND25YZR2D4	YZ	R2	D4	1947 ~
		SPHWWAHDND25YZR3D4		R3		
	5700	SPHWWAHDND25YZQ2D4	YZ	Q2	D4	1944 ~
		SPHWWAHDND25YZQ3D4		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	2384 ~
		SPHWWAHDNE23YZY3D4		Y3		
	2700	SPHWWAHDNE23YZW2D4	YZ	Y2	D4	2452 ~
		SPHWWAHDNE23YZW3D4		Y3		
	3000	SPHWWAHDNE23YZV2D4	YZ	V2	D4	2670 ~
		SPHWWAHDNE23YZV3D4		V3		
	4000	SPHWWAHDNE23YZT2D4	YZ	T2	D4	2781 ~
		SPHWWAHDNE23YZT3D4		T3		
	5000	SPHWWAHDNE23YZR2D4	YZ	R2	D4	2744 ~
		SPHWWAHDNE23YZR3D4		R3		
	5700	SPHWWAHDNE23YZQ2D4	YZ	Q2	D4	2756 ~
		SPHWWAHDNE23YZQ3D4		Q3		
80	2700	SPHWWAHDNE25YZW1D4	YZ	W1	D4	2364 ~
		SPHWWAHDNE25YZW2D4		W2		
	3000	SPHWWAHDNE25YZV1D4	YZ	V1	D4	2435 ~
		SPHWWAHDNE25YZV2D4		V2		
	3500	SPHWWAHDNE25YZU1D4	YZ	U1	D4	2494 ~
		SPHWWAHDNE25YZU2D4		U2		
	4000	SPHWWAHDNE25YZT1D4	YZ	T1	D4	2570 ~
		SPHWWAHDNE25YZT2D4		T2		
	5000	SPHWWAHDNE25YZR2D4	YZ	R2	D4	2608 ~
		SPHWWAHDNE25YZR3D4		R3		
	5700	SPHWWAHDNE25YZQ2D4	YZ	Q2	D4	2597 ~
		SPHWWAHDNE25YZQ3D4		Q3		

90	6500	SPHWHAHADNE25YZP2D4	YZ	P2	D4	2566 ~
		SPHWHAHADNE25YZP3D4		P3		
	2700	SPHWHAHADNE27YZW1D4	YZ	W1	D4	1926 ~
		SPHWHAHADNE27YZW2D4		W2		
	3000	SPHWHAHADNE27YZV1D4	YZ	V1	D4	2066 ~
		SPHWHAHADNE27YZV2D4		V2		
	3500	SPHWHAHADNE27YZU1D4	YZ	U1	D4	2133 ~
		SPHWHAHADNE27YZU2D4		U2		
	4000	SPHWHAHADNE27YZT1D4	YZ	T1	D4	2236 ~
		SPHWHAHADNE27YZT2D4		T2		
	5000	SPHWHAHADNE27YZR2D4	YZ	R2	D4	2273 ~
		SPHWHAHADNE27YZR3D4		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	SPHWWAHDNF23YZY2D4	YZ	Y2	D4	2856 ~	
		SPHWWAHDNF23YZY3D4		Y3			
	2700	SPHWWAHDNF23YZW2D4	YZ	W2	D4	3066 ~	
		SPHWWAHDNF23YZW3D4		W3			
	3000	SPHWWAHDNF23YZV2D4	YZ	V2	D4	3197 ~	
		SPHWWAHDNF23YZV3D4		V3			
	4000	SPHWWAHDNF23YZT2D4	YZ	T2	D4	3331 ~	
		SPHWWAHDNF23YZT3D4		T3			
	5000	SPHWWAHDNF23YZR2D4	YZ	R2	D4	3287 ~	
		SPHWWAHDNF23YZR3D4		R3			
	5700	SPHWWAHDNF23YZQ2D4	YZ	Q2	D4	3301 ~	
		SPHWWAHDNF23YZQ3D4		Q3			
	80	2700	SPHWWAHDNF25YZW1D4	YZ	W1	D4	2832 ~
			SPHWWAHDNF25YZW2D4		W2		
3000		SPHWWAHDNF25YZV1D4	YZ	V1	D4	2921 ~	
		SPHWWAHDNF25YZV2D4		V2			
3500		SPHWWAHDNF25YZU1D4	YZ	U1	D4	2977 ~	
		SPHWWAHDNF25YZU2D4		U2			
4000		SPHWWAHDNF25YZT1D4	YZ	T1	D4	3069 ~	
		SPHWWAHDNF25YZT2D4		T2			
5000		SPHWWAHDNF25YZR2D4	YZ	R2	D4	3123 ~	
		SPHWWAHDNF25YZR3D4		R3			
5700		SPHWWAHDNF25YZQ2D4	YZ	Q2	D4	3101 ~	
		SPHWWAHDNF25YZQ3D4		Q3			
6500		SPHWWAHDNF25YZP2D4	YZ	P2	D4	3072 ~	
		SPHWWAHDNF25YZP3D4		P3			

90	2700	SPHWWAHDNF27YZW1D4	YZ	W1	D4	2309 ~
		SPHWWAHDNF27YZW2D4		W2		
	3000	SPHWWAHDNF27YZV1D4	YZ	V1	D4	2490 ~
		SPHWWAHDNF27YZV2D4		V2		
	3500	SPHWWAHDNF27YZU1D4	YZ	U1	D4	2567 ~
		SPHWWAHDNF27YZU2D4		U2		
	4000	SPHWWAHDNF27YZT1D4	YZ	T1	D4	2671 ~
		SPHWWAHDNF27YZT2D4		T2		
	5000	SPHWWAHDNF27YZR2D4	YZ	R2	D4	2721 ~
		SPHWWAHDNF27YZR3D4		R3		

※ 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	SPHWHHDNG23YZY2D4	YZ	Y2	D4	3758 ~
		SPHWHHDNG23YZY3D4		Y3		
	2700	SPHWHHDNG23YZW2D4	YZ	W2	D4	3970 ~
		SPHWHHDNG23YZW3D4		W3		
	3000	SPHWHHDNG23YZV2D4	YZ	V2	D4	4219 ~
		SPHWHHDNG23YZV3D4		V3		
	4000	SPHWHHDNG23YZT2D4	YZ	T2	D4	4354 ~
		SPHWHHDNG23YZT3D4		T3		
	5000	SPHWHHDNG23YZR2D4	YZ	R2	D4	4266 ~
		SPHWHHDNG23YZR3D4		R3		
	5700	SPHWHHDNG23YZQ2D4	YZ	Q2	D4	4345 ~
		SPHWHHDNG23YZQ3D4		Q3		
80	2700	SPHWHHDNG25YZW1D4	YZ	W1	D4	3723 ~
		SPHWHHDNG25YZW2D4		W2		
	3000	SPHWHHDNG25YZV1D4	YZ	V1	D4	3917 ~
		SPHWHHDNG25YZV2D4		V2		
	3500	SPHWHHDNG25YZU1D4	YZ	U1	D4	3965 ~
		SPHWHHDNG25YZU2D4		U2		
	4000	SPHWHHDNG25YZT1D4	YZ	T1	D4	4035 ~
		SPHWHHDNG25YZT2D4		T2		
	5000	SPHWHHDNG25YZR2D4	YZ	R2	D4	4125 ~
		SPHWHHDNG25YZR3D4		R3		
	5700	SPHWHHDNG25YZQ2D4	YZ	Q2	D4	4085 ~
		SPHWHHDNG25YZQ3D4		Q3		
	6500	SPHWHHDNG25YZP2D4	YZ	P2	D4	4058 ~
		SPHWHHDNG25YZP3D4		P3		

90	2700	SPHWHAHDNG27YZW1D4	YZ	W1	D4	3077 ~
		SPHWHAHDNG27YZW2D4		W2		
	3000	SPHWHAHDNG27YZV1D4	YZ	V1	D4	3305 ~
		SPHWHAHDNG27YZV2D4		V2		
	3500	SPHWHAHDNG27YZU1D4	YZ	U1	D4	3391 ~
		SPHWHAHDNG27YZU2D4		U2		
	4000	SPHWHAHDNG27YZT1D4	YZ	T1	D4	3534 ~
		SPHWHAHDNG27YZT2D4		T2		
	5000	SPHWHAHDNG27YZR2D4	YZ	R2	D4	3604 ~
		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	4604 ~
		SPHWAHDNH23YZY3D4		Y3		
	2700	SPHWAHDNH23YZW2D4	YZ	W2	D4	4944 ~
		SPHWAHDNH23YZW3D4		W3		
	3000	SPHWAHDNH23YZV2D4	YZ	V2	D4	5155 ~
		SPHWAHDNH23YZV3D4		V3		
	4000	SPHWAHDNH23YZT2D4	YZ	T2	D4	5371 ~
		SPHWAHDNH23YZT3D4		T3		
	5000	SPHWAHDNH23YZR2D4	YZ	R2	D4	5299 ~
		SPHWAHDNH23YZR3D4		R3		
	5700	SPHWAHDNH23YZQ2D4	YZ	Q2	D4	5323 ~
		SPHWAHDNH23YZQ3D4		Q3		
80	2700	SPHWAHDNH25YZW1D4	YZ	W1	D4	4565 ~
		SPHWAHDNH25YZW2D4		W2		
	3000	SPHWAHDNH25YZV1D4	YZ	V1	D4	4812 ~
		SPHWAHDNH25YZV2D4		V2		
	3500	SPHWAHDNH25YZU1D4	YZ	U1	D4	4892 ~
		SPHWAHDNH25YZU2D4		U2		
	4000	SPHWAHDNH25YZT1D4	YZ	T1	D4	4987 ~
		SPHWAHDNH25YZT2D4		T2		
	5000	SPHWAHDNH25YZR2D4	YZ	R2	D4	5035 ~
		SPHWAHDNH25YZR3D4		R3		
	5700	SPHWAHDNH25YZQ2D4	YZ	Q2	D4	5035 ~
		SPHWAHDNH25YZQ3D4		Q3		
	6500	SPHWAHDNH25YZP2D4	YZ	P2	D4	4954 ~
		SPHWAHDNH25YZP3D4		P3		

90	2700	SPHWHAHDNH27YZW1D4	YZ	W1	D4	3821 ~
		SPHWHAHDNH27YZW2D4		W2		
	3000	SPHWHAHDNH27YZV1D4	YZ	V1	D4	4122 ~
		SPHWHAHDNH27YZV2D4		V2		
	3500	SPHWHAHDNH27YZU1D4	YZ	U1	D4	4244 ~
		SPHWHAHDNH27YZU2D4		U2		
	4000	SPHWHAHDNH27YZT1D4	YZ	T1	D4	4340 ~
		SPHWHAHDNH27YZT2D4		T2		
	5000	SPHWHAHDNH27YZR2D4	YZ	R2	D4	4388 ~
		SPHWHAHDNH27YZR3D4		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	5693 ~	
		SPHWAHDNK23YZY3D4		Y3			
	2700	SPHWAHDNK23YZW2D4	YZ	W2	D4	5920 ~	
		SPHWAHDNK23YZW3D4		W3			
	3000	SPHWAHDNK23YZV2D4	YZ	V2	D4	6260 ~	
		SPHWAHDNK23YZV3D4		V3			
	4000	SPHWAHDNK23YZT2D4	YZ	T2	D4	6642 ~	
		SPHWAHDNK23YZT3D4		T3			
	5000	SPHWAHDNK23YZR2D4	YZ	R2	D4	6519 ~	
		SPHWAHDNK23YZR3D4		R3			
	5700	SPHWAHDNK23YZQ2D4	YZ	Q2	D4	6583 ~	
		SPHWAHDNK23YZQ3D4		Q3			
	80	2700	SPHWAHDNK25YZW1D4	YZ	W1	D4	5646 ~
			SPHWAHDNK25YZW2D4		W2		
		3000	SPHWAHDNK25YZV1D4	YZ	V1	D4	5841 ~
			SPHWAHDNK25YZV2D4		V2		
3500		SPHWAHDNK25YZU1D4	YZ	U1	D4	6049 ~	
		SPHWAHDNK25YZU2D4		U2			
4000		SPHWAHDNK25YZT1D4	YZ	T1	D4	6168 ~	
		SPHWAHDNK25YZT2D4		T2			
5000		SPHWAHDNK25YZR2D4	YZ	R2	D4	6177 ~	
		SPHWAHDNK25YZR3D4		R3			
5700		SPHWAHDNK25YZQ2D4	YZ	Q2	D4	6227 ~	
		SPHWAHDNK25YZQ3D4		Q3			
6500		SPHWAHDNK25YZP2D4	YZ	P2	D4	6126 ~	
		SPHWAHDNK25YZP3D4		P3			

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2700	SPHWHAHDNK27YZW1D4	YZ	W1	D4	4674 ~
	SPHWHAHDNK27YZW2D4		W2		
3000	SPHWHAHDNK27YZV1D4	YZ	V1	D4	4951 ~
	SPHWHAHDNK27YZV2D4		V2		
3500	SPHWHAHDNK27YZU1D4	YZ	U1	D4	5159 ~
	SPHWHAHDNK27YZU2D4		U2		
4000	SPHWHAHDNK27YZT1D4	YZ	T1	D4	5332 ~
	SPHWHAHDNK27YZT2D4		T2		
5000	SPHWHAHDNK27YZR2D4	YZ	R2	D4	5436 ~
	SPHWHAHDNK27YZR3D4		R3		
5700	SPHWHAHDNK27YZQ2D4	YZ	Q2	D4	5318 ~
	SPHWHAHDNK27YZQ3D4		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	8430 ~	
		SPHWWAHDNL231ZY3D4		Y3			
	2700	SPHWWAHDNL231ZW2D4	1Z	W2	D4	8794 ~	
		SPHWWAHDNL231ZW3D4		W3			
	3000	SPHWWAHDNL231ZV2D4	1Z	V2	D4	9440 ~	
		SPHWWAHDNL231ZV3D4		V3			
	4000	SPHWWAHDNL231ZT2D4	1Z	T2	D4	9835 ~	
		SPHWWAHDNL231ZT3D4		T3			
	5000	SPHWWAHDNL231ZR2D4	1Z	R2	D4	9557 ~	
		SPHWWAHDNL231ZR3D4		R3			
	5700	SPHWWAHDNL231ZQ2D4	1Z	Q2	D4	9747 ~	
		SPHWWAHDNL231ZQ3D4		Q3			
	80	2700	SPHWWAHDNL251ZW1D4	1Z	W1	D4	8360 ~
			SPHWWAHDNL251ZW2D4		W2		
3000		SPHWWAHDNL251ZV1D4	1Z	V1	D4	8810 ~	
		SPHWWAHDNL251ZV2D4		V2			
3500		SPHWWAHDNL251ZU1D4	1Z	U1	D4	8938 ~	
		SPHWWAHDNL251ZU2D4		U2			
4000		SPHWWAHDNL251ZT1D4	1Z	T1	D4	9133 ~	
		SPHWWAHDNL251ZT2D4		T2			
5000		SPHWWAHDNL251ZR2D4	1Z	R2	D4	9220 ~	
		SPHWWAHDNL251ZR3D4		R3			
5700		SPHWWAHDNL251ZQ2D4	1Z	Q2	D4	9220 ~	
		SPHWWAHDNL251ZQ3D4		Q3			
6500		SPHWWAHDNL251ZP2D4	1Z	P2	D4	9071 ~	
		SPHWWAHDNL251ZP3D4		P3			

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2700	SPHWHAHADNL271ZW1D4	1Z	W1	D4	6912 ~
	SPHWHAHADNL271ZW2D4		W2		
3000	SPHWHAHADNL271ZV1D4	1Z	V1	D4	7390 ~
	SPHWHAHADNL271ZV2D4		V2		
3500	SPHWHAHADNL271ZU1D4	1Z	U1	D4	7649 ~
	SPHWHAHADNL271ZU2D4		U2		
4000	SPHWHAHADNL271ZT1D4	1Z	T1	D4	7947 ~
	SPHWHAHADNL271ZT2D4		U2		
5000	SPHWHAHADNL271ZR2D4	1Z	R2	D4	8034 ~
	SPHWHAHADNL271ZR3D4		R3		
5700	SPHWHAHADNL271ZQ2D4	1Z	Q2	D4	7874 ~
	SPHWHAHADNL271ZQ3D4		Q3		

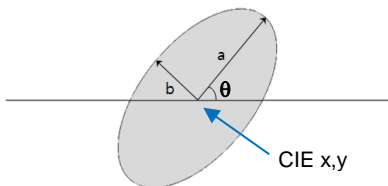
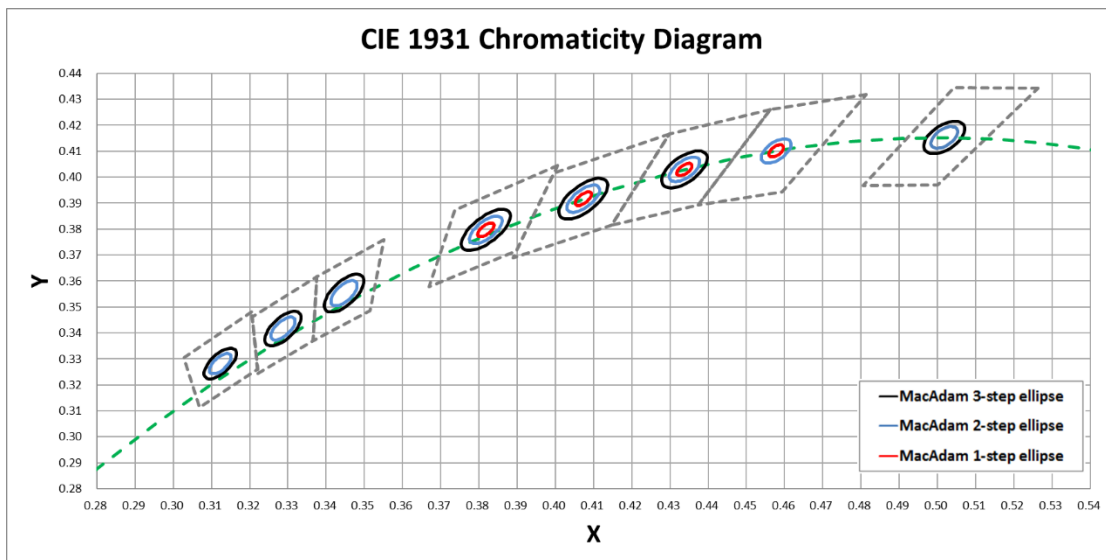
※ LCo8oD(I<sub>F</sub> = 1620 mA, T<sub>J</sub> = 85 °C)

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 (Q2, Q3)					
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

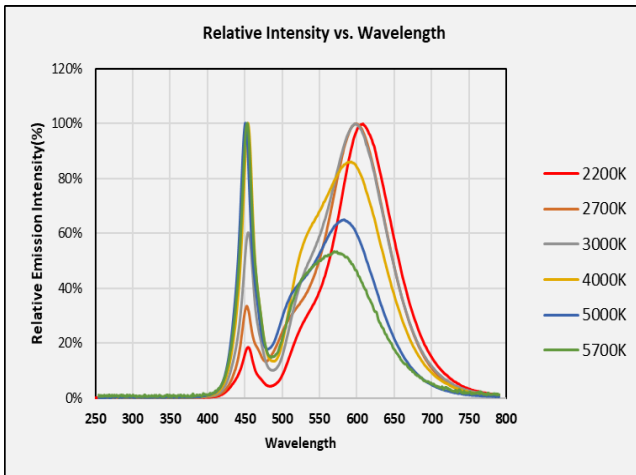
**Note:**

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

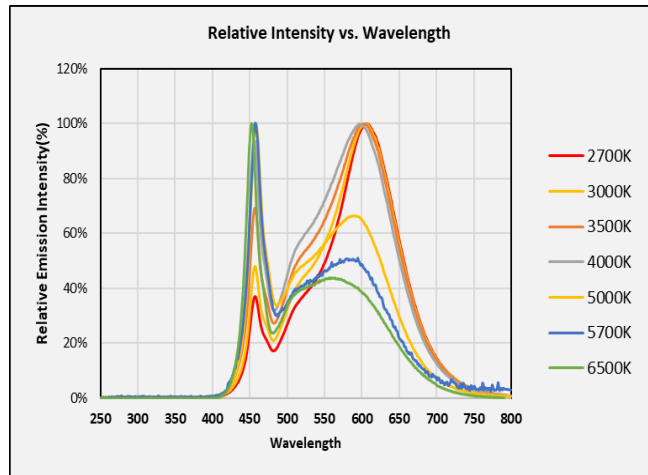
### 3. Typical Characteristics Graphs

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

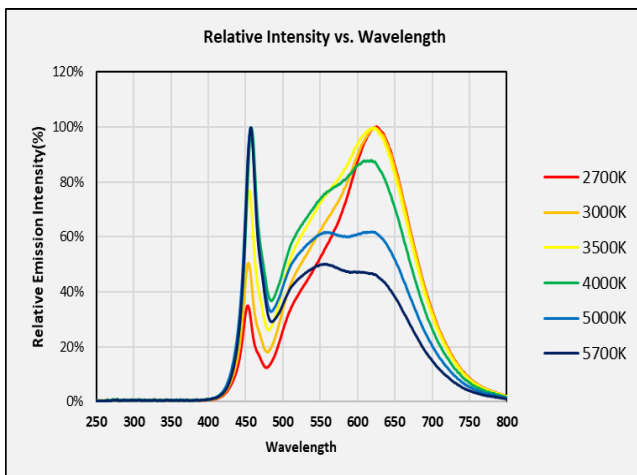
##### CRI Ra 70+



##### CRI Ra 80+

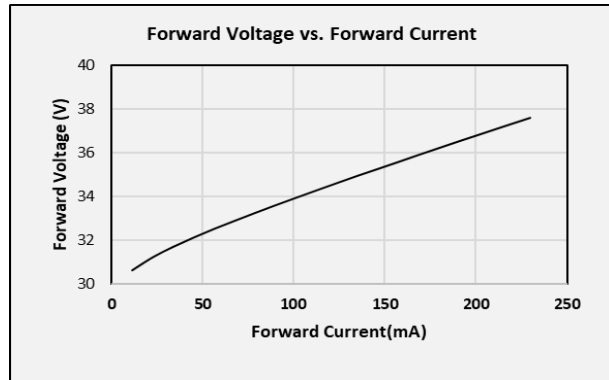
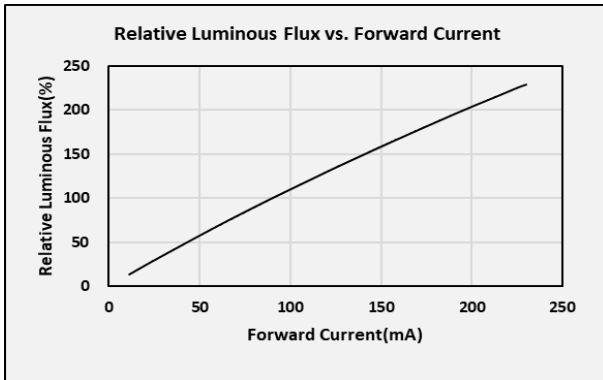


##### CRI Ra 90+

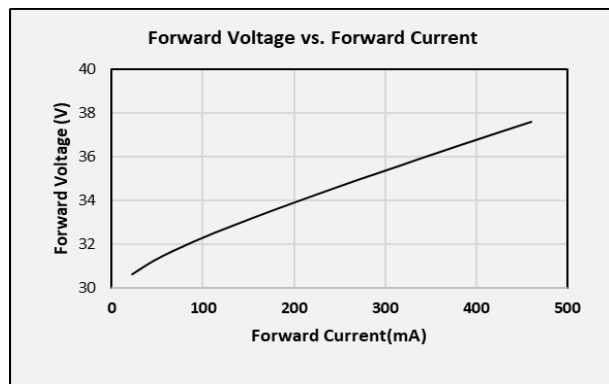
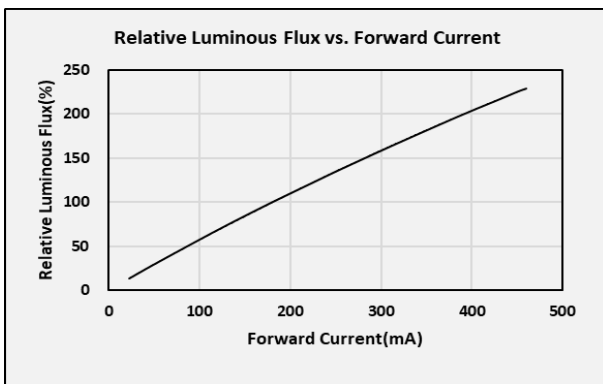


## b) Forward Current Characteristics ( $T_J = 85^\circ\text{C}$ )

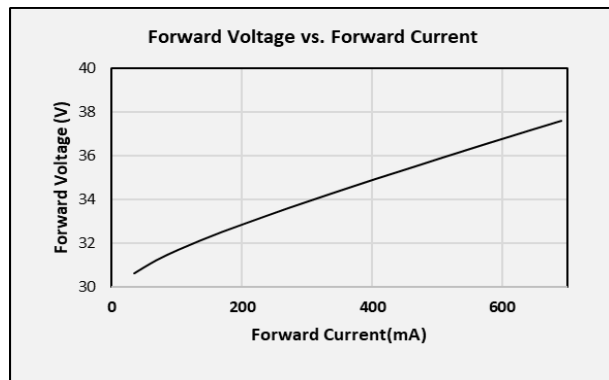
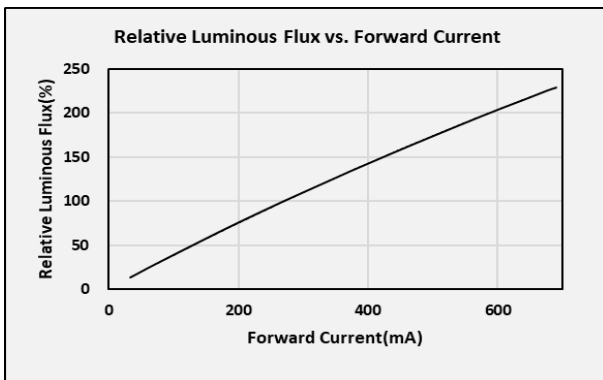
### 1) LC003D



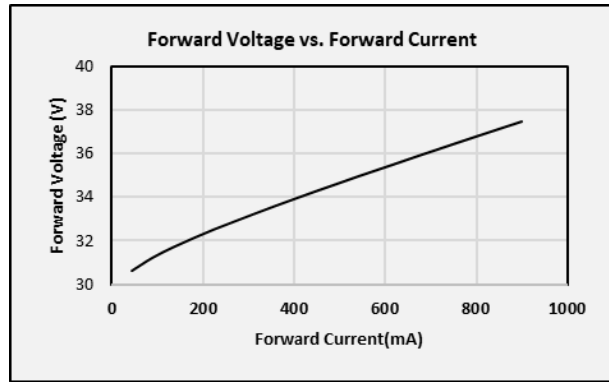
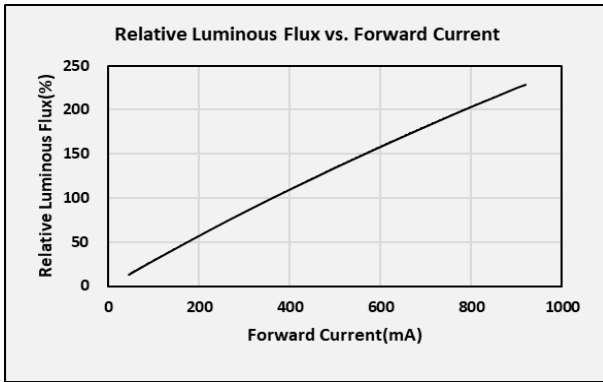
### 2) LC006D



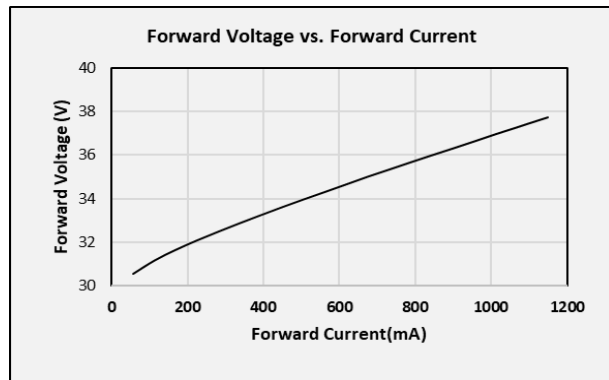
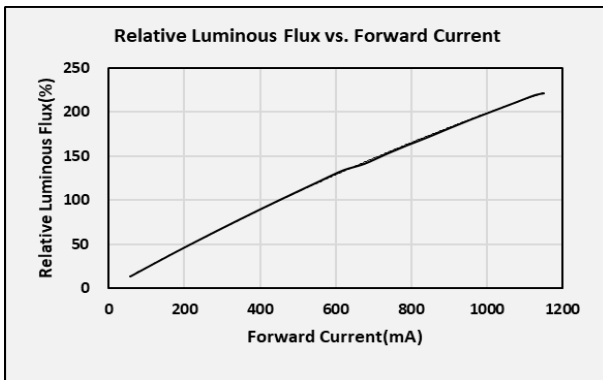
### 3) LC009D



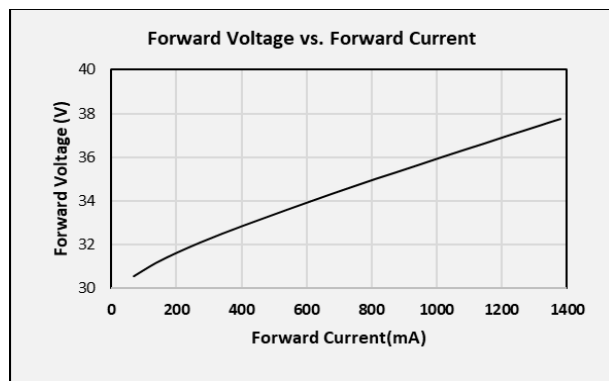
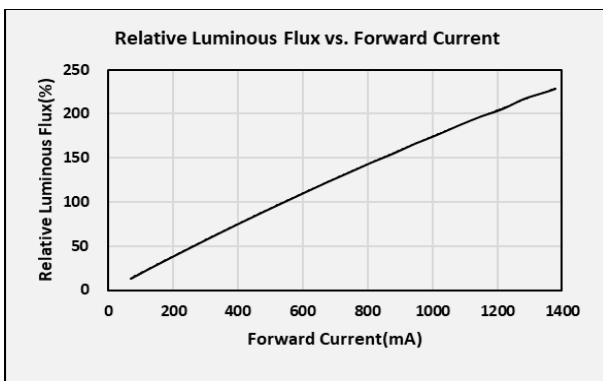
## 4) LC013D



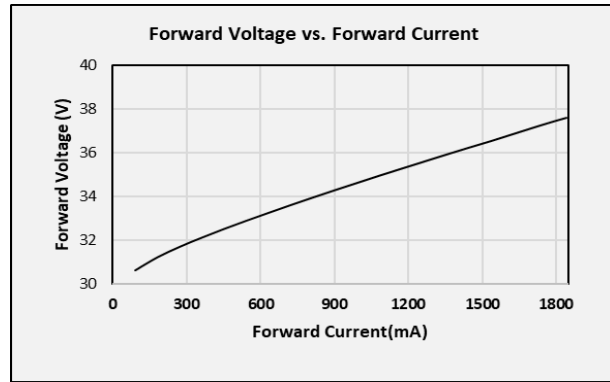
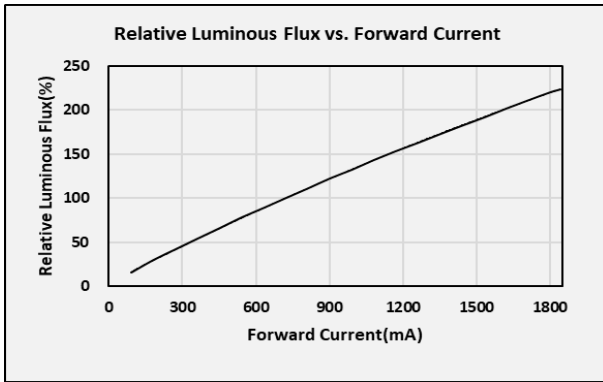
## 5) LC016D



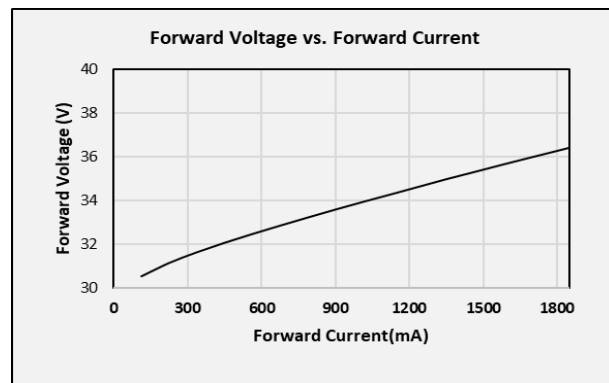
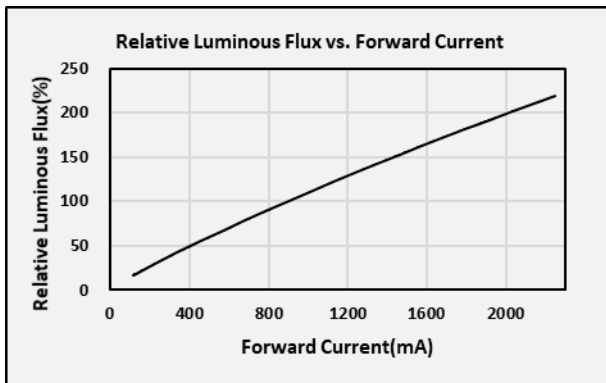
## 6) LC019D



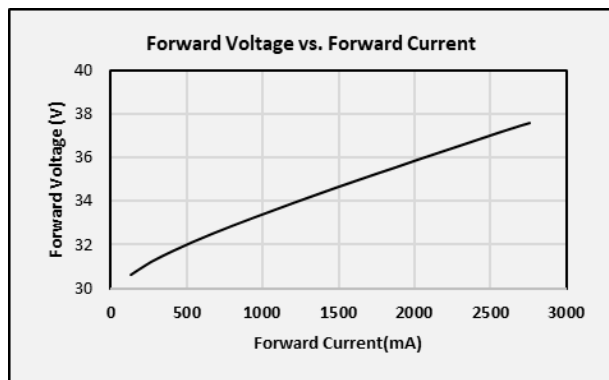
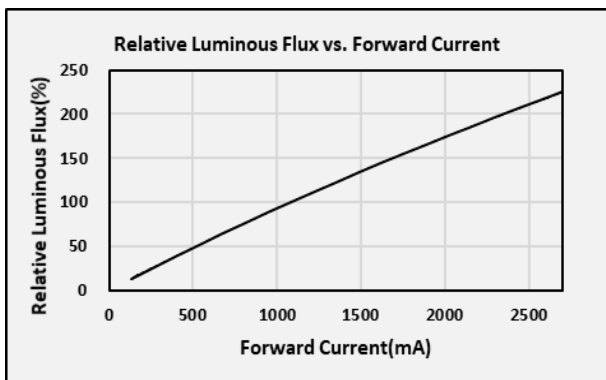
## 7) LC026D



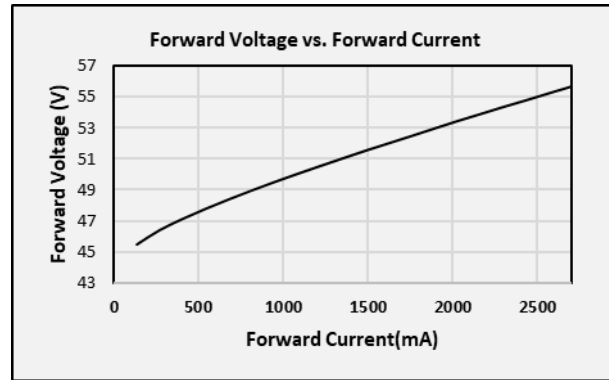
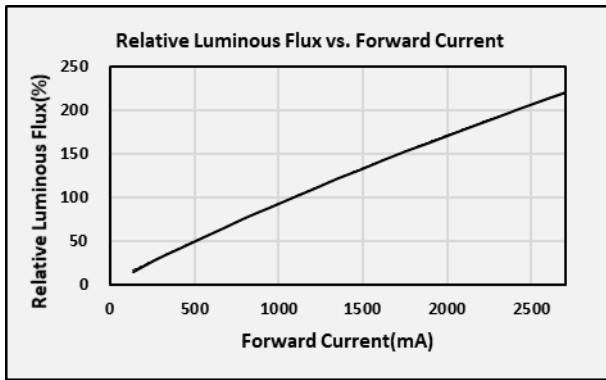
## 8) LC033D



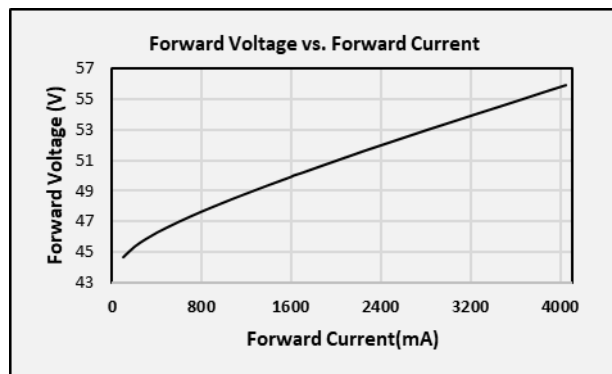
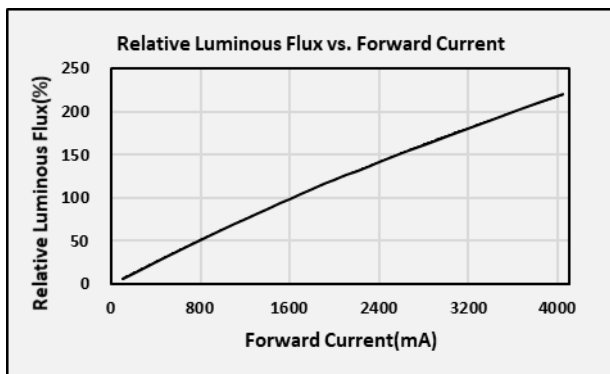
## 9) LC040D



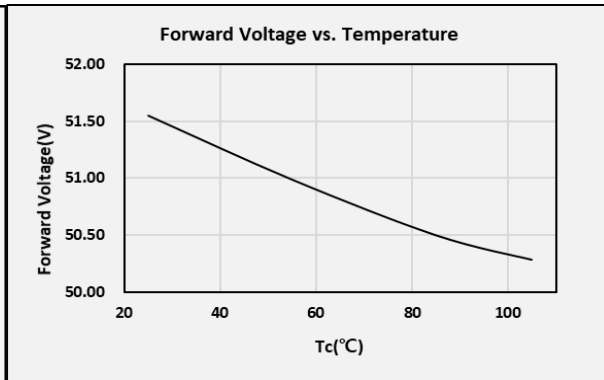
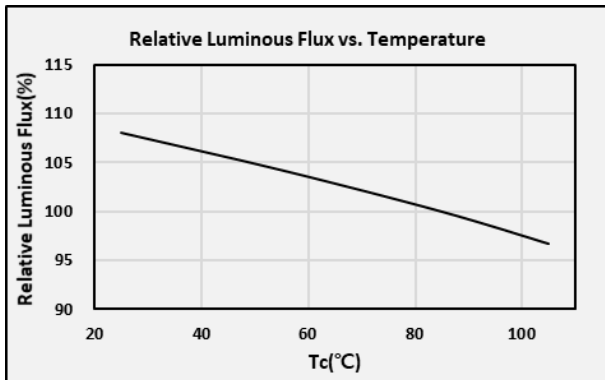
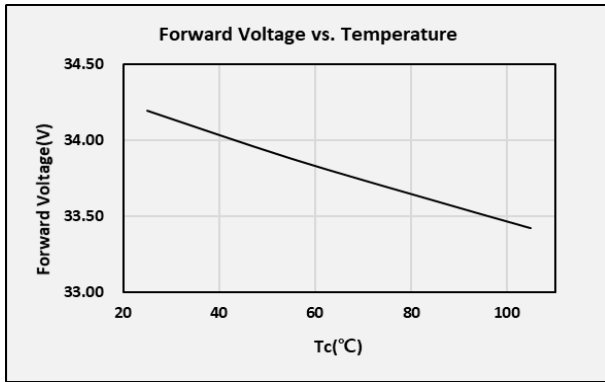
## 10) LC060D



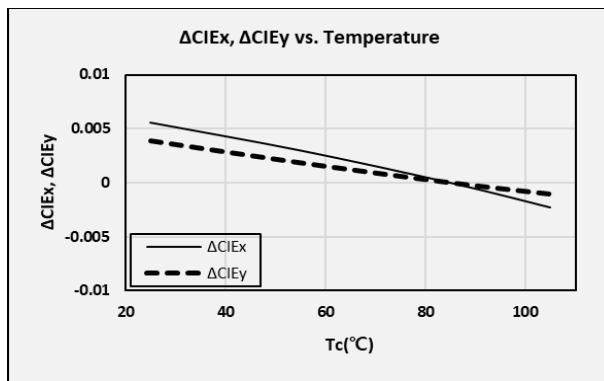
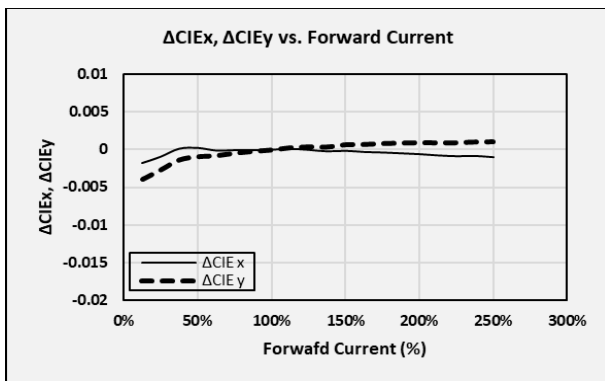
## 11) LC080D



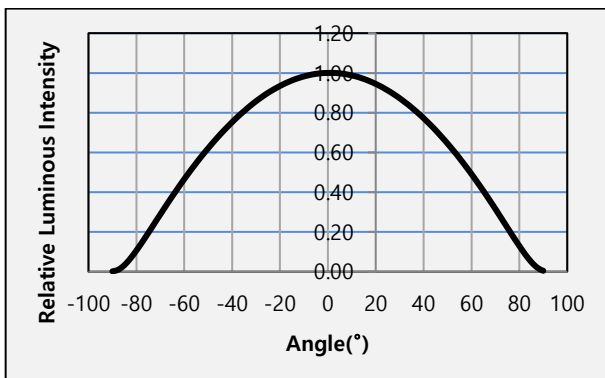
c) Temperature Characteristics ( $I_F$  = Sorting Current)



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

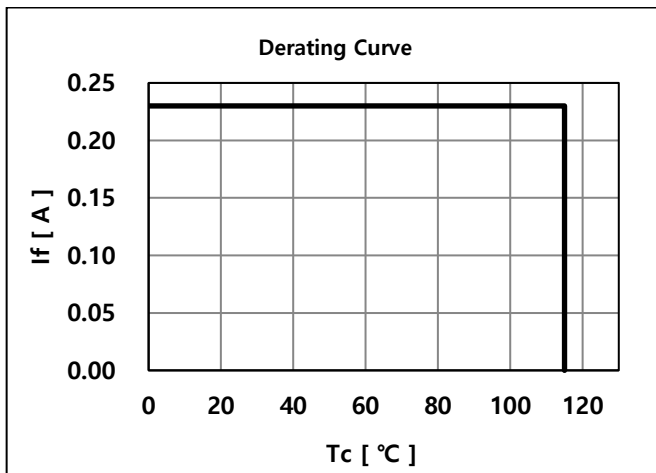


e) Beam Angle Characteristics ( $I_F$  = Sorting Current,  $T_J = 85$  °C)

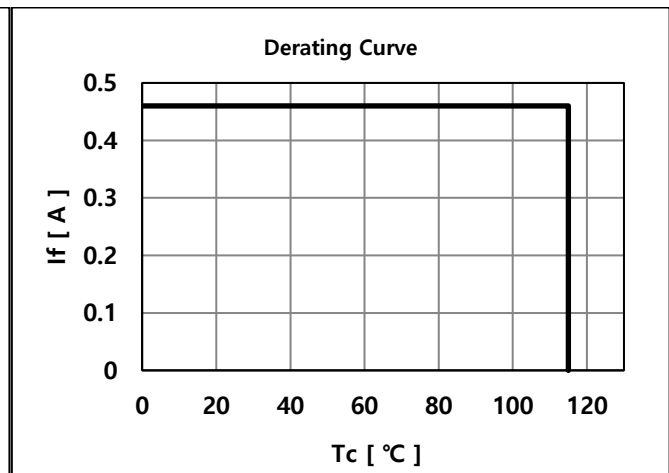


## f) Derating Characteristics

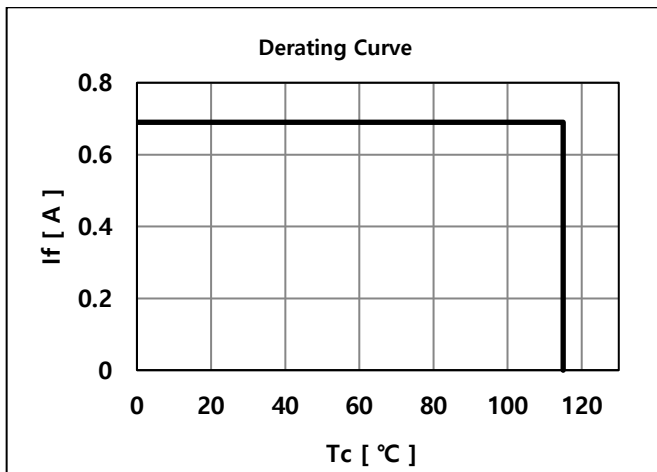
1) LC003D



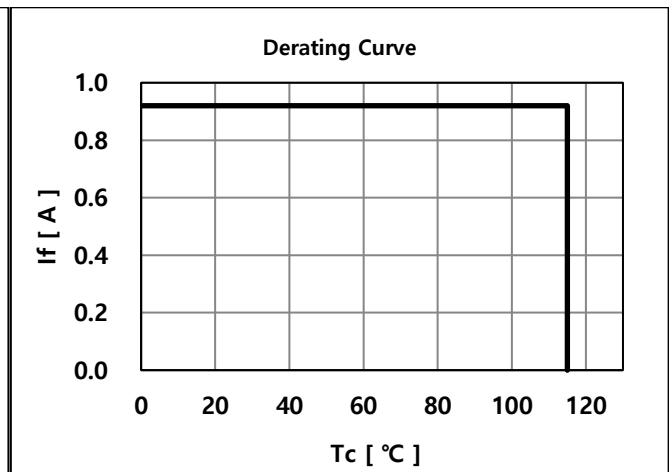
2) LC006D



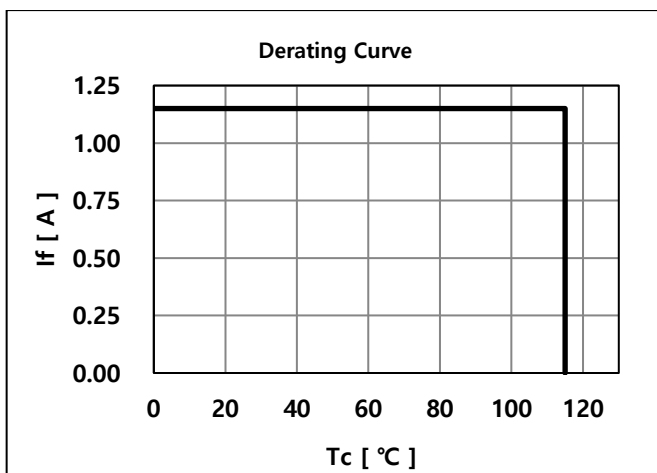
3) LC009D



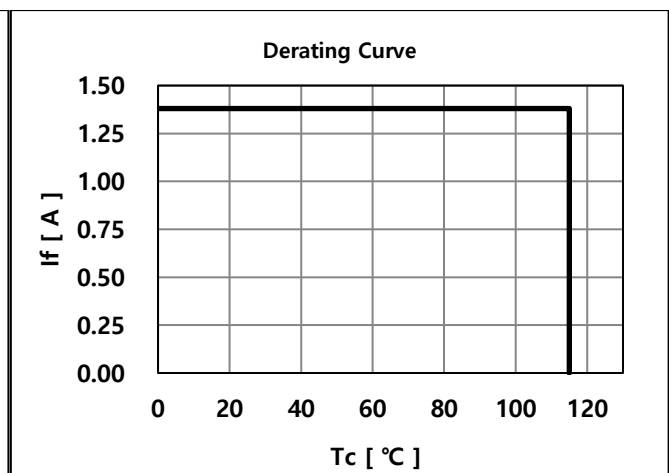
4) LC0013D



5) LC016D

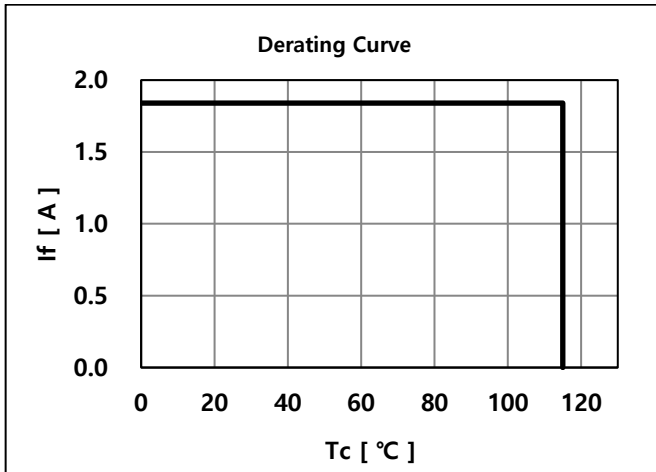


6) LC0019D

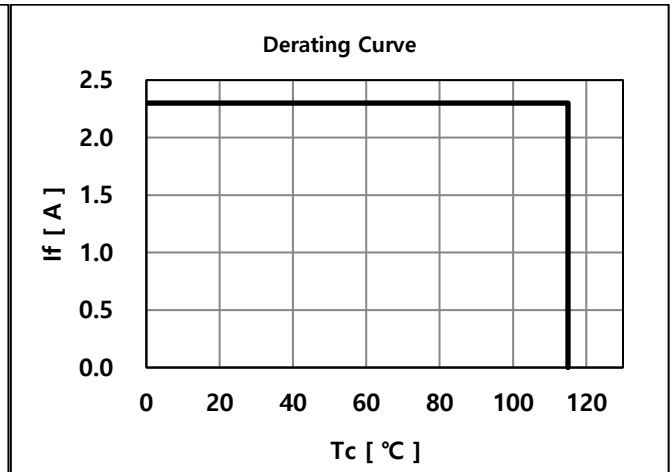




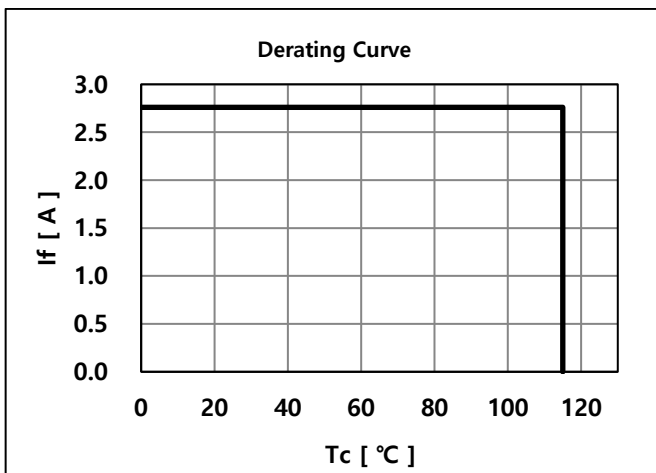
7) LC026D



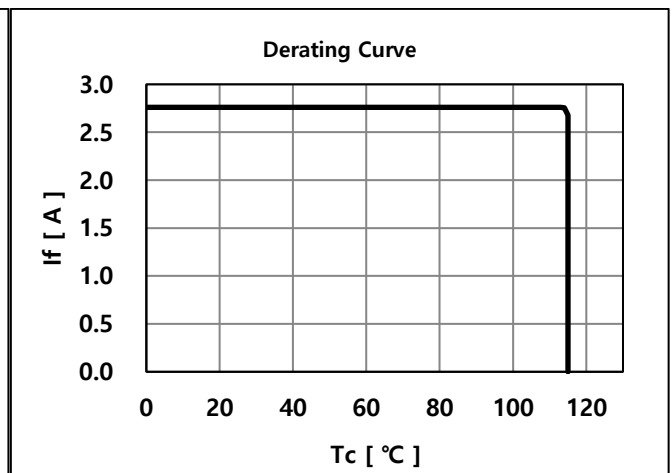
8) LC0033D



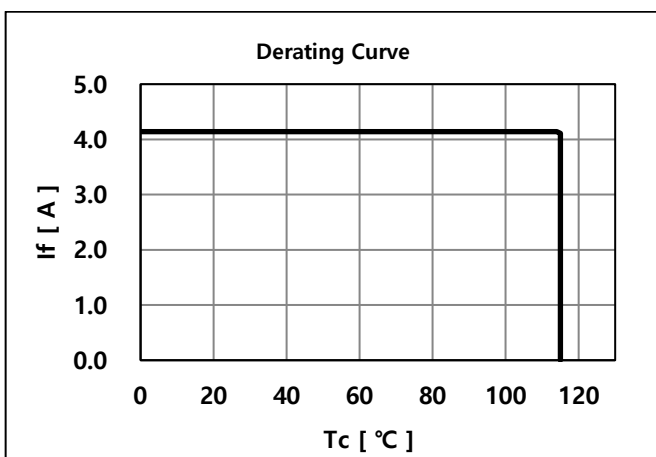
9) LC040D



10) LC060D

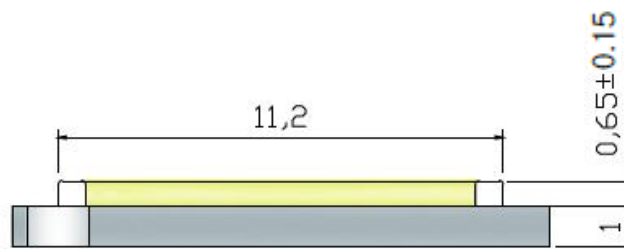
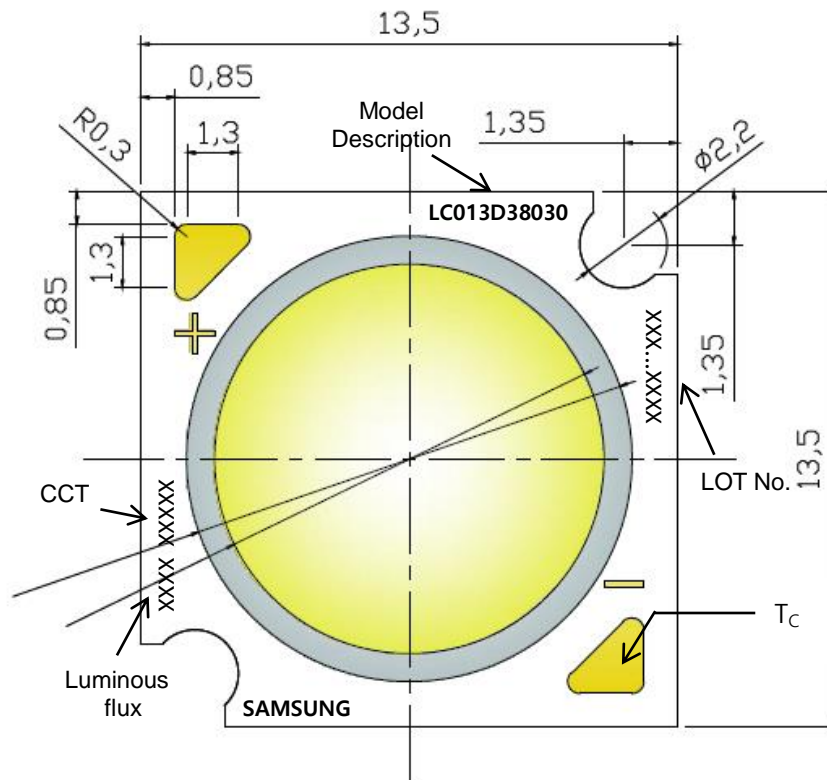


11) LC080D



4. Outline Drawing & Dimension

※ Model : LC003D, LC006D, LC009D, LC013D

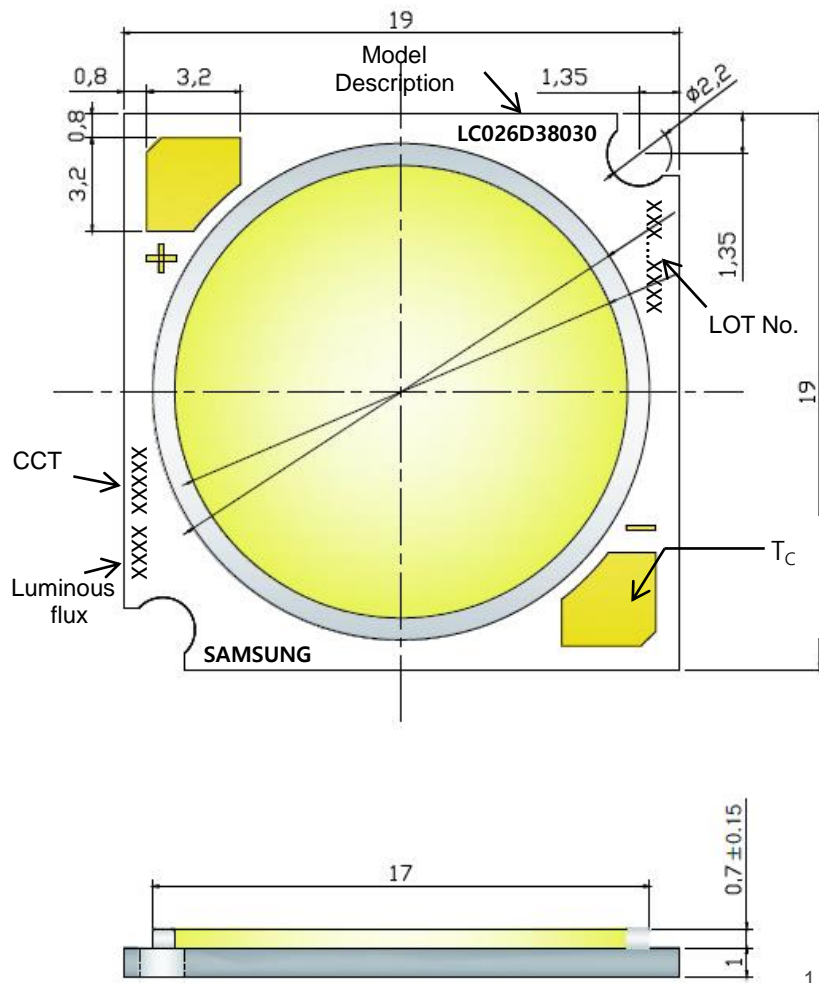


- 1. Unit: mm
- 2. Tolerance: ± 0.3 mm

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

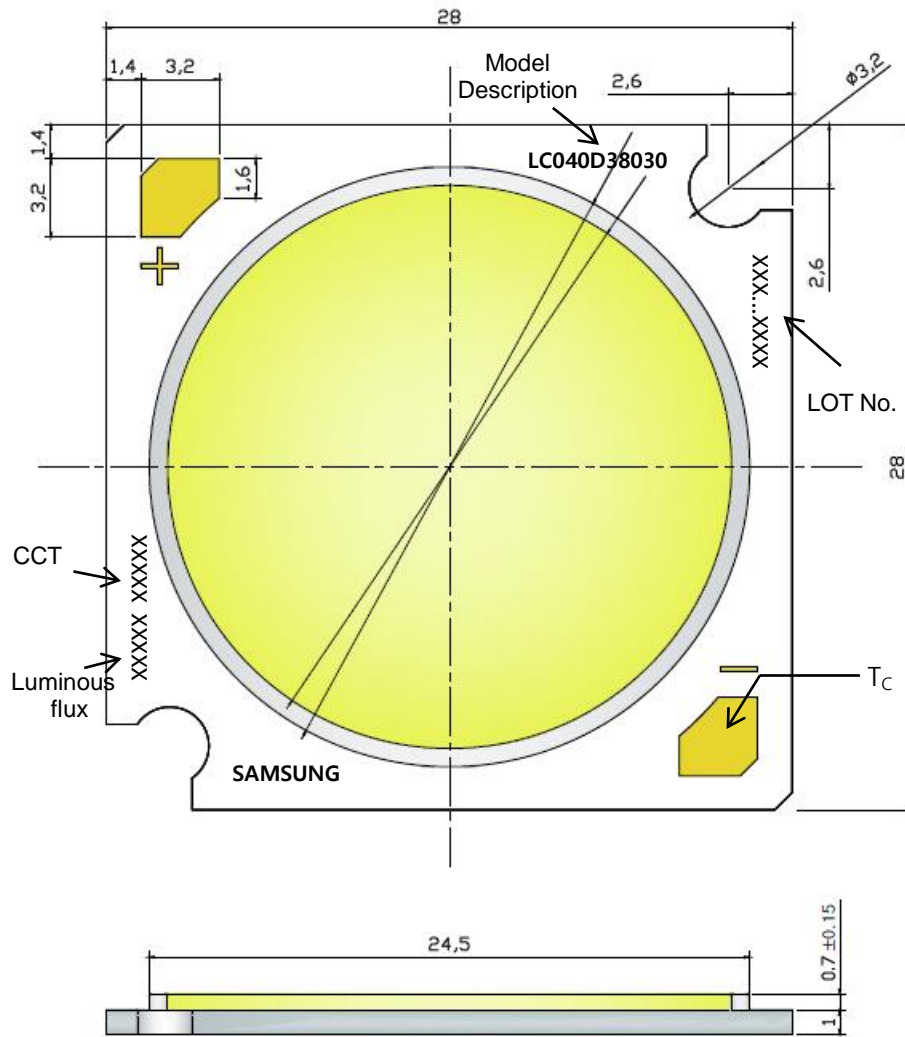


- 1. Unit: mm
- 2. Tolerance:  $\pm 0.3$  mm

Item	Dimension	Tolerance	Unit
Length	19.0	$\pm 0.15$	mm
Width	19.0	$\pm 0.15$	mm
Height	Dam	$\pm 0.15$	mm
	Substrate	$\pm 0.10$	mm
LES Diameter	Light Emitting Surface 14.5	$\pm 0.30$	mm

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

※ Model : LC040D, LC060D, LC080D



- 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	±0.15	mm
	Substrate	±0.10	mm
LES Diameter	Light Emitting Surface	±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 <sub>F</sub>	1000 h
High Temperature Operating Life Test (HTOL)	85 °C, DC Derating, I <sub>F</sub>	1000 h
Low Temperature Operating Life Test (LTOL)	-40 °C, DC, Derating I <sub>F</sub>	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 <sub>F</sub> = 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 <sub>F</sub> = Sorting Current	L.S.L. * 0.9	U.S.L. * 1.1
Luminous Flux	Φ <sub>v</sub>	I <sub>F</sub> = 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:



① ③④⑤⑥⑦⑧⑨ / 1(a)(b)(c) / 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)

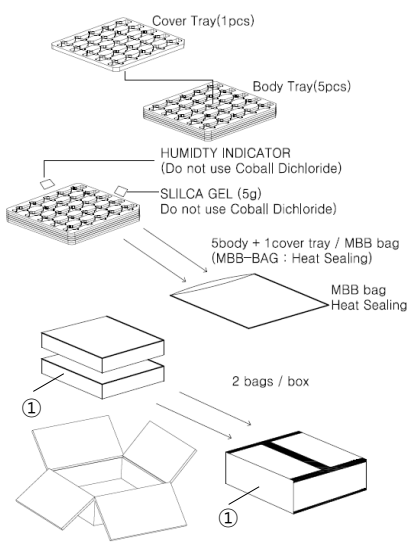
(a)(b)(c) : Product serial number (001 ~ 999)

## 7. Packing Structure

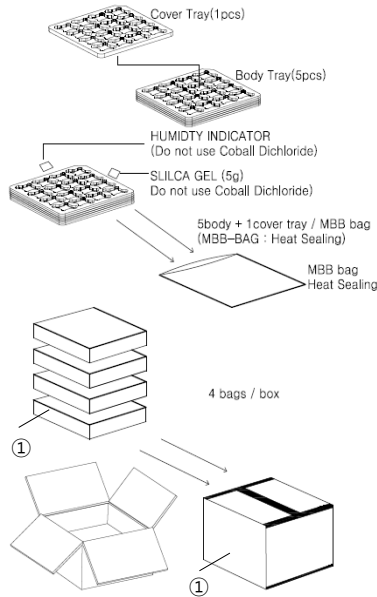
※ Model : L003D, LC006D, LC009D, LC013D

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



[MBB BAG drawing]

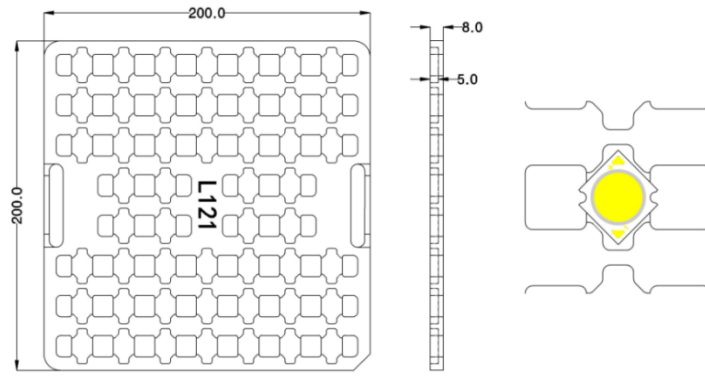


### ① Side Label

LC013D RA80 2700K  
**YZW2D4**  
SPHWHAHDND25YZW2D4 YZW2D4 01  
G4AZC4001/1001/ xxxx pcs  
**SAMSUNG**

(1P) Supplier Part Number : SPHWHAHDND25YZW2D4  
(Q) Quantity : XXXX  
(33P) Bin Code / YZW2D4  
(100) Data Code : 2109  
(1T) Lot Number / 1001  
(4L) Country of Origin : CN

## b) Tray

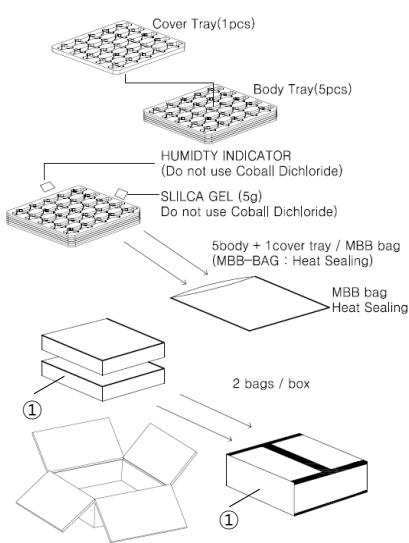




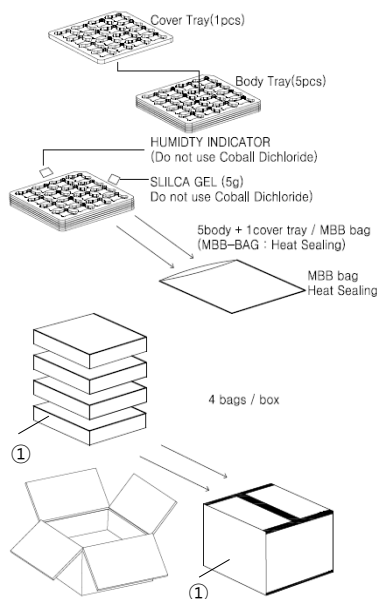
※ Model : LC016D, LC019D, LC026D, LC033D

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



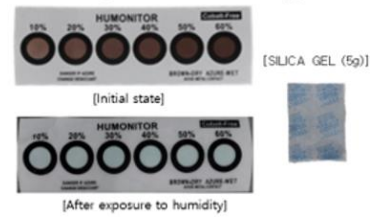
※ Small Box



※ Middle Box



[MBB BAG drawing]



[SILICA GEL (5g)]

[Initial state]

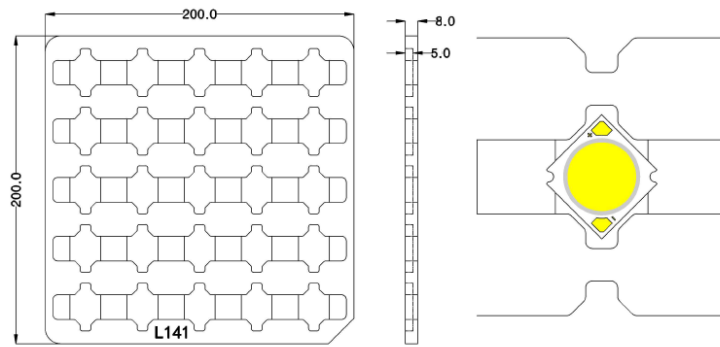
[After exposure to humidity]

① Side Label

LC026D RA80 2700K  
**YZW2D4**  
 SPHWHAHDNG25YZW2D4 YZW2D4 01  
 G4AZC4001/1001/ xxx pcs  
**SAMSUNG**

(1P) Supplier Part Number : SPHWHAHDNG25YZW2D4  
 (Q) Quantity : XXX  
 (33P) Bin Code / YZW2D4  
 (100) Data Code : 2109  
 (1T) Lot Number / 1001  
 (4L) Country of Origin : CN

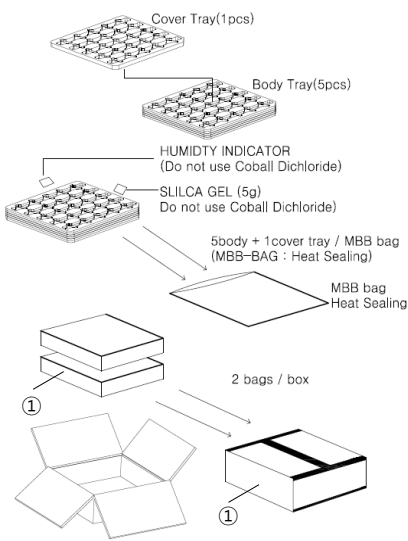
## b) Tray



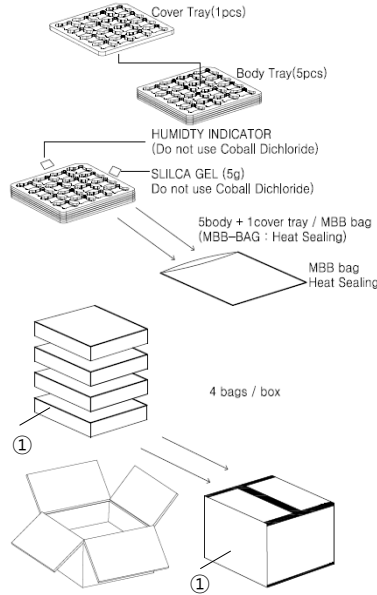
※ Model : LC040D, LC060D, LC080D

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



[MBB BAG drawing]




① Side Label





**LC040D RA80 2700K**  
**YZW2D4**


SPHWHAHDNK25YZW2D4 YZW2D4 01  
G4AZC4001/1001/ xxx pcs


**SAMSUNG**


(1P) Supplier Part Number : SPHWHAHDNK25YZW2D4  


(33P) Bin Code / YZW2D4  


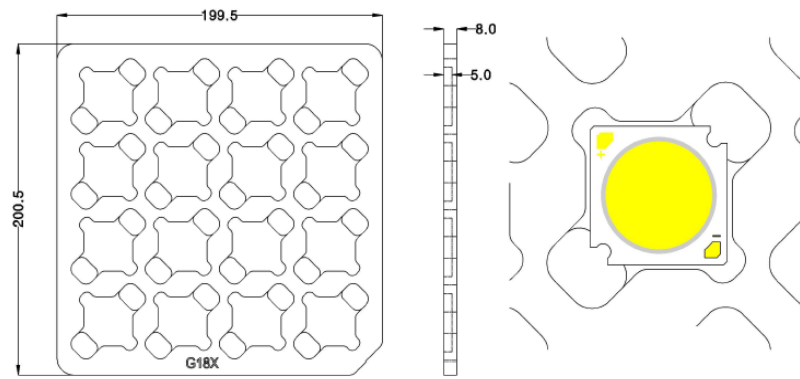
(1T) Lot Number / 1001  


(Q) Quantity : XXX  


(100) Data Code : 2109  


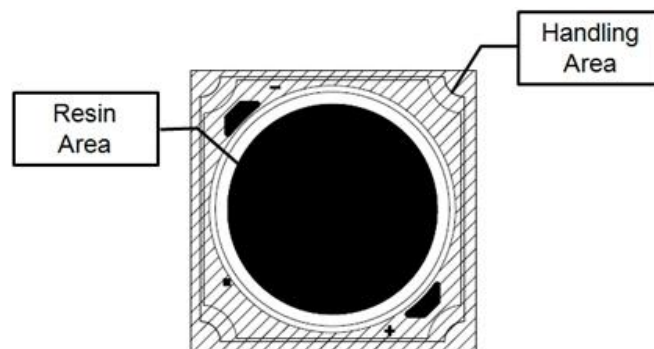
(4L) Country of Origin : CN  


## b) Tray



## 8. Precautions in Handling & Use

- 1) This device should not be used in any type of fluid such as water, oil, organic solvent, etc. Some solvent-based cleaning agent may damage the silicone resins used in the device.
- 2) LEDs must be stored in a clean environment. Shelf life of sealed bags is 12 months at temperature 0~40 °C, 0~90 % RH.
- 3) After storage bag is opened, device subjected to soldering (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 Electronics Co., Ltd. inspires the world and shapes the future with transformative ideas and technologies, redefining the worlds of TVs, smartphones, wearable devices, tablets, cameras, digital appliances, printers, medical equipment, network systems and semiconductors.

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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